HANDBOOK OF THE BIRDS OF THE WORLD

Volume 15

Weavers *to* New World Warblers



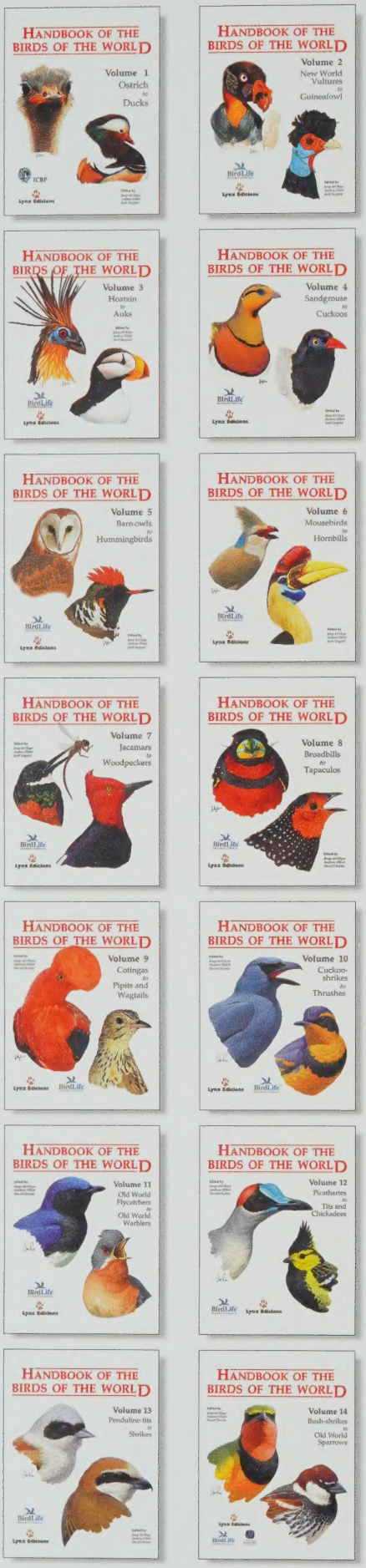


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Edited by
Josep del Hoyo
Andrew Elliott
David Christie

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Jacket illustration by CHRIS ROSE
Golden-backed Weaver (*Ploceus jacksoni*)
Red-faced Warbler (*Cardellina rubrifrons*)



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Josep del Hoyo
Andrew Elliott
David Christie

Vladimir Arkhipov
Leon Bennun
David Brewer
Stuart Butchart

Peter Clement
Nigel Collar
Adrian Craig
Jon Curson
Ian Newton

Ronald Orenstein
Robert Payne
Douglas Pratt
Alison Stattersfield

Colour Plates by

Norman Arlott
Hilary Burn

Douglas Pratt
David Quinn

Brian Small
Tim Worfolk

Consultant for Systematics and Nomenclature

Walter J. Bock

Consultant for Status and Conservation

Nigel J. Collar

Lynx Edicions

Barcelona

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Authors of Volume 15

V. Y. Arkhipov
Senior Research Fellow, Institute of Theoretical and Experimental Biophysics, Russian Academy of Sciences, Pushchino, Moscow Oblast, Russia.

Dr L. A. Bennun
Director of Science, Policy and Information, BirdLife International, Cambridge, England.

Dr D. Brewer
Research Associate, Department of Ornithology, Royal Ontario Museum, Toronto, Canada.

Dr S. H. M. Butchart
Global Research and Indicators Coordinator, BirdLife International, Cambridge, England.

P. Clement
Field ornithologist and freelance ornithological consultant, Wisbech, Cambridgeshire, England.

Dr N. J. Collar
Leventis Fellow in Conservation Biology, BirdLife International, Cambridge, England.

Professor A. J. F. K. Craig
Professor of Zoology, Department of Zoology and Entomology, Rhodes University, Grahamstown, Eastern Cape, South Africa.

J. M. Curson
Independent researcher, Seaford, East Sussex, England.

Professor I. Newton
Emeritus Fellow, Centre for Ecology & Hydrology, Wallingford, England.

Dr R. I. Orenstein
Freelance consultant, Mississauga, Ontario, Canada.

Professor R. B. Payne
Professor Emeritus, Department of Ecology and Evolutionary Biology; also Museum of Zoology; both at University of Michigan, Ann Arbor, Michigan, USA.

Dr H. D. Pratt
Research Curator of Birds, North Carolina State Museum of Natural Sciences, Raleigh, North Carolina, USA.

A. J. Stattersfield
Head of Science, BirdLife International, Cambridge, England.

Editorial Council

Ramón Mascort
(President)

Josep del Hoyo
Ramón Mascort Brugarolas
Carmen Pascual
Pilar Ruiz-Olalla
Jordi Sargatal



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Axel Bräunlich

Assistant to Editors

Ana Conesa

Artwork Co-ordinator

Francesc Jutglar

Photo Captions

Nick Langley

Documentation

José Luis Copete
Svenja Sammler
Rüdiger Becker
Alan Elliott
Heather Elliott

Scientific Consultant on Bibliography

Frank Steinheimer

Design

Josep del Hoyo
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Production

Xavier Ruiz

Production Assistants

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Montserrat Silva

Administration

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Ana Lineros
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Cecilia Vega
Graham Weeks

CONTENTS

Foreword ..... *S. H. M. Butchart, N. J. Collar, A. J. Stattersfield & L. A. Bennun* 13
Introduction 69

Order PASSERIFORMES
Family PLOCEIDAE (WEAVERS) ..... *A. J. F. K. Craig* 74
Family VIDUIDAE (WHYDAHS AND INDIGOBIRDS) ..... *R. B. Payne* 198
Family ESTRILDIDAE (WAXBILLS) ..... *R. B. Payne* 234
Family VIREONIDAE (VIREOS) ..... *D. Brewer & R. I. Orenstein* 378
Species accounts of Vireonidae: *D. Brewer*
Family FRINGILLIDAE (FINCHES) ..... *N. J. Collar & I. Newton* 440
Species accounts of Fringillidae: *P. Clement*
(species 3, 79, 85, 86 ,88, 97 and 111 co-authored with *V. Y. Arkhipov*)
Family DREPANIDIDAE (HAWAIIAN HONEYCREEPERS) ..... *H. D. Pratt* 618
Family PEUCEDRAMIDAE (OLIVE WARBLER) ..... *J. M. Curson* 660
Family PARULIDAE (NEW WORLD WARBLERS) ..... *J. M. Curson* 666

REFERENCES
References of Scientific Descriptions 803
General List of References 811

INDEX 863

LIST OF PLATES

Plate 1	PLOCEIDAE I (*Bubalornis, Dinemellia*)	*T. Worfolk*	132
Plate 2	PLOCEIDAE II (*Plocepasser, Histurgops, Sporopipes, Pseudonigrita, Philetairus,*	*T. Worfolk*	134
	Amblyospiza, Quelea)	*T. Worfolk*	142
Plate 3	PLOCEIDAE III (*Euplectes*)	*T. Worfolk*	148
Plate 4	PLOCEIDAE IV (*Euplectes*)	*T. Worfolk*	154
Plate 5	PLOCEIDAE V (*Foudia, Brachycope, Pachyphantes, Ploceus*)	*T. Worfolk*	160
Plate 6	PLOCEIDAE VI (*Ploceus*)	*T. Worfolk*	168
Plate 7	PLOCEIDAE VII (*Ploceus*)	*T. Worfolk*	174
Plate 8	PLOCEIDAE VIII (*Ploceus*)	*T. Worfolk*	180
Plate 9	PLOCEIDAE IX (*Ploceus*)	*T. Worfolk*	186
Plate 10	PLOCEIDAE X (*Ploceus*)	*T. Worfolk*	192
Plate 11	PLOCEIDAE XI (*Notiospiza, Malimbus, Anaplectes*)	*H. Burn*	218
Plate 12	VIDUIDAE I (*Anomalospiza, Vidua*)	*H. Burn*	226
Plate 13	VIDUIDAE II (*Vidua*)	*H. Burn*	298
Plate 14	ESTRILDIDAE I (*Amandava, Paludipasser, Ortygospiza, Amadina*)	*H. Burn*	304
Plate 15	ESTRILDIDAE II (*Parmoptila, Nigrita, Coccopygia*)	*H. Burn*	310
Plate 16	ESTRILDIDAE III (*Nesocharis, Mandingoa, Cryptospiza, Estrilda*)	*H. Burn*	314
Plate 17	ESTRILDIDAE IV (*Estrilda*)	*H. Burn*	320
Plate 18	ESTRILDIDAE V (*Estrilda, Pyrenestes, Spermophaga*)	*H. Burn*	326
Plate 19	ESTRILDIDAE VI (*Uraeginthus, Granatina*)	*H. Burn*	330
Plate 20	ESTRILDIDAE VII (*Pytilia, Euschistospiza, Hypargos,Clytospiza*)	*H. Burn*	336
Plate 21	ESTRILDIDAE VIII (*Lagonosticta*)	*H. Burn*	340
Plate 22	ESTRILDIDAE IX (*Lagonosticta*)	*H. Burn*	344
Plate 23	ESTRILDIDAE X (*Erythrura*)	*H. Burn*	350
Plate 24	ESTRILDIDAE XI (*Heteromunia, Emblema, Oreostruthus, Stagonopleura, Neochmia*)	*H. Burn*	356
Plate 25	ESTRILDIDAE XII (*Taeniopygia, Poephila, Lepidopygia, Euodice, Spermestes*)	*H. Burn*	364
Plate 26	ESTRILDIDAE XIII (*Lonchura*)	*H. Burn*	372
Plate 27	ESTRILDIDAE XIV (*Lonchura*)	*B. Small*	414
Plate 28	VIREONIDAE I (*Cyclarhis, Vireolanius, Vireo*)	*B. Small*	420
Plate 29	VIREONIDAE II (*Vireo*)	*B. Small*	428
Plate 30	VIREONIDAE III (*Vireo*)	*B. Small*	434
Plate 31	VIREONIDAE IV (*Hylophilus*)	*H. Burn*	512
Plate 32	FRINGILLIDAE I (*Fringilla, Serinus*)	*H. Burn*	520
Plate 33	FRINGILLIDAE II (*Serinus*)	*H. Burn*	526
Plate 34	FRINGILLIDAE III (*Serinus*)	*H. Burn*	534
Plate 35	FRINGILLIDAE IV (*Serinus, Pseudochloroptila, Alario, Neospiza*)	*H. Burn*	540
Plate 36	FRINGILLIDAE V (*Linurgus, Rhynchostruthus, Carduelis*)	*H. Burn*	546
Plate 37	FRINGILLIDAE VI (*Carduelis*)	*H. Burn*	552
Plate 38	FRINGILLIDAE VII (*Carduelis*)	*H. Burn*	558
Plate 39	FRINGILLIDAE VIII (*Carduelis*)	*H. Burn*	568
Plate 40	FRINGILLIDAE IX (*Carduelis, Leucosticte*)		
Plate 41	FRINGILLIDAE X (*Callacanthis, Rhodopechys, Bucanetes, Eremopsaltria, Rhodospiza,*	*N. Arlott*	576
	Uragus, Urocynchramus, Carpodacus)	*N. Arlott*	582
Plate 42	FRINGILLIDAE XI (*Carpodacus*)	*N. Arlott*	590
Plate 43	FRINGILLIDAE XII (*Carpodacus*)	*N. Arlott*	596
Plate 44	FRINGILLIDAE XIII (*Pyrrhospiza, Kozlowia*)	*N. Arlott*	598
Plate 45	FRINGILLIDAE XIV (*Propyrrhula, Pinicola, Haematospiza, Loxia*)	*H. Burn*	606
Plate 46	FRINGILLIDAE XV (*Pyrrhula, Coccothraustes*)		

Plate 47	FRINGILLIDAE XVI (*Eophona*, *Mycerobas*, *Hesperiphona*, *Pyrrhoplectes*)	*H. Burn*	612
	DREPANIDIDAE Extinct species (*Paroreomyza*, *Dysmorodrepanis*, *Loxops*, *Hemignathus*, *Akialoa*, *Himatione*, *Ciridops*)	*D. Pratt*	647
Plate 48	DREPANIDIDAE I (*Melamprosops*, *Paroreomyza*, *Telespiza*, *Loxioides*, *Psittirostra*, *Oreomystis*, *Magumma*, *Loxops*)	*D. Pratt*	648
Plate 49	DREPANIDIDAE II (*Manucerthia*, *Chorodrepanis*, *Hemignathus*, *Pseudonestor*, *Himatione*, *Palmeria*, *Drepanis*)	*D. Pratt*	654
Plate 50	PEUCEDRAMIDAE (*Peucedramus*)	*D. Quinn*	665
Plate 51	PARULIDAE I (*Vermivora*, *Parula*)	*D. Quinn*	738
Plate 52	PARULIDAE II (*Dendroica*)	*D. Quinn*	744
Plate 53	PARULIDAE III (*Dendroica*)	*D. Quinn*	750
Plate 54	PARULIDAE IV (*Dendroica*, *Catharopeza*, *Mniotilta*, *Setophaga*)	*D. Quinn*	756
Plate 55	PARULIDAE V (*Protonotaria*, *Helmitheros*, *Limnothlypis*, *Seiurus*, *Oporornis*)	*D. Quinn*	764
Plate 56	PARULIDAE VI (*Geothlypis*)	*D. Quinn*	770
Plate 57	PARULIDAE VII (*Microligea*, *Teretistris*, *Leucopeza*, *Wilsonia*, *Cardellina*, *Ergaticus*, *Myioborus*)	*D. Quinn*	776
Plate 58	PARULIDAE VIII (*Myioborus*, *Euthlypis*, *Basileuterus*)	*D. Quinn*	784
Plate 59	PARULIDAE IX (*Basileuterus*)	*D. Quinn*	792
Plate 60	PARULIDAE X (*Zeledonia*, *Icteria*, *Granatellus*, *Xenoligea*)	*D. Quinn*	798

Foreword

Conservation of the world's birds: the view from 2010

Introduction

The *Handbook of the Birds of the World* (HBW) began chronicling all of the world's bird species with the publication of Volume 1 in 1992. By 1999, Volume 5 had appeared, carrying a Foreword describing the factors that can be used to assess the conservation status of species, presenting the then newly developed Red List criteria of the International Union for Conservation of Nature (IUCN), and discussing why such status assessments are important (Collar 1999). Conservationists had already been calling for action to save the planet's dwindling natural resources for over a century, with limited effect. By the turn of the twenty-first century this message was at last starting to get through. The stark evidence that human impacts were impoverishing our world, and, as a result, our own lives, was finally awakening a public conscience and seeping into political awareness.

In response, at the World Summit on Sustainable Development in 2002, the world's governments committed themselves to achieve a significant reduction in the rate of biodiversity loss by 2010. The "2010 target" has focused considerable attention on biodiversity and how we can measure its status. It has also been formally incorporated into the United Nations Millennium Development Goals (MDGs) for environmentally sustainable development. Biodiversity, and the ecosystem services it underpins, are fundamental for achieving these goals. Biodiversity conservation is vital for long-term environmental sustainability, and directly affects issues such as health, water, sanitation and many other aspects of peoples' lives (Millennium Ecosystem Assessment 2005, TEEB 2008).

Almost two decades on from the start of its journey, HBW is nearly complete. Using the IUCN Red List categories and criteria for assessing species' conservation status described in HBW 5 (see also IUCN 2001), BirdLife International and Lynx Edicions published *Threatened Birds of the World* in 2000 (BirdLife International 2000): a detailed analysis of the status, distribution, habitats, ecology and actions needed for threatened species. This has since been comprehensively updated at four-yearly intervals (BirdLife International 2004a, 2008a), with partial annual updates. These species assessments, along with a growing body of information on key sites—"Important Bird Areas" (IBAs)—and habitats for the world's birds, formed the basis of *State of the World's Birds* (BirdLife International 2004b, 2008b), which in turn underpins the review here. Where they are not specifically cited, data come from the latest version of the IUCN Red List assessments for birds (BirdLife International 2010a), including abbreviated Red List categories for species of conservation concern. In the light of the 2010 target, our aim here is to review the status of the world's birds, the most important pressures they face, and how these threats can be tackled.

Birds as biodiversity indicators

Abbreviations are given for IUCN Red List categories of extinction risk as follows:
EX = Extinct
EW = Extinct in the Wild
CR = Critically Endangered
EN = Endangered
VU = Vulnerable
NT = Near Threatened

While we focus on birds, our conclusions are relevant to biodiversity more generally, because birds are effective indicators for a number of reasons. Birds occur almost everywhere in the world and in virtually all habitats. Their biology and life-histories are relatively well understood; their taxonomy is well known and relatively stable, and their populations are often easily surveyed and counted. Birds are mobile and responsive to environmental change, and there are enough bird species to show meaningful patterns. Birds also have economic importance in their own right. However, birds are less effective indicators for some habitats and are generally less specialised

* Please note that some of the taxonomy and nomenclature followed in this foreword differs from that used in the main body of HBW (see page 69).

within micro-habitats than, for example, insects or plants; so, at a local scale, patterns of bird distribution may not always match well those of other taxa (Pearson 1995, Lawton *et al.* 1998). Nevertheless, networks of sites selected as important for birds also capture most other biodiversity (Howard *et al.* 1998, Brooks *et al.* 2001) and, at a larger scale, birds are very useful indicators of species richness and endemism patterns (Bibby *et al.* 1992, Stattersfield *et al.* 1998, Burgess *et al.* 2002, Rodrigues 2007). Most importantly, bird population trends tend to integrate several ecological factors and therefore provide a useful indication of environmental change (Donald *et al.* 2001, Gregory *et al.* 2003).

As indicators, the most significant advantage of birds is that we have so much information about them. Indeed, HBW is weighty proof that birds are considerably better known than any other class of organism. Again, the character of birds provides the reason for this. Most birds have several or many of the following attributes: they are common, diurnal, conspicuous, colourful, beautiful, vocal, musical and responsive to feeding, making them attractive, interesting, watchable and identifiable. In most places in the world there are good (but not overwhelming) numbers of species. Watching birds is therefore highly popular. For example, c. 46 million people in the USA (c. 20%) spend time observing and identifying birds (USFWS 2003a), and in doing so contributed US$36 billion to the US economy in 2006 alone (La Rouche 2009), while 20 million people (c. 30%) in the UK are birdwatchers or regularly feed birds in their gardens (Beolens 2010).

Scientific research on birds is intensive, and expanding. A "Web of Science" keyword search reveals that since 1990 there have been over 160,000 articles in mainstream academic journals with the word "bird" in the title or abstract—over 20 a day on average! There are numerous professional ornithologists, but in addition many birdwatchers are skilled observers, and contribute high-quality data to "citizen science" programmes. Information on bird distribution, migration, ecology and behaviour is collected from all over the world, by thousands of individuals and organisations. In many countries, data are gathered through extensive bird-ringing programmes (e.g. 1·1 and 0·8 million birds per year are ringed in the USA and UK respectively: BTO 2009, USGS 2010).

The level of interest in birds is reflected by the extraordinary number of field guides and books that have been published about them, with individual guides covering nearly every country in the world, and many others focusing on individual bird families. This huge array of information is also being brought together in a meaningful way for conservation. Since 1980, BirdLife International (and its precursor the International Council for Bird Preservation) has published Red Data Books, presenting comprehensive information on all globally threatened bird species. The latest in this series, *Threatened Birds of Asia*, cites over 7000 references (BirdLife International 2001), while the latest version of *Threatened Birds of the World* (BirdLife International 2008a) cites 5900 references. BirdLife's World Bird Database (WBDB), initiated in 1994, manages extensive information on all c. 10,000 species, and a similar number of IBAs and 218 Endemic Bird Areas (EBAs: areas of endemism supporting at least two "restricted-range" species). What do all these data tell us about the conservation status of the world's birds in 2010?

Extinctions

In his Foreword to HBW 7, Fuller (2002) documented 75 bird species that had gone extinct since 1600, plus a number of taxa whose taxonomic status and/or survival were uncertain. Some of these are now considered to have died out much earlier, while others are treated as Critically Endangered (**CR**), as there is still hope that individuals may survive. BirdLife lists a total of 132 recently extinct bird species. The additions to Fuller's list are (a) species that went extinct after 1500 (the cut-off date used by BirdLife and IUCN) but before 1600, (b) taxa whose taxonomic status and/or extinction are no longer considered uncertain, and (c) other extinct taxa shown to be good species in recent years. BirdLife classifies an additional four species as Extinct in the Wild (**EW**), with populations surviving only in captivity.

Some species currently categorised as **CR** may also be extinct, but cannot be designated as such until we are as close to certain as possible. This is in order to avoid giving up on them prematurely, termed the "Romeo error" by Collar (1998) in discussing the case of Cebu Flowerpecker (*Dicaeum quadricolor*) **CR**. This bird was rediscovered in 1992 after 86 years without a record (Dutson *et al.* 1993), having been written off as extinct at least 40 years earlier on the presumption that no forest remained on the island of Cebu (Magsalay *et al.* 1995). A total of 13 **CR** species are tagged as **Possibly Extinct** (and one as **Possibly Extinct in the Wild**) because they are, on the

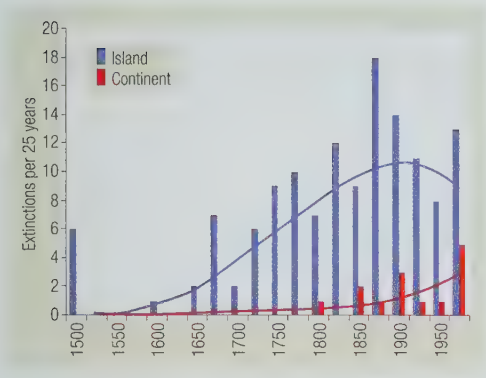


Figure 1
The extinction rate on islands has declined over the last century, but the rate on continents is accelerating. Totals include bird species classified as Extinct, Extinct in the Wild, Critically Endangered (Possibly Extinct) and Critically Endangered (Possibly Extinct in the Wild).

balance of evidence, likely to have died out, but there is a small chance that some wild individuals survive undetected (Butchart *et al.* 2006a). Adding these to the totals above indicates that 150 bird species may have been lost since 1500. Many more bird species were driven extinct in historic times by human expansion around the world, for example, by the colonisation of Polynesia (Steadman 1995).

Extinctions are continuing: 18 species were lost in the last quarter of the twentieth century, and three are known or suspected to have gone since 2000. The last known wild Spix's Macaw (*Cyanopsitta spixii*) **CR, Possibly Extinct in the Wild** disappeared in Brazil towards the end of 2000, the last two wild Hawaiian Crows (*Corvus hawaiiensis*) **EW** disappeared in June 2002, and the last known Poo-uli (*Melamprosops phaeosoma*) **CR, Possibly Extinct** also from Hawaii, died in captivity in November 2004.

Most extinctions (88%) have been on islands (Butchart *et al.* 2006a), even though most bird species (>80%) live on continents (Johnson & Stattersfield 1990). Many island extinctions resulted from the introduction of invasive alien species such as cats, rats and goats, which devoured the native species or degraded their habitats. Native species on oceanic islands are often particularly susceptible to introduced predators, having lost their natural defences after evolving in isolation for many thousands of years. The extinction rate on islands may be slowing, presumably because many susceptible species are already extinct, while conservation interventions are successfully improving the status of some of the remainder. By contrast, the extinction rate on continents is increasing (Fig. 1), and the continuing large-scale destruction of natural habitats bodes ill for many continental bird species.

Avoiding the "Romeo error", and not designating a species Extinct until it certainly is, may lead to a modest underestimation of extinction rates. This is compounded by time-lags before the last individuals of a species disappear following habitat loss. In Kakamega Forest, Kenya, the number of species in habitat fragments was found to decline exponentially after isolation, with a half-life of 23–80 years, i.e. half the number of species that are expected eventually to disappear are lost in the first 23–80 years following isolation (Brooks *et al.* 1999). This suggests that many species threatened by habitat loss will be "committed to extinction" unless conservation action is implemented urgently.

Threatened species

Using the IUCN Red List criteria and categories (IUCN 2001), BirdLife's 2010 assessment of all the world's birds shows that 1240 species (12·5% of the 9895 extant species, or one in eight) are threatened with global extinction. These comprise 190 species classed as **CR** (1·9%), 372 as Endangered (**EN**, 3·8%) and 678 as Vulnerable (**VU**, 6·9%). An additional 838 species (8·5%) are considered Near Threatened (**NT**) because they are close to qualifying as globally threatened. Hence a total of 2078 species (a fifth of all the world's birds) are assessed as being of significant global conservation concern. Only 62 species (0·6% of the total) are considered insufficiently known for their threat status to be determined, and so are classified as Data Deficient, far fewer proportionately than other taxonomic classes, such as mammals (15·5%), amphibians (25·4%) and corals (17·5%) (Vié *et al.* 2008, Butchart & Bird 2009), precisely because of the greater knowledge about birds.

There are particularly high proportions of threatened species among albatrosses (77%, 17 out of 22 species), cranes (73%, 11 out of 15), penguins (61%, 11 out of 18), petrels and shearwaters (43%, 35 out of 82) and guans (34%, 17 out of 50). Furthermore, families and genera with few species have disproportionately high numbers of threatened species (Purvis *et al.* 2000), and larger-bodied species and those with low reproductive rates (owing to small clutch sizes) are also more likely to be threatened (Bennett & Owens 1997).

The populations of 80% of threatened birds (992 species) are below 10,000 individuals, and 42% (524 species) are below 2500 individuals. Some 60 species have tiny populations that may support no more than 50 individuals worldwide. Eighty-two percent of threatened birds are declining; and for 36% (449 species) the declines are rapid (over 30% in ten years or three generations). Eighteen species have declined by over 80% over the past ten years or three generations. For example, numbers of Mariana Crow (*Corvus kubaryi*) **CR** fell from 1318 birds in 1982 to 85 pairs in 2008 (Amar *et al.* 2008), and Spoon-billed Sandpiper (*Eurynorhynchus pygmeus*) **CR** declined from an estimated 2000–2800 pairs in the 1970s to 150–450 pairs by 2008 (Zöckler *et al.* 2008). Only 118 threatened species (10% of those with trend estimates) have stable populations, and just 59 (5%) have increasing populations, almost all in response to conservation efforts, e.g. St Lucia Amazon (*Amazona versicolor*) **VU** and Mauritius Kestrel (*Falco punctatus*) **VU**.

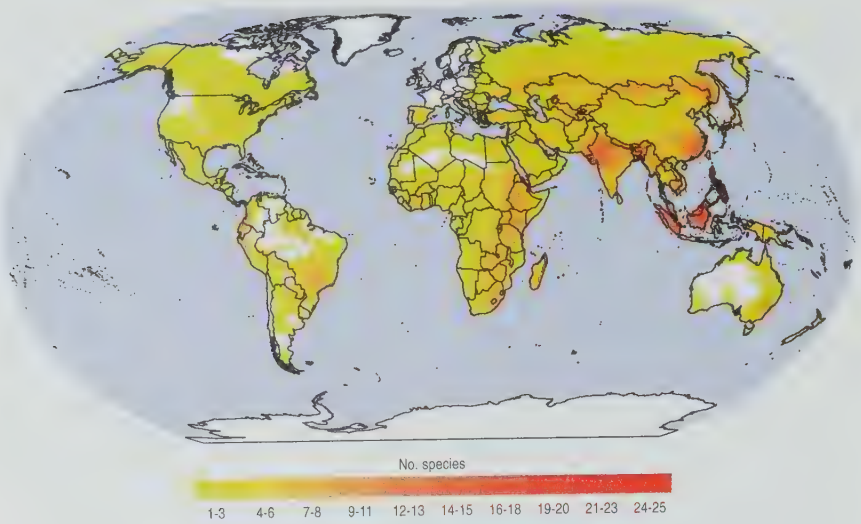


Figure 2
The highest density of threatened bird species occurs where centres of endemism coincide with high levels of threat.

Most threatened bird species have small or very small ranges, rendering them more susceptible to threatening processes. Forty-one species (3%) occupy ranges smaller than 10 km^2, the majority on small islands. For example, Floreana Mockingbird (*Nesomimus trifasciatus*) **CR** is restricted to two tiny islets totalling just 0·9 km^2 in the Galapagos Islands, Ecuador, and Cerulean Paradise-flycatcher (*Eutrichomyias rowleyi*) **CR** is restricted to 2 km^2 of forest on the Indonesian island of Sangihe. Altogether 672 threatened birds (54%) qualify as threatened because their ranges are smaller than 20,000 km^2 and are declining and fragmented or restricted to a few locations. In total, 346 threatened species (28%) are known from ten or fewer locations, with 296 (24%) found at five or fewer. A total of 217 **CR** or **EN** species are restricted to single sites, and hence qualify under the criteria of the Alliance for Zero Extinction (www.zeroextinction.org; see also Ricketts *et al.* 2005). Examples include Pale-headed Brush-finch (*Atlapetes pallidiceps*) **CR**, now restricted to a single site in southern Ecuador, Millerbird (*Acrocephalus familiaris*) and Nihoa Finch (*Telespiza ultima*), both **CR** and found only on Nihoa Island, Hawaii, USA.

The few threatened birds that have very large ranges (36 species or 3% have range sizes over 1 million km^2) are considered threatened either because they occur at very low densities and have small declining populations, or because they have undergone extremely steep population declines. An example of the former circumstance is Lappet-faced Vulture (*Torgos tracheliotus*) **VU**, which occurs over 8·7 million km^2 in Africa and the Middle East but at low population densities, with a total, declining population of 8500 individuals. Examples of the latter are provided by three Asian *Gyps* vultures whose numbers have decreased by up to 99% in recent years owing to poisoning by the veterinary drug diclofenac (see below).

Distribution of threatened species

All countries and territories of the world host one or more globally threatened bird species, with particularly high densities in the tropical Andes, Atlantic Forests of Brazil, eastern Himalayas, eastern Madagascar and insular South-East Asia (Fig. 2). The highest densities of threatened seabirds are found in international waters in the southern oceans, with a particular concentration around New Zealand (Fig. 3). Ten countries have more than 60 globally threatened birds, with Brazil and Indonesia heading the list, holding 123 and 119 respectively (Fig. 4). It is notable that, with dependent territories included, the USA jumps from seventh to fourth in the list of countries with the most threatened birds, supporting 97 species (22 in overseas territories), while France's rank shifts from 144 to eight with 78 species (71 overseas). In total, 756 threatened birds (61%) have ranges confined to just one country, and 78 countries (35%) have one or more such endemic threatened birds. Again, Brazil and Indonesia top the list, with 70 and 68 endemics respectively, while the proportion of threatened species that are endemic is highest in São Tomé e Principe (90% of 10 species), Philippines (81% of 73 species) and Madagascar (77% of 35 species). Conversely, the ranges of some threatened birds may cross the borders of several countries: Lesser Kestrel (*Falco naumanni*) **VU** tops the list, occurring regularly in 97 countries (and as a vagrant to 15 others) in Europe, Asia and Africa, and Wandering Albatross (*Diomedea exulans*) **VU** occurs in 17 (breeding in four and visiting the territorial seas of 13 others). Thirteen other species have ranges that encompass 30 or more countries, and 160 species are recorded from five or more countries. Hence the

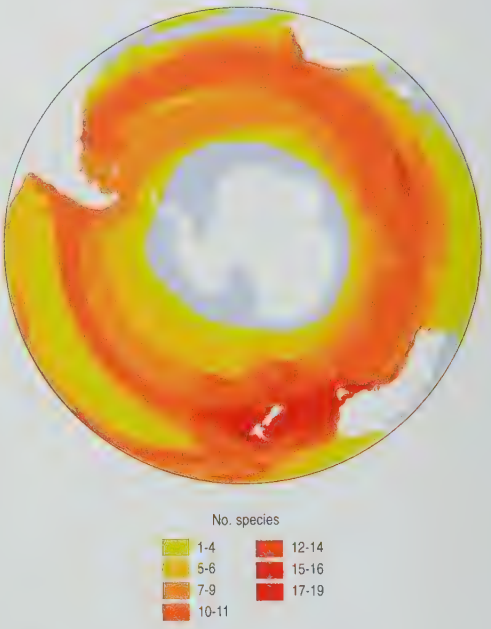
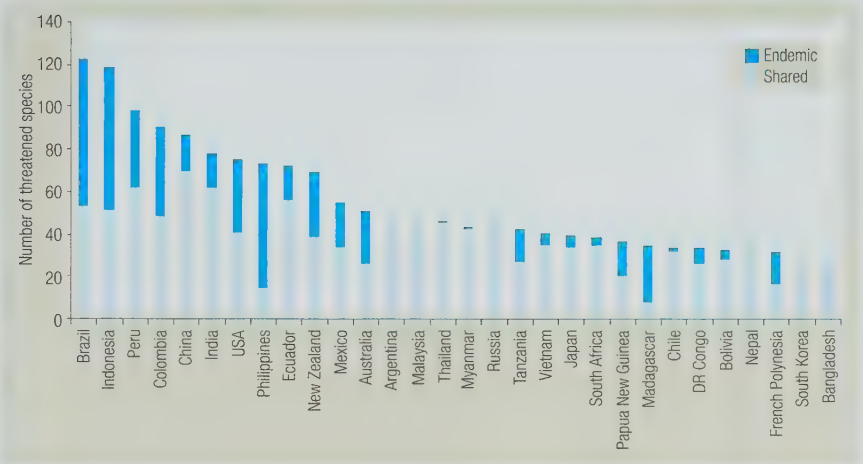


Figure 3
Threatened seabird species are concentrated in the southern oceans around New Zealand.

Figure 4
Many countries support threatened bird species, but some have exceptional numbers.



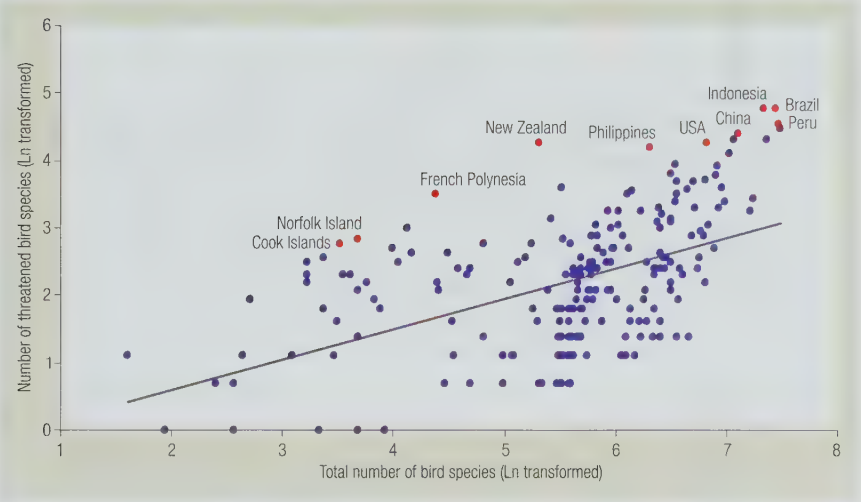


Figure 5
Some countries have particularly threatened avifaunas (marked in red on a regression of the number of threatened bird species against the total number of bird species for each country).

political responsibility for saving threatened species falls to individual countries but also requires international cooperation in both conservation action and financing.

The overall avifaunas of some countries are particularly threatened. A graph of the number of threatened species plotted against the total number of bird species per nation shows that numerous countries are situated well above the regression line, i.e. they support more threatened species than expected (Fig. 5). The ten countries with the most threatened avifaunas include seven of the most important in terms of absolute numbers of threatened birds (e.g. Indonesia, Peru and Brazil). The analysis also highlights several territories that have highly threatened avifaunas despite relatively low total avian diversity. For example, French Polynesia supports 79 bird species, of which 32 are globally threatened, and Norfolk Island (to Australia) supports 39 species, with 16 globally threatened. Some countries also hold far fewer threatened species than expected. These include very small states with no globally threatened birds (e.g. Monaco and the Faroe Islands), but also large ones such as Guyana, Suriname and Congo, with avifaunas of more than 600 species. Fortunately, few bird species are yet threatened in these countries because they still hold vast tracts of largely pristine forest and host very few restricted-range species.

Most of the world's bird species (>80%) are continental in distribution (Johnson & Stattersfield 1990). However, just as islands have disproportionately high numbers of extinctions, so they also have disproportionately high numbers of threatened species: almost equal numbers are found on islands (583 species) as on continents (613), with few (30, 2·5%) shared between them. Oceanic islands hold more than twice as many threatened species as continental shelf islands (Fig. 6). Some small island groups harbour exceptionally high numbers of threatened birds: 33 on Hawaii (USA) and 14 each on the Northern Marianas (to USA) and Galapagos (Ecuador).

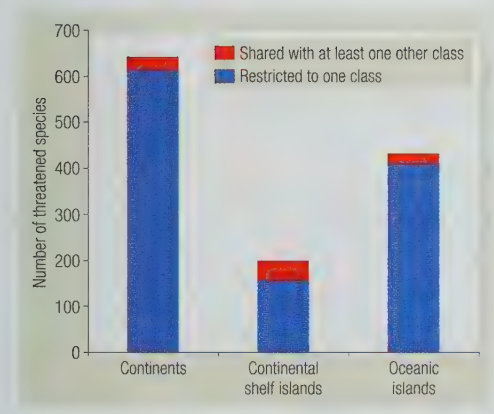


Figure 6
Islands (particularly oceanic islands) hold a disproportionate number of threatened bird species.

Habitats of threatened species

Forests are the most important habitat for threatened birds, supporting 946 species (76%). Shrubland (scrub, bushland and thicket habitats, supporting 339 species, 27%),

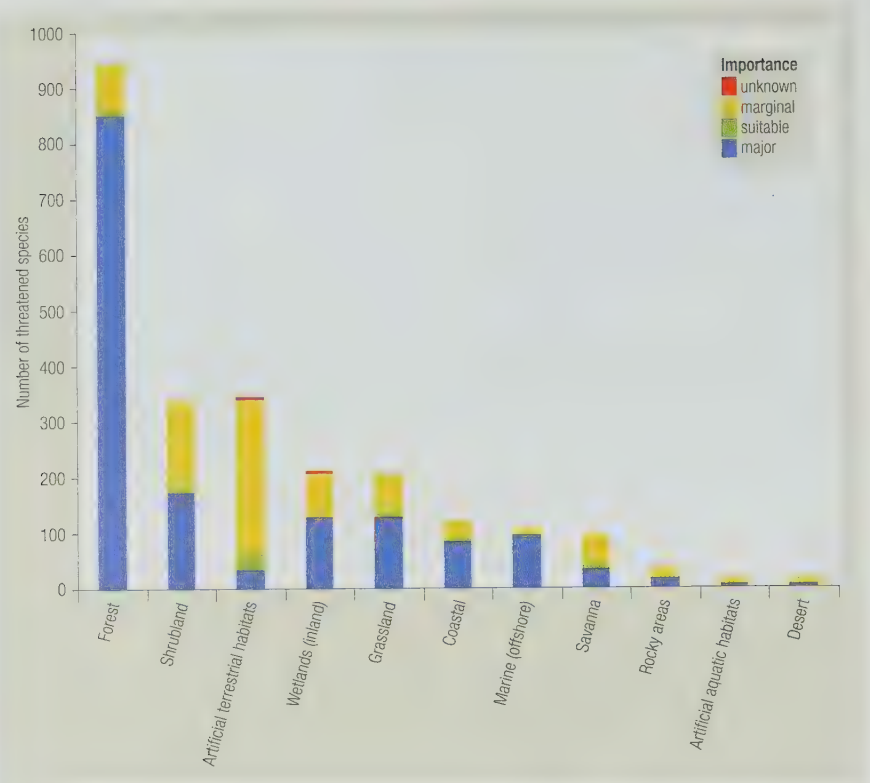


Figure 7
Forest is the most important habitat for threatened bird species.

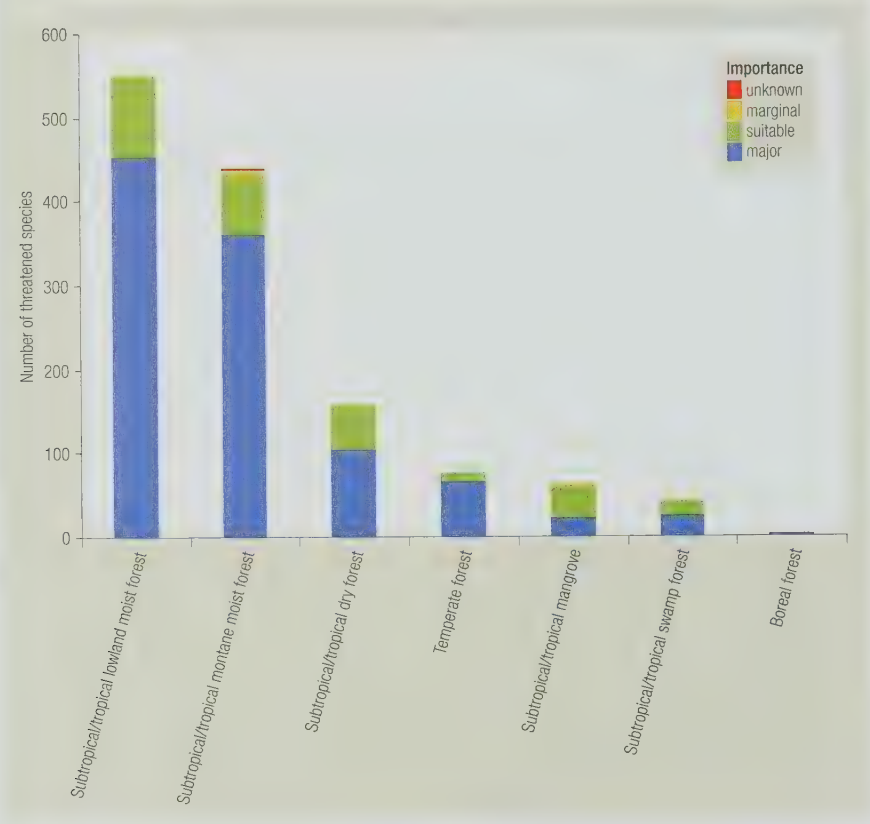


Figure 8
Tropical moist forests are the most important forest type for threatened bird species.

inland wetlands (211 species, 17%) and grasslands (204 species, 17%) are the next most important habitats (with some species occurring in multiple habitat types; Fig. 7). Only 347 threatened species (28%) utilise what are termed artificial habitats (compared with 45% of all birds), largely because threatened species tend to be less tolerant of habitat modification. These species usually depend on adjacent natural or semi-natural habitats for breeding or feeding, but are able to use human-modified habitats to some extent. Threatened birds are found in all forest types (Fig. 8), but tropical/subtropical lowland and montane moist forest are the most important, supporting 550 species (58% of forest-dwelling threatened species) and 439 species (46%)

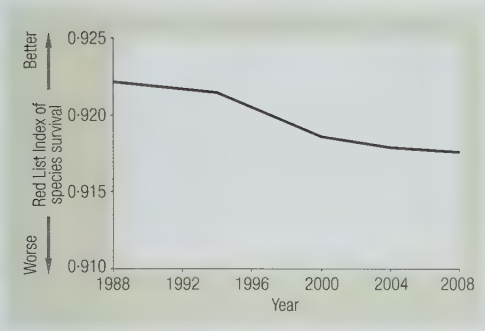


Figure 9
The status of the world's birds has declined during 1988–2008 (N=9833 non-Data Deficient extant species). A Red List Index (RLI) value of 1·0 equates to all species being categorised as Least Concern, and hence that none is expected to go extinct in the near future. An RLI value of zero indicates that all species have gone extinct.

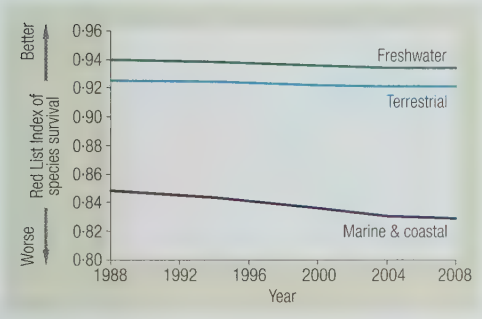


Figure 10
Marine and coastal birds are more threatened overall and deteriorating faster than terrestrial or freshwater species. Red List Index (RLI) of species survival for bird species in different ecosystems (N=1307 non-Data Deficient extant freshwater species, 9679 terrestrial species and 334 marine and coastal species; note that some species occur in more than one ecosystem).

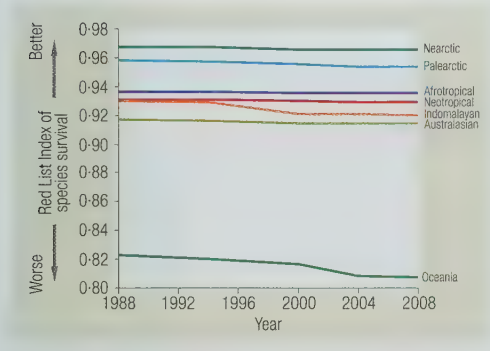


Figure 11
Birds are most threatened and declining fastest in Oceania compared to other biogeographic realms. Red List Index (RLI) of species survival for bird species in different biogeographic realms (N=1706 non-Data Deficient extant Palearctic species, 964 Nearctic, 2210 Afrotropical, 3972 Neotropical, 2144 Indomalayan, 1765 Australasian and 354 Oceanic species).

respectively, with tropical/subtropical dry forest supporting 157 (17%). Threatened forest birds tend to be intolerant of habitat degradation: 76% (709 species) show a strong dependency on intact forest.

Recent trends in threatened species

The Red List Index (RLI) for birds tracks trends in their overall extinction risk, with values relating to the proportion of species expected to remain extant in the near future without additional conservation action (Butchart *et al.* 2004, 2007). It shows (Fig. 9) that there has been a steady and continuing deterioration in the status of the world's birds since 1988 (when the first comprehensive global assessment was carried out: Collar & Andrew 1988). The RLI is based on the number of species in each Red List category and the number moving between categories (when the entire set is reassessed) as a result of genuine changes in status (i.e. excluding moves resulting from improved knowledge or taxonomic changes: Butchart *et al.* 2004, 2005, 2007). Although 40 species have improved in status since 1988 (sufficient to be downlisted to a category of lower threat), 234 have deteriorated in status (sufficient to be uplisted to a category of higher threat), giving a net decline in the index overall.

The RLI can be disaggregated to show trends for different subsets of species. Birds in terrestrial, freshwater and marine ecosystems (including coastal habitats) have all declined in status over the last 20 years (Fig. 10). Marine species are of particular concern: they are substantially more threatened on average (with the lowest RLI values), and have declined faster than others. Similarly, birds in all regions have declined in status, but those in Oceania are substantially more threatened on average, and have declined fastest (Fig. 11), often owing to the detrimental impacts of invasive alien species on Pacific islands. In the Indomalayan realm, there was a sharp decline in the status of birds between 1994 and 2000. This was a consequence of the destruction of forests in the Sundaic lowlands of Malaysia and particularly Indonesia, which escalated in the late 1990s. Some species groups have been impacted very seriously by human activities and have an exceptionally high proportion of species listed as globally threatened. Pelagic seabirds (those using the open seas) are substantially more threatened and declining faster than other groups (Fig. 12), owing to a combination of marine threats (notably from incidental mortality in longline fisheries) and threats at breeding colonies (particularly the impacts of invasive alien species).

Common bird declines

In much of the world, familiar common bird species may not yet be globally threatened, but are nevertheless in decline (Fig. 13). At least 40% of bird species worldwide (3967) have declining population trends, compared with 44% that are stable (4393), 7% that are increasing (653) and 8% with unknown trends (823). Reductions in population and/or distribution have been documented across both temperate and tropical regions, and in farmlands, forests, wetlands and other habitats, indicating widespread environmental problems. The species with stable or increasing populations tend to be those that can thrive in human-altered habitats, although some are benefiting from conservation efforts. Detailed information on declines in common birds is patchy: below we look at examples where trends have been quantified.

Europe

In Europe, Wild Bird Indices (WBIs) show that populations of farmland specialist birds (such as Corn Bunting *Miliaria calandra*) have declined by 48% since 1980, with decline rates greatest in the late 1970s and early 1980s (Fig. 14; Gregory *et al.* 2005, 2008, PECBMS 2009, www.ebcc.info). Forest species have fluctuated in numbers over the past three decades, with declines in northern and southern Europe contrasting with apparently stable or increasing trends in parts of central and eastern Europe (Gregory *et al.* 2007). Populations of long-distance migrants that breed in Europe and winter in sub-Saharan Africa (such as Spotted Flycatcher *Muscicapa striata*) have suffered sustained and often severe declines over the past few decades. Over 40% of Afro-Palearctic migrants have undergone substantial declines since 1970 (Sanderson *et al.* 2006), whereas residents and short-distance migrants breeding in the same habitats in Europe have not. Varying combinations of multiple threats, including habitat degradation on breeding grounds in Europe, hunting in southern Eu-

rope and North Africa, loss of staging areas, reduced over-winter survival (owing to reduced rainfall and increased agricultural intensification) and possibly climate change (asynchrony in the timing of migration and resource availability), seem likely to be driving the declines, but it remains extremely difficult to identify the most significant among them.

North America

In North America, WBIs (Fig. 15) show that since 1968 populations of grassland species (such as Lark Bunting *Calamospiza melanocorys*) have declined by 28%, aridland species (such as Scaled Quail *Callipepla squamata*) by 27% and forest species (such as Kentucky Warbler *Oporornis formosus*) by 2% overall (but by 25% in eastern forests) (US NABCI Committee 2009). The dramatic population declines in grasslands and aridlands are largely attributed to habitat loss driven by agricultural expansion and intensification, as well as infrastructure and housing development, mining and other energy development. Climate change is also a significant threat, especially for tundra-breeding species. In parallel with results from Europe, over half the Neotropical migratory birds in North America have suffered substantial declines over the past 40 years, particularly since the 1980s (e.g. Western Wood-pewee *Contopus sordidulus*). The reasons are unclear, but forest fragmentation in breeding areas and deforestation in non-breeding ranges may be important. In contrast, indicators for wetland specialists (such as Redhead *Aythya americana*) show that their populations have increased 56% since 1968, probably as a consequence of changes in precipitation, land-use and management practices.

Australia

In Australia, too, common and widespread birds have declined sharply in recent years, most notably across the Murray-Darling Basin (covering a large part of south-east Australia). Woodland, grassland and heathland bird populations all appear to be in decline (Olsen 2008). Detailed indices based on atlas data are currently available only at a subregional scale (for eight catchments in New South Wales), but show consistently negative trends in common species such as Australian Magpie (*Gymnorhina tibicen*) and Eastern Rosella (*Platycercus eximius*) (Cunningham & Olsen 2009). Aerial surveys of waterbirds across eastern Australia also show that their overall numbers are much lower than in the 1980s. Shorebird numbers, in particular, have plummeted over the last two decades, including both migrants (such as Far Eastern Curlew *Numenius madagascariensis* and Curlew Sandpiper *Calidris ferruginea*), and residents (such as Banded Lapwing *Vanellus tricolor* and Red-necked Avocet *Recurvirostra novaehollandiae*) (Kingsford & Porter 2008).

Waterbirds worldwide

Despite the positive trends noted above for waterbirds in North America, 40% of 1200 waterbird populations worldwide (for which trends are known) are declining, with only 17% increasing (Delany & Scott 2006). Reliable trend data are unavailable for the remaining 1105 waterbird populations, and the availability of information varies regionally. Data from Europe (where estimates are available for 73% of 351 populations) show a similarly high proportion (41%) of populations in decline, while in Asia 59% of populations with known trends are declining (Delany & Scott 2006). For shorebirds (one of the better known groups), the proportion of declining populations has increased from 41% in the 1980s to 52% in the 2000s (Fig. 16; Davidson & Stroud 2010). For example, numbers of the *rufa* subspecies of Red Knot (*Calidris canutus*), which migrates between the Canadian Arctic and Tierra del Fuego, fell from 100,000 individuals in 1989 to just 17,200 in 2006, mainly owing to humans over-harvesting key food sources at important stop-over sites (Baker *et al.* 2004).

African raptors

In other regions and for other species groups, information is patchier but trends are generally negative. Two recent studies highlight declines in African raptors, which are likely to be symptomatic of trends in birds in the African countryside more generally. Surveys in Burkina Faso, Mali and Niger in 1969–1973 and 2003–2004 showed that

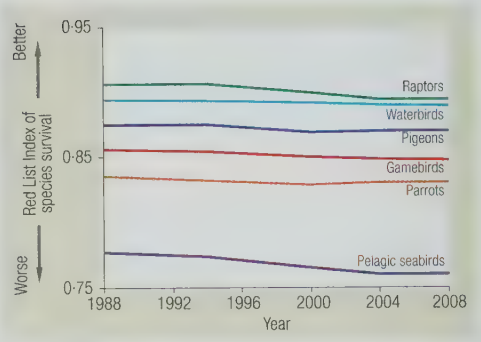


Figure 12
Pelagic seabirds are the most threatened group, and are declining fastest. Red List Index (RLI) of species survival for bird species in different species groups (N=311 non-Data Deficient extant raptors, 824 waterbirds, 304 pigeons, 286 gamebirds, 355 parrots and 190 pelagic seabirds).

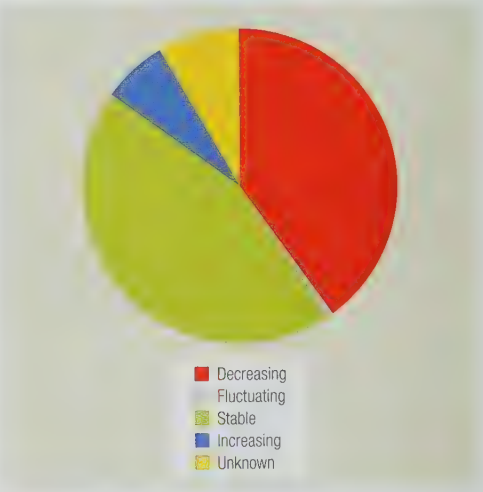


Figure 13
Nearly half of all bird species currently have declining populations (N=9895 extant species).

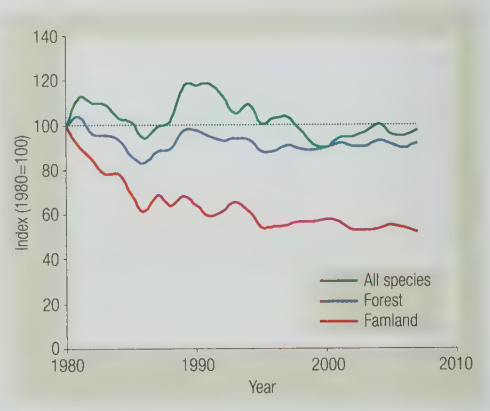


Figure 14
European common birds have declined since 1980, particularly in farmland (N=136 species, including 36 farmland and 29 woodland species). Source: Wild Bird Indices from EBCC/RSPB/BirdLife International/Statistics Netherlands (www.ebcc.info/).

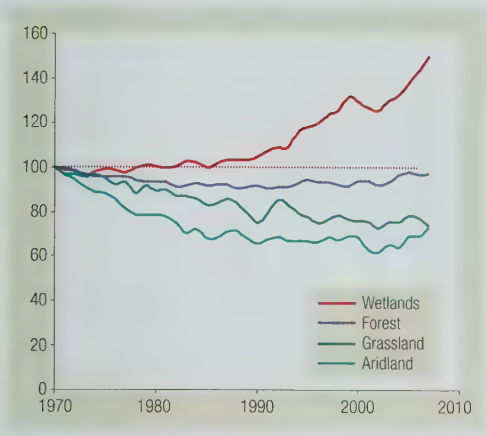


Figure 15
North American grassland and aridland specialists have declined since 1970, while forest specialists have been more or less stable and wetland specialists have increased (N=17 aridland, 42 grassland, 96 forest and 139 wetland species). Source: US NABCI Committee (2009).

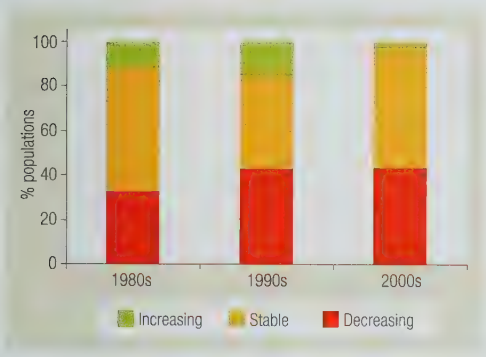


Figure 16
An increasing proportion of waterbird populations of Least Concern species have shown declines since the 1980s (N=104 populations in the 1980s, 170 in 1990s and 46 in 2000s). Source: Davidson & Stroud (2010).

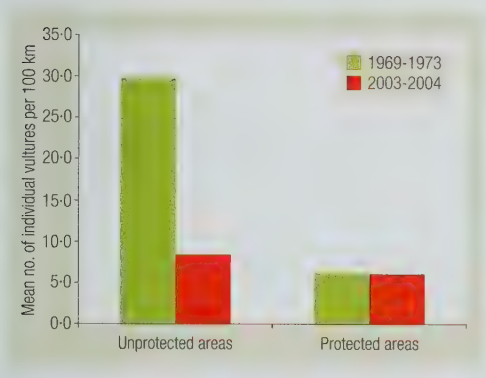


Figure 17
Vultures in West Africa outside protected areas have declined substantially since the early 1970s. Data from six species in Burkina Faso, Mali and Niger. Unprotected areas include densely cultivated countryside to extensively grazed Sahelian grassland; protected areas include national parks, their buffer zones and forest reserves. Source: Thiollay (2006b, 2007b).

eleven large eagle species declined by 86–98% over the 30-year period outside protected areas. Six large vulture species also suffered dramatic declines outside protected areas (Fig. 17), almost certainly linked to rapid human population expansion and accompanying habitat degradation, over-hunting of wild ungulates (antelopes, gazelles, etc.), increased disturbance and the poisoning of carcasses (Thiollay 2006a, 2006b, 2007a, 2007b). In Botswana too, large raptors seem to have declined severely outside protected areas (Fig. 18; Herremans & Herremans-Tonnoeyr 2000). The effect was greatest for large eagle species, but similar patterns were found for smaller raptors. Again, livestock overgrazing and the widespread depletion of potential prey are likely to be important drivers (Herremans 1998).

The principal threats to birds

Human activity is the predominant cause of population declines and extinction risk in birds. The most important way this impacts species is through habitat loss, including destruction and degradation of forests by agriculture and unsustainable forestry, loss of wetlands to drainage, development and pollution, and degradation of other habitats through conversion and modification. Habitat destruction and degradation are often driven by a combination of direct interconnected threats whose importance varies regionally. For deforestation, small-scale and subsistence agriculture is the most important, causing half of forest loss in Africa and 40% in the Asia-Pacific region and South America (Blaser & Robledo 2007). Cultivation of commercial crops is the motivation for 24% of forest clearance in Asia-Pacific, and a fifth in South America and Africa, with the key crops in these regions including oil palm, soya and cocoa respectively. Timber extraction for wood, paper and packaging causes a quarter of deforestation in Asia-Pacific, 15% in Africa and 12% in South America. Extraction of fuelwood contributes 8–10% of forest loss in each region, while clearance for cattle ranching is largely a South American phenomenon, driving 20% of forest loss there, but less than 5% in Africa and Asia-Pacific. Often these processes are interconnected, with logging companies initially extracting timber, followed by clearance of remaining vegetation for commercial crops, with small-scale and subsistence agriculture and fuelwood extraction then spreading along the access routes created. Fires started deliberately for clearance also often spread and damage adjacent areas of intact forest, further exacerbating impacts and expanding the area destroyed or degraded.

Similarly, habitat loss in wetlands is caused by a combination of drainage, infilling and conversion of lakes and marshes for agriculture, commercial use and residential development; damming, canalisation, water extraction and disruption to flow regimes of the world's rivers for transportation, hydropower, irrigation and commercial and domestic water supplies; and reclamation, modification and pollution of coastal wetlands for agriculture, aquaculture and industrial and urban development.

Across all habitats and for all bird species, the three most important threats are agriculture, which puts 911 threatened birds (73%) at risk, logging and wood harvesting, impacting 669 species (54%), and invasive alien species, affecting 422 species (34%) (Fig. 19). Hunting and trapping (for food, pets and sport), residential and commercial development, energy production and mining, changes to fire regimes, pollution, fisheries and, increasingly, climate change, are also having serious negative impacts. A similar picture emerges from examining the drivers of changes in the status of species leading to their being re-categorised on the IUCN Red List since 1988 (Fig. 20). The most prominent is agriculture, followed by hunting/trapping and invasive alien species. Threats impact bird populations in different ways (termed "stresses" by IUCN: Salafsky *et al.* 2008). Habitat destruction and degradation, as described above, is the most important consequence of threats for 1189 threatened species (96%), while threats primarily causing problems through direct mortality and reduced reproductive success affect 682 species (55%) and 413 species (33%) respectively (Fig. 21).

Similar threats impact the key sites for the world's birds: Important Bird Areas (IBAs). Nearly half (47%) of IBAs with data are threatened by agriculture and aquaculture, 39% are impacted by hunting and trapping, 35% by invasive alien species and 28% by logging and harvesting plants (Fig. 22). Interestingly, human disturbance is identified as a key threat for 40% of IBAs, reflecting the great pressures IBAs are under from expanding human populations.

We review these key threats to the world's birds in turn.

Agriculture

The spread and intensification of agriculture, resulting in habitat destruction and degradation, is the greatest threat to biodiversity, particularly in the tropics (Vié *et al.* 2008). This is driven by expanding human populations, increasing food needs, growing demands for animal protein, and increasing production of biofuels.

Expanding and intensifying cultivation of annual and perennial crops such as cereals, pulses and vegetables is the most important form of agriculture in terms of its impact on threatened birds (affecting 810 species, 89% of those threatened by agriculture), with industrial-scale farming impacting 348 species (38%) and small-holder farming affecting 368 species (40%). Livestock farming is a key pressure on 400 species (44%), with industrial-scale livestock farming (231 species, 25%) slightly more significant than small-holder livestock farming (206 species, 23%). Wood plantations (principally for timber, paper pulp and palm oil) affect 125 species (14%). We discuss a selection of examples here of the ways in which agricultural growth is destroying natural habitats and threatening the world's birds.

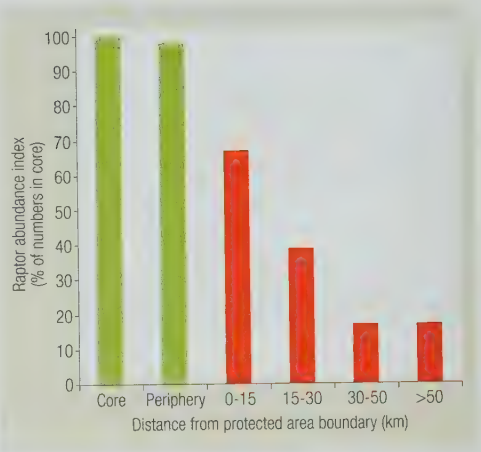


Figure 18
Raptors in Botswana are more abundant inside protected areas (green bars) than outside (red bars), and are less common further from protected area boundaries. Source: Herremans & Herremans-Tonnoeyr (2000).

Soybean

Soybean is one of the world's major staples, being used for vegetable oil, a protein substitute in food, and, most importantly, livestock feed for cows, pigs and chickens (the destination for 80% of the world's soy production). It is also in increasing demand for biodiesel. Most soybean is grown in South America, where production increased 15% per year during 1999–2004, with Brazil poised to overtake the USA as the largest single producer (Mardas *et al.* 2009). Expansion of soybean cultivation is a major driver of deforestation, but production is also expanding into the *cerrado*, a biodiverse savanna habitat supporting over 900 bird species, including Kaempfer's Woodpecker (*Celeus obrieni*) CR and Cone-billed Tanager (*Conothraupis mesoleuca*) CR. By 2004, farming, primarily for soybean, had reduced the area of *cerrado* by 57%, with 1% of the remaining habitat being converted annually (Butler 2007a, 2007b). Apart from threatening many bird species, use of soybean as a biofuel is ineffective for tackling climate change: *cerrado* soil and vegetation have high levels of stored carbon, so it takes 37 years to replace the carbon lost when *cerrado* is converted to soybean production (Fargione *et al.* 2008).

Soybean expansion also has indirect negative impacts in South America, through displacing cattle ranching into formerly forested areas. Beef production through cattle ranching is now responsible for 20% of deforestation in the continent: over 10 million hectares of forest have been cut down for this purpose in the last decade, and nearly 80% of land deforested in the Amazon between 1996 and 2006 is now used for cattle

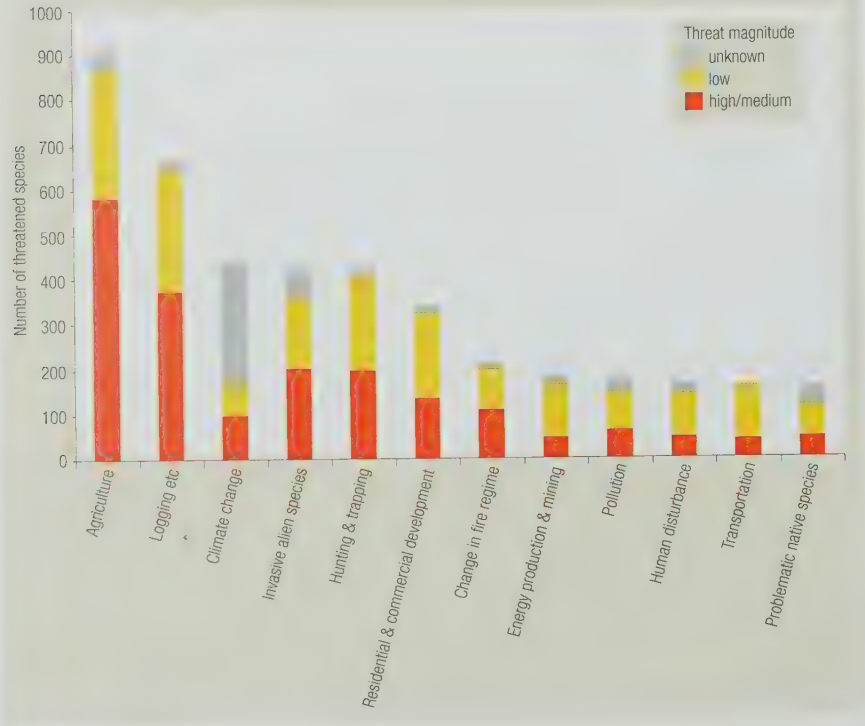


Figure 19
Expansion and intensification of agriculture is the most important of many threats impacting threatened bird species.

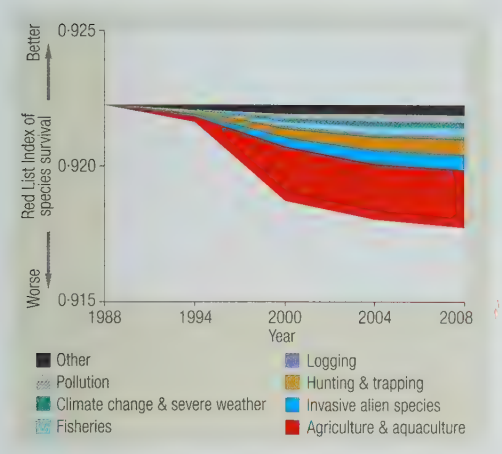


Figure 20
Agriculture has been the main driver of declines in the status of birds in the last two decades. Red List Index (RLI) for bird species showing trends driven by different factors (N=9833 non-Data Deficient extant species). The differently shaded bands illustrate the contribution of different drivers to the overall decline in the RLI.

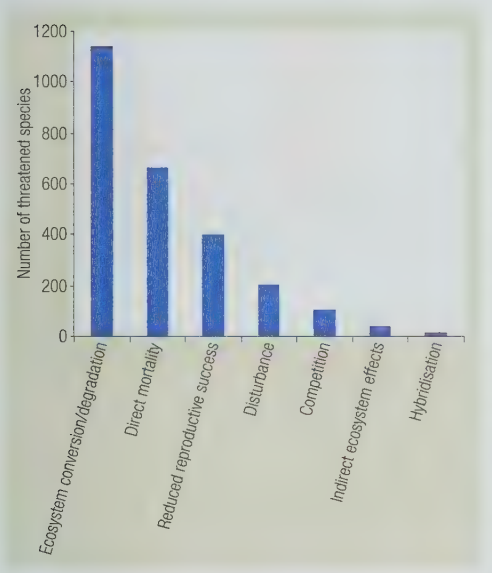


Figure 21
Most threats impact threatened bird species through ecosystem conversion and degradation, but many cause direct mortality also.

pasture (Verweij *et al.* 2009). Brazil, again, is the major producer, exporting US$4 billion worth of beef a year—more than any other country—of which a third is consumed by the European Union (EU) (Mardas *et al.* 2009).

Corn

One of the reasons for the recent surge in soybean expansion in Brazil has been a shift from soybean to corn production in the USA (Butler 2007a, 2007b). This has been driven by policies promoting biofuels, including a target of reducing gasoline use by 20% through the use of corn ethanol in fuels (Searchinger *et al.* 2008). As a consequence, the US Department of Agriculture is considering allowing landowners currently enrolled in the "Conservation Reserve Program"—under which farmers are paid to leave land fallow, benefiting waterbirds and other species that live on grass-covered wetlands (Westcott 2007)—to terminate their contracts early for the stated purpose of "providing more acreage to meet the demand for corn" (Ducks Unlimited 2007). In the prairies of North and South Dakota, this would impact species such as Sedge Wren (*Cistothorus platensis*) and Bobolink (*Dolichonyx oryzivorus*), leading to declines of up to 52% and 39% respectively, and a combined loss of over 1·8 million individuals of five grassland passerines (Niemuth *et al.* 2007), many of which are already declining rapidly across North America (Butcher & Niven 2007). This highlights the importance of the Conservation Reserve Program, and the danger of converting the land it protects to corn production.

Agricultural intensification in Europe

In Europe, the principal threat to birds in the wider countryside is the intensification of farming, particularly in the EU where the Common Agricultural Policy (CAP) applies. Intensive farming driven by CAP subsidies has produced food surpluses and negative environmental consequences, as illustrated by the 48% fall in the Wild Bird Index for farmland species referred to earlier. The biggest declines in farmland birds are directly related to intensive agricultural practices: 30% of the variance in these declines across countries in Europe can be explained solely by national differences in cereal yield (Donald *et al.* 2001, 2006). Few birds can breed in the monocultures that are now typical of north-west Europe, and other wildlife species are likely to have suffered similarly (Stanners & Bourdeau 1995). Birds outside the EU in central and eastern Europe have fared better until recently (Fig. 23), mainly because agriculture has remained less intensive and less environmentally destructive. Without CAP reform, the twelve countries that have joined the EU since 2004 now face subsidised agricultural intensification and similar declines in their farmland birds.

The EU has also operated a similar scheme to the US Conservation Reserve Program referred to above. "Set-aside", as it is known, was introduced in 1992 to reduce the size of Europe's grain surpluses. It was not intended as an environmental measure, but it provided significant environmental benefits such as valuable food and nesting sites for many farmland bird species. For example, Little Bustard (*Tetrax tetrax*) **NT** has been driven extinct by agricultural intensification in at least eleven European countries, and the remaining population in France—which has crashed by over 90% in the last 20 years—now largely depends on set-aside for its survival (Wolff *et al.* 2001,

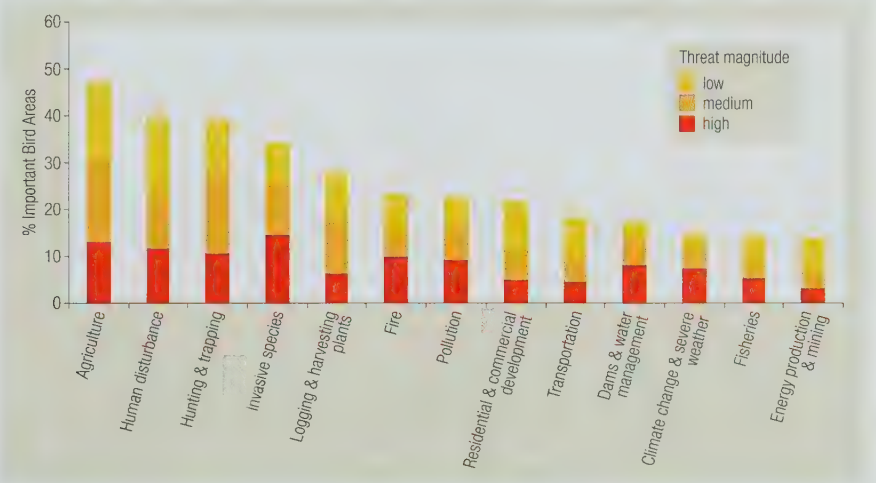


Figure 22
The main threats to Important Bird Areas (N=914 IBAs in 78 countries worldwide).

BirdLife International 2006a). Similarly, 80% of Eurasian Linnets (*Carduelis cannabina*) in East Anglia, UK, spend the winter on set-aside, compared to 1% that winter on cereals (Cook 2008).

In 2007, owing to increasing demand for cereal crops and biofuels, the European Commission suspended set-aside, and from 2009 abolished it completely; but the environmental measures proposed by the Commission are woefully inadequate to compensate for the loss of valuable habitats. As a result, much set-aside land has been cultivated, once again reducing habitat availability for many farmland birds. In the UK, the area of temporary fallow land fell by 83% between 2007 and 2008 (DEFRA 2009), and a 30% reduction in set-aside land is expected (Cook 2008).

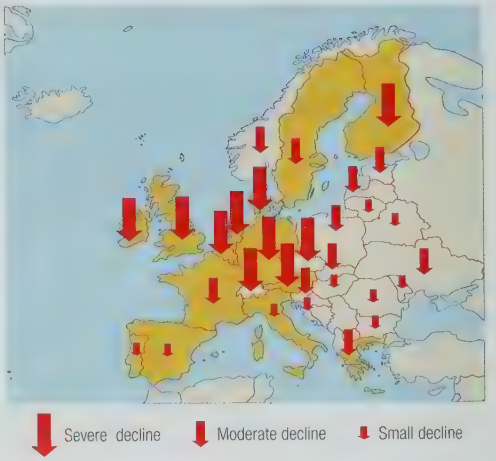


Figure 23
Farmland bird declines between 1970 and 1990 in Europe have been steepest in those countries that have been part of the European Union for longest. Source: Donald et al. *(2001, 2002).*

Coffee

Coffee, the world's most exported product after crude oil (O'Brien & Kinnaird 2003), is cultivated in two main ways. In traditional "shade coffee" plantations, the plants are grown under rainforest trees. This disrupts the natural understorey, but allows some forest birds and other biodiversity to survive within the complex vegetation structure. By contrast, intensive "sun coffee" plantations support many fewer species. For example, in the Cordillera Central of the Dominican Republic, bird diversity in intensive full-sun coffee plantations is less than half that found in traditional coffee plantations, shaded by native *Inga vera* trees (Fig. 24; Wunderle & Latta 1996). This and many other studies have demonstrated that forest bird communities are depleted when shade-coffee systems are converted to full-sun farming (Donald 2004), and the results are consistent across a wide range of other wildlife groups (Gallina *et al.* 1996, Perfecto *et al.* 1996, Wunderle & Latta 1996). Some guilds of birds are especially sensitive: nectar-feeders dependent on forest flowers are largely eliminated from intensive coffee plantations. Conversion from shade to full-sun systems clearly reduces the value of plantations for forest bird communities. Nevertheless, even shade-coffee plantations cannot substitute for pristine forests, despite their relatively biodiverse habitat matrix: many forest specialists survive poorly in shade-coffee plantations (Donald 2004). Levels of species richness within coffee plantations are also highly dependent on their proximity of natural forests: in one study, the diversity of restricted-range birds was found to decline along a gradient away from remaining intact forest by 43% within just 8 km (Anand *et al.* 2008).



Figure 24
Bird species diversity in intensive coffee plantations in the Dominican Republic is much lower than in shade-coffee plantations. Source: Wunderle & Latta (1996).

Cocoa

Cocoa is also a major agricultural export commodity, with 60% of the global production coming from West Africa (Donald 2004). Global demand grew 3% a year over the twentieth century, and cocoa production is likely to remain a major driver of tropical deforestation, as demand is expected to more than double by 2050 (Bisseleua *et al.* 2009). As with coffee, forest birds are threatened by both the intensification of existing production methods and the conversion of intact forest to plantations. At present, around 70% of world demand is met from small-scale farmers operating traditional, low-intensity agroforestry systems (Donald 2004). Typically, cocoa crops are grown beneath thinned primary forest or under a canopy of artificially planted trees, thereby providing a structurally complex habitat capable of sustaining a far higher array of organisms than other agricultural landscapes such as oil palm plantations or cattle pastures (Faria *et al.* 2006). However, several studies in Latin America have shown that while shade cocoa supports large numbers of woodland generalist and migratory species, it is of limited value for specialist forest-interior birds (Greenberg *et al.* 2000, Reitsma *et al.* 2001, Faria *et al.* 2006). Despite the limitations of shade-growth systems, the current trend towards eliminating shade cover in order to increase yield is alarming. Landscapes dominated by full-sun monocultures support depauperate biological communities and may experience impaired ecosystem functioning. In Malaysia, the conversion to full-sun production left many cocoa crops susceptible to disease, which eventually caused the country's cocoa industry to collapse (Donald 2004).

Oil palm

Palm oil, alongside soya, is the most lucrative commodity produced on deforested land. It is used in an extraordinary variety of foods and cosmetics, including, for example, 43 of the 100 best-selling branded products in British supermarkets in 2008 (Hickman 2009). Oil palm cultivation, already a massive industry, is expanding fur-

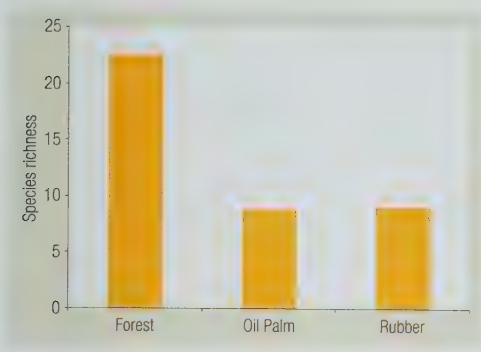


Figure 25
Oil palm and rubber plantations in southern Thailand support far fewer species than natural lowland forest (N=128 species across all habitat types; 30 oil palm plantations and 30 rubber plantations and adjacent forests). Source: Aratrakorn et al. *(2006).*

ther (as with soya) through the demand for biofuels. The combined global demand for palm oil is expected to double by 2020 (e.g. Clay 2004, Green *et al.* 2005). In Melanesia and South-East Asia, the spread of oil palm plantations has been the most significant driver of deforestation in recent years. In Malaysia, for example, the area of oil palm plantations increased by over 70% between 1994 and 2004 (Clay 2004), and Malaysia and Indonesia now produce more than 80% of the world's palm oil. Expansion of oil palm in other regions, particularly West Africa, is also a cause for concern.

Conversion of tropical lowland forest to oil palm poses a significant threat to birds and other biodiversity, because the majority of forest species cannot survive in such monocultures. One study in Thailand found that bird species diversity was 60% lower in oil palm and rubber plantations than in lowland forest areas (Fig. 25; Aratrakorn *et al.* 2006). Almost all species of conservation concern (15 of the 16 globally threatened or NT species recorded in forested areas) disappeared after the land was converted to plantations. Species with more specialised dietary requirements (e.g. insectivores and frugivores) suffered greater losses than more generalist consumers (omnivores), evidently owing to a reduction in food availability. Another study in Sumatra found that less than 10% of the original primary forest bird species remained in oil palm plantations (Danielson & Heegaard 1995).

On the island of New Britain off New Guinea, 12% (3000 km^2) of the island's forest was cleared between 1989 and 2000, principally for commercial oil palm plantations. Lowland forest was most affected, with nearly 25% of forest below 100 m disappearing during the period. At current rates, all forest below 200 m will be gone by 2060 (Buchanan *et al.* 2008). None of the island's 37 restricted-range or endemic species are supported by oil palm monocultures. Four of them, including Russet Hawk-owl (*Ninox odiosa*) VU and Bismarck Kingfisher (*Alcedo websteri*) VU are now suspected to be declining at rates exceeding 30% over three generations. Consequently, the total number of endemic or restricted-range species classified as globally threatened or NT on New Britain owing to population declines from forest clearance recently increased from 12 to 21 (Buchanan *et al.* 2008).

Unsustainable forestry

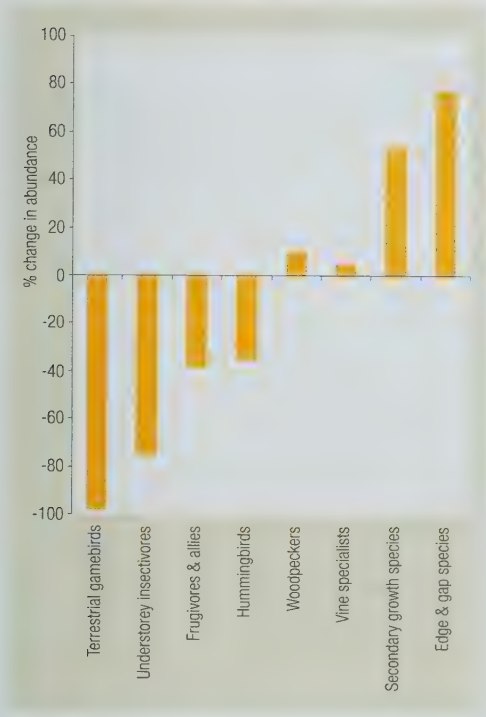


Figure 26
Following selective logging of tropical forests, species tolerant of edge habitats may increase in abundance, but most species groups decline in abundance. Source: Thiollay (1997) comparing abundance in undisturbed primary forest in northern French Guiana and forest ten years after selective logging.

Forests, particularly in the tropics, support the majority of the world's biodiversity, including nearly two-thirds of all bird species. Deforestation has many interconnected drivers, as described above, but commercial logging is a key factor. The global trade in tropical timber is valued at about US$16 billion annually (Rytkönen 2003), with about half exported to China for manufacture of furniture, flooring and paper, much of which is re-exported (DFID 2007). The majority of this timber is harvested illegally and/or unsustainably. For example, less than 5% of wood consumed in Europe is from certified sources (Mardas *et al.* 2009).

Asian forests in particular have suffered from unsustainable forestry, with 3% of humid tropical forest lost in the region during 2000–2005 alone (Hansen *et al.* 2008). In South-East Asia, there is so little primary forest left that many forests will be logged for the second or third time in the near future, while in Sabah and Peninsular Malaysia there is virtually no primary rainforest left outside protected areas. In Indonesia, remaining forests are being rapidly cleared for timber and wood-pulp (c. 40 million cubic metres per year: FWI & GFW 2002), and the land is then converted to other uses such as oil palm (see above). Indonesia's production capacity for wood-pulp and paper has grown by 700% since the late 1980s—mainly through illegal logging and land clearance—and is at a level that cannot be met by any form of sustainable forest management (Bryant *et al.* 1997). More than half of all Indonesian timber produced during 2003–2006 was logged illegally (Human Rights Watch 2009), while elsewhere in the region virtually all timber removed from forest in Laos in recent years was illegal (EIA & Telepak 2008).

Across the tropics, such practices are leaving previously continuous tracts of forest fragmented into habitat islands, scattered across an agricultural landscape (Schelhas & Greenberg 1996). Such extensive habitat loss, degradation and fragmentation has serious consequences for birds, with small islands of habitat eventually losing many of their forest-dependent species, as noted above. Selective logging is substantially less damaging to biodiversity than intensive timber extraction or clear-felling, but it also leads to reductions in diversity and abundance of forest bird species. A review of several studies shows that abundance drops by c. 30% in selectively logged forests (Johns 1988, Marsden 1998, Thiollay 1992, 1997, Felton *et al.* 2008) with forest-dependent birds in particular becoming rare. In contrast, birds adapted to open or degraded habitats are able to colonise selectively logged forest. Guilds differ in their

responses to logging, with declines greatest in terrestrial, understorey and insectivorous species (Fig. 26; Thiollay 1997, Fimbel *et al.* 2001, Lambert & Collar 2002, Felton *et al.* 2008). For example, in Neotropical forests, terrestrial insectivores such as leaftossers (*Sclerurus* spp.) and ant-thrushes (*Formicarius* spp.) are most sensitive (Fimbel *et al.* 2001).

Invasive alien species and disease

Invasive alien species (IAS) are a substantial threat to the world's avifauna, impacting 422 threatened birds (34% of the total). The problem is especially acute on islands, particularly oceanic ones (where it affects 75% of threatened species), as discussed above. Overall, alien invasive mammals are the biggest problem (impacting 340 species: 81% of those threatened by IAS), with plants (109 species, 26%), birds (78 species, 18%) and disease/micro-organisms (75 species, 18%) of lesser significance (Fig. 27). Among invasive mammals, carnivores impact 295 (70% of IAS-affected bird species, with domestic cat being the most important), rodents (particularly black rat *Rattus rattus*) impacting 273 species (65%), and ungulates (particularly domestic pig)

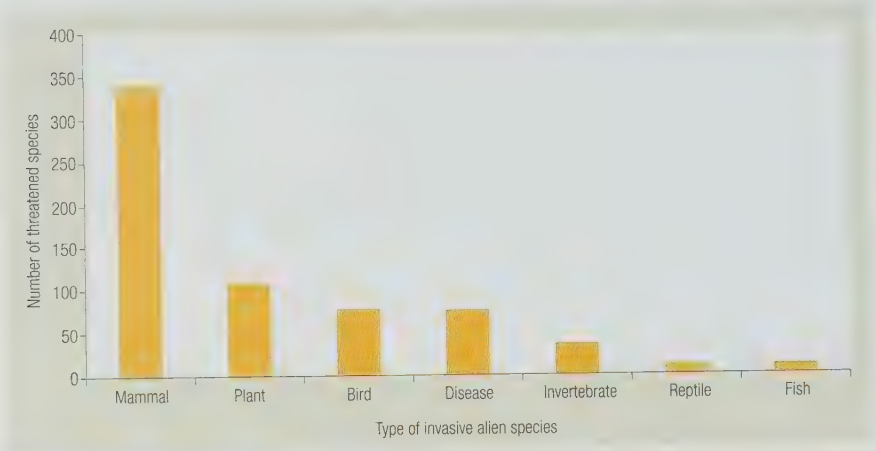


Figure 27
Mammals are the most important class of Invasive Alien Species impacting birds (N=422 threatened species threatened by Invasive Alien Species out of 9895 extant species).

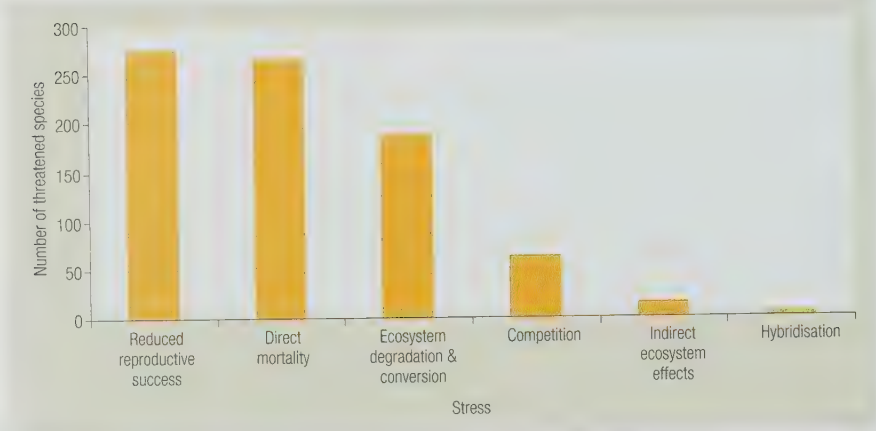


Figure 28
Invasive Alien Species primarily cause reduced reproductive success and direct mortality of adults, chicks and eggs, but habitat degradation is important too (N=422 threatened species threatened by Invasive Alien Species out of 9895 extant species).

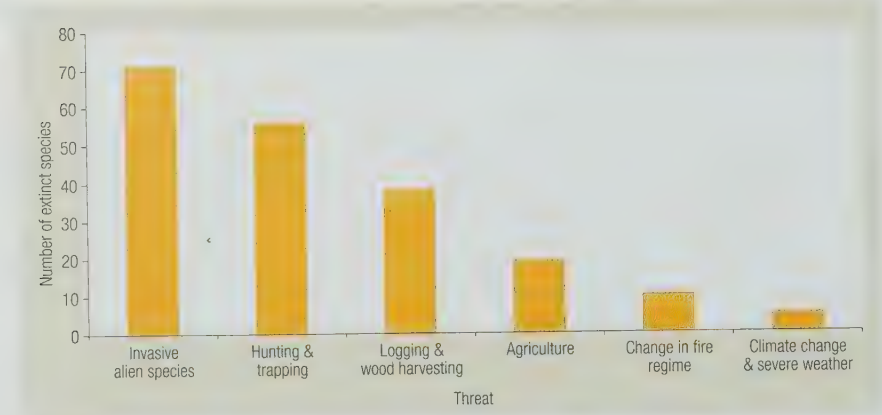


Figure 29
Invasive Alien Species have been the most important driver of bird extinctions since 1500 (N=150 species classified as Extinct, Extinct in the Wild or Critically Endangered [Possibly Extinct or Possibly Extinct in the Wild]).

142 species (34%). Among other classes, Common Myna (*Acridotheres tristis*) is the most problematic invasive bird, brown tree snake (*Boiga irregularis*) the most significant reptile, and avian malaria (*Plasmodium relictum*) and avian pox (*Poxvirus avium*) the worst diseases. These affect threatened birds in different ways (Fig. 28), but the most significant impacts are reduced reproductive success, usually through predation of eggs or chicks (276 species, 65%), direct mortality by predators (affecting 265 species, 63%), habitat degradation by invasive herbivores and/or invasive plants (188 species, 45%), and competition for food and nest sites (63 species, 15%).

The threat from IAS is likely to rise, as people travel more, global trade expands and ongoing habitat degradation and fragmentation make it easier for aliens to establish populations. Climate change is also expected to make the problem significantly worse; for example increasing temperatures enable disease-carrying mosquitoes to spread (see below). Notably, IAS have been the primary driver of known bird extinctions, in combination with overexploitation and habitat loss driven by logging and agriculture (Fig. 29). IAS are associated with the extinction of at least 71 species, with rats, cats and introduced pathogens being the most deadly (contributing to the loss of 41, 34 and 16 species respectively).

Three examples demonstrate the seriousness of the challenge posed by IAS. In Ecuador, the Galapagos Petrel (*Pterodroma phaeopygia*) **CR** has undergone an extremely rapid decline since the early 1980s, owing in particular to predation by introduced rats, cats and dogs, and the destruction of breeding habitat by introduced goats and cattle. These invasives will need to be eradicated or effectively controlled to allow the petrel to survive. Meanwhile, on Gough Island in the South Atlantic, seabird populations are being devastated by house mice (*Mus musculus*) which, since their colonisation following a shipwreck, have rapidly evolved body sizes and behaviours that mimic rats (and which will be just as difficult to eradicate): almost the entire world populations of Tristan Albatross (*Diomedea dabbenena*) **CR** and Atlantic Petrel (*Pterodroma incerta*) **VU** breed on Gough, but c. 60% of chicks die before fledging owing to mice predation (Cuthbert *et al.* 2006, Wanless *et al.* 2007), causing disastrous declines in these long-lived, slow-reproducing species, and also resulting in an endemic landbird—Gough Bunting (*Rowettia goughensis*)—being listed as **CR**. Finally, over half of the 100 or so endemic bird taxa in Hawaii have been driven extinct by introduced predators, disease and habitat loss, and many of the remainder are highly threatened by IAS (Olson & James 1982, La Pointe 2000): for forest-dwelling native birds such as Palila (*Loxioides bailleui*) **CR**, the accidental introduction of mosquitoes (*Culex quinquefasciatus*), bringing with them avian malaria and avian pox, has had devastating consequences (La Pointe 2000, Jarvi *et al.* 2001, van Riper & Scott 2001).

Introduced avian malaria and avian pox are just two examples of bird diseases that can cause chronic population declines, dramatic die-offs, and reductions in the reproductive success and survival of individuals, threatening many of the world's bird species. Certain avian diseases appear to be spreading to populations previously unaffected:

- Avian botulism is arguably the most important bacterial disease of migratory birds worldwide. In 2002–2003, an outbreak in Taiwan killed over 7% of the world population of Black-faced Spoonbill (*Platalea minor*) **EN** (Yu 2003), while the disease is suspected to have been the cause of death in over 160 Laysan Ducks (*Anas laysanensis*) **CR** on Midway Atoll, Hawaii, USA, in 2009, representing a 40–50% decline in this translocated population (M. Reynolds *in litt.* 2008).
- West Nile Virus, a mosquito-borne viral disease which kills both birds and people, has recently spread through eastern USA, Latin America and the Caribbean. American Crow (*Corvus brachyrhynchos*) has shown very high levels of mortality from this disease but remains relatively stable across its range (Peterson *et al.* 2004, Caffrey *et al.* 2005), while Yellow-billed Magpie (*Pica nuttalli*) has undergone a recent rapid (but hopefully temporary) population crash (Crosbie *et al.* 2008).
- Avian cholera and *Erysipelothrix rhusiopathiae*, two bacterial diseases, have caused considerable declines in Indian Yellow-nosed Albatross (*Thalassarche carteri*) **EN** on Amsterdam Island (French Southern Territories). Both diseases may threaten nearby colonies of Sooty Albatross (*Phoebetria fusca*) **EN** and Amsterdam Albatross (*Diomedea amsterdamensis*) **CR** (Weimerskirch 2004). Avian cholera also threatens Cape Cormorant (*Phalacrocorax capensis*) **NT** in South Africa, e.g. killing c. 13,000 individuals in 2002 (Williams & Ward 2002).
- Mycoplasmal conjunctivitis, an infectious disease, has recently caused a significant decline in the introduced population of House Finch (*Carpodacus mexicanus*) in eastern North America, and has started to spread to native populations of this species.
- High Pathogenicity Avian Influenza (HPAI) is a poultry disease that evolved from a milder virus in wild birds. A particularly virulent strain—H5N1—recently caused devastating impacts on poultry flocks, and some human fatalities (Thomas 2005,

Werner & Harder 2006, WHO 2008). H5N1 can also kill wild birds, but its direct impacts have usually been very low (although an outbreak at Qinghai Lake, China, killed c. 6000 waterbirds in 2005: Chen *et al.* 2005). Evidence to date suggests that the role of infected migratory birds in spreading the disease is insignificant compared to the poultry trade. However, media hysteria and public misunderstanding have led to wild migratory birds being blamed and persecuted, e.g. through culling and nest-destruction (FAO 2005, Feare & Yasué 2006, Sims & Narrod 2008). These measures put wild birds and other biodiversity in jeopardy, while being ineffective in preventing the spread of the disease.

Over-exploitation of species

Unsustainable exploitation of species is a significant threat to the world's birds, either through hunting and trapping (principally for the cagebird trade and for food and sport), incidental mortality as bycatch in fisheries, or over-exploitation of prey species (particularly in the marine environment).

Hunting and trade

Birds are used extensively by people. A recent study found evidence of use for 4561 bird species, representing 46% of the world's birds (Butchart 2008). Two purposes dominate: 87% of utilised species (3968) are used as pets, and 34% (1550)—although this is likely to be an underestimate—are hunted or trapped for food. Birds are also hunted for sport, used in traditional medicine, and exploited for apparel and ornamentation. The total numbers of individuals used in these different ways are unknown, but likely to be substantial. The number of individual birds sold in international trade at the start of the 1990s was estimated to be c. 2–5 million per year, and the number of individual birds *taken* each year for international trade at that time may have been up to 10 million—because up to half the birds could have died before they reached a dealer (Mulliken *et al.* 1992). The numbers taken and sold in domestic trade are unknown, but are probably on a similar scale. In terms of hunting for sport and food, Hirschfeld & Heyd (2005) estimated that over 100 million individuals of 82 bird species listed on Annex II of the EU Birds Directive were killed in the EU during 2001–2003 alone, and Magnin (1991) estimated that a staggering 0·5–1 billion songbirds are killed annually in Europe, roughly equating to one for every person alive in Europe—each year!

For many species, such levels of use are unsustainable. Some 50 bird species that were driven extinct since 1500 (one third of the total) were subject to overharvesting, including Great Auk (*Pinguinus impennis*) (EX since c. 1852) and Carolina Parakeet (*Conuropsis carolinensis*) (EX 1918). Currently, 422 globally threatened bird species (34%) are affected by overexploitation for human use. These impacts are biased towards large species (for food) and colourful and/or vocal species (as cagebirds), and



Figure 30
Overexploitation impacts parrots, pigeons, doves and galliforms in particular. Only families with 15 or more species are included here; the percentage of species affected is given in parentheses.

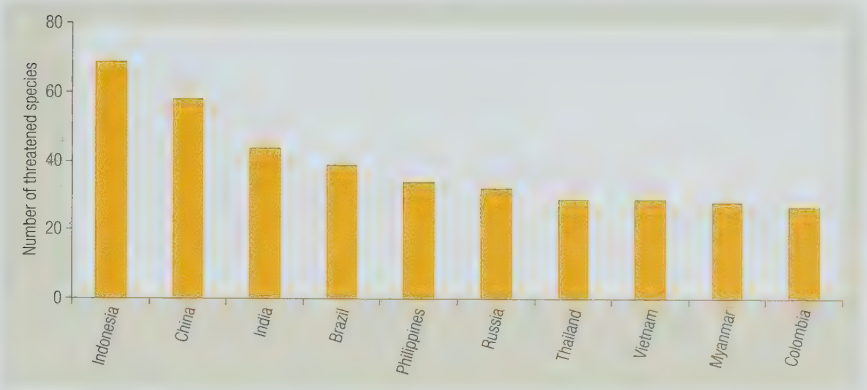


Figure 31
Overexploitation is a particular concern in Asia, a region holding eight out of ten countries with the largest number of species impacted by over-exploitation.

hence are particularly severe for certain families, notably parrots, pigeons and pheasants (Fig. 30). Overexploitation appears to be a particular problem in Asia (Fig. 31).

Hunting is a particular concern for certain threatened bird species. For example, in August 2009 one of the last five known wild Northern Bald Ibises (*Geronticus eremita*) **CR** in the Middle East was found to have been shot (BirdLife International 2009a), and hunting on its migration route may prove to be the single most important threat to Sociable Lapwing (*Vanellus gregarius*) **CR**. Recent evidence gathered in early 2010 suggested that the Spoon-billed Sandpiper might be suffering serious losses on its winter mudflats in Myanmar (Burma), where villagers net waders indiscriminately for food (Zöckler *et al.* 2010).

Red List Indices (RLIs) showing trends over time in the status of utilised species indicate that such birds, overall, deteriorated in status during 1988–2004 (Butchart 2008). Although some of these species were downlisted to lower categories of threat owing to successful conservation action (e.g. Lear's Macaw *Anodorhynchus leari* **CR** to **EN**), many more were uplisted to higher categories owing to increased threats and worsening status (e.g. Yellow-crested Cockatoo *Cacatua sulphurea* **EN** to **CR**). A combination of factors drove these trends, but hunting and trade together were the most important driver after agriculture and aquaculture.

Commercial fisheries

Across the world, commercial fisheries have expanded dramatically since the 1960s, in both intensity and extent. Commercial longline and trawl fisheries are responsible for the incidental deaths of hundreds of thousands of seabirds each year, threatening 34 species, especially albatrosses. Seabirds are particularly vulnerable to bycatch in areas where foraging concentrations overlap with high densities of commercial longline fishery vessels. Since the 1990s, scientists have been attaching remote tracking devices to albatrosses and petrels around the world in order to understand better where they forage. The results show that albatrosses travel hundreds of kilometres per day in search of food, and that they concentrate in foraging hotspots, many of which overlap with longline fishing effort (Fig. 32; BirdLife International 2004c). These are

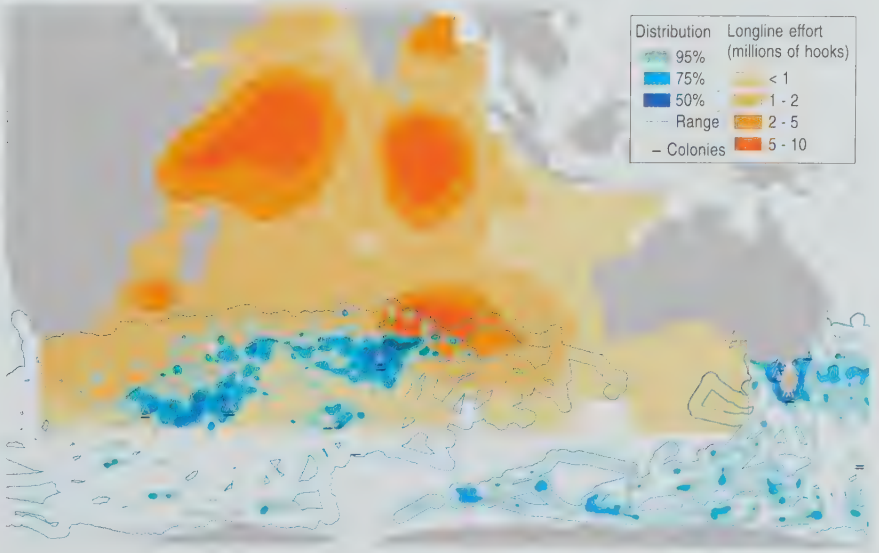


Figure 32
Foraging areas of albatrosses, petrels and shearwaters overlap with areas of longline fishing effort for tuna and swordfish in the Indian Ocean. Legend: Orange = tuna and swordfish longline fishing effort (2002–2005); darker shades indicate greater intensity; white = zero fishing effort. Blue = seabird breeding season foraging areas; darker shades indicate greater density. Blue line = boundary of known seabird foraging areas. Grey = land. Source: BirdLife International Global Procellariiform Tracking Database.

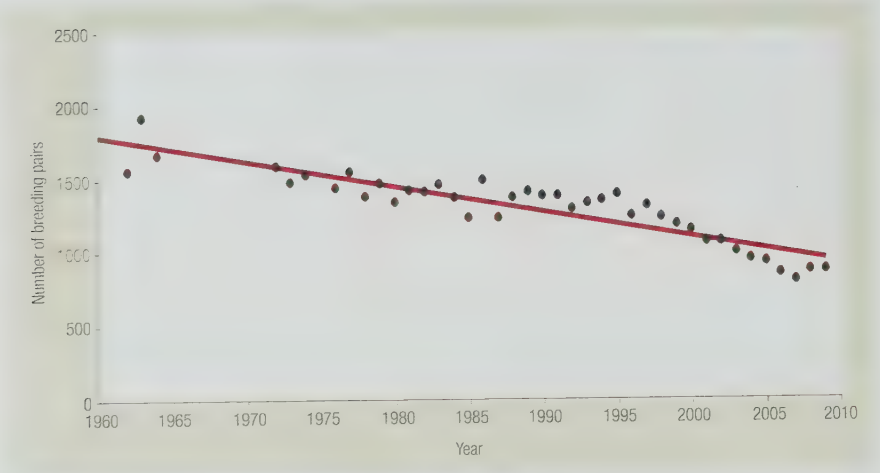


Figure 33
The population of Wandering Albatross at Bird Island, South Georgia, is in long-term decline. Regression line fitted to annual census data. Source: Croxall et al. *(1998), Poncet* et al. *(2006), updated by R. Phillips* in litt. *(2009).*

areas where there is the highest risk of seabird bycatch, and where mitigation efforts are most urgently needed. Even a partial overlap in fishing and foraging areas is significant, because small increases in mortality can have severe effects on long-lived seabirds. For example, at Bird Island (South Georgia), long-term monitoring and demographic studies have revealed steady declines of 2–4% per year over the last few decades for Wandering Albatross, Grey-headed Albatross (*Thalassarche chrysostoma*) VU and Black-browed Albatross (*Thalassarche melanophrys*) EN, driven by reduced survival (Fig. 33). These apparently modest annual declines are highly significant for long-lived, slowly reproducing species. With long generation lengths (up to 30 years), the declines are sufficient to qualify these species as threatened with extinction.

Trawl fisheries also threaten seabirds. For example, in the South African hake trawl fishery, 18,000 seabirds were estimated to have been killed in 2005–2006 (Watkins *et al.* 2008). It is estimated that 85% of birds were killed by the warp cables that attach the trawl net to the fishing vessel, entangling individuals and dragging them under the water. The remaining 15% died entangled in nets. Of the birds killed, 70% were White-capped Albatross (*Thalassarche steadi*) NT and Black-browed Albatross, 14% were Cape Gannet (*Morus capensis*) NT and 9% White-chinned Petrel (*Procellaria aequinoctialis*) NT.

Indirect impacts through prey species

As populations of larger fish species decline throughout the world's oceans, fisheries are increasingly targeting species that occupy a lower trophic level in the food web. This can have severe implications for the food supplies of many seabirds, as illustrated by declines in the Black-legged Kittiwake (*Rissa tridactyla*) population breeding on the Isle of May, UK. Overfishing of cod, mackerel and herring in the North Sea is thought to have relaxed the pressure on one of the Black-legged Kittiwake's prey species—the lesser sandeel (*Ammodytes marinus*)—causing it to increase in abundance in the 1950s. Consequently a major fishery developed for sandeel (for processing into fish meal and oil). Catches near the Isle of May peaked at 100,000 tonnes in 1993, almost certainly depleting the local sandeel supply for seabirds. The Black-legged Kittiwake population declined sharply, owing to poor breeding success and reduced adult survival. By 2000, sandeel fishing was finally banned around the island, but sandeel shortages have continued, thought to be caused by climate change disrupting the plankton community at the base of the food chain (Frederiksen *et al.* 2004, Daunt *et al.* 2008). This example of a fishery targeting a small fish species reflects global fisheries trends, with short-lived fish that occupy lower trophic levels substituting for depleted stocks of long-lived predatory fish (Pauly *et al.* 1998, Pauly & Watson 2005). Similarly, invertebrates such as Antarctic krill (*Euphausia superba*) in the Southern Ocean are now being exploited, with potential implications for penguins and other seabirds (Croxall & Nicol 2004, Kock *et al.* 2007).

Residential and commercial infrastructure development

Ongoing infrastructure development, including residential and commercial growth, energy production, mining and transport, is a significant threat to the world's birds

(Fig. 34), and one that is likely to increase. Over 70% of the world's land surface is predicted to be impacted by infrastructure development by 2032, particularly in Latin America, the Caribbean and the Asia-Pacific region (UNEP 2002). Unless this expansion is better controlled and planned, substantial environmental problems will affect food production, freshwater resources and health, as well as biodiversity. For birds, the most significant threat comes from the residential and commercial growth that characterises urbanisation, which is affecting 245 species (20% of threatened birds), although mining and quarrying (156 species, 13%) and roads and railroads (134 species, 11%) are also important. Urban development is occurring most rapidly in Asia (Choi 2008), and as a consequence this region holds 111 species threatened by this factor (34% of all species so affected). For example, the major wintering area for Relict Gull (*Larus relictus*) **VU** at Bothai Bay, China, has been encroached by reclamation for oilfields, harbours, roads and other developments, and there are plans to reclaim 43% of the remaining habitat (Yang Liu *et al.* 2006). In South Korea, reclamation of 400 km^2 of coastal mudflats at Saemangeum for a golf complex in 2006 (following abandonment of initial plans to use the land for rice farming) seems likely to have caused a 20% decline in the world population of Great Knot (*Calidris tenuirostris*) since then (D. Rogers *in litt.* 2009). In Australia, urban encroachment into Swift Parrot (*Lathamus discolor*) **EN** breeding and foraging areas is a major threat because the species seems particularly susceptible to collisions with fences, windows and cars (Saunders & Tzaros 2009).

Powerlines, masts and wind-farms

Telecommunications towers (for radio, television and mobile phones), energy powerlines and buildings are a real danger to birds, killing astonishingly large numbers through collisions each year (Shire *et al.* 2000). One study suggested that 4–5 million birds are killed in the USA each year by collisions with towers (USFWS 2002), but in reality the annual total may reach as high as 40 million (Longcore *et al.* 2005). In Wisconsin, a single radio tower caused at least 120,000 bird deaths during 1957–1995 (Kemper 1996), and there are at least 100,000 large towers of this sort in the USA alone (Evans & Manville 2000).

Powerlines can cause bird mortality through electrocution as well as collision. Electrocution generally affects large species such as owls and diurnal raptors, while collision mainly affects nocturnal migrants and species with low flight manoeuvrability (such as bustards, swans, storks, cranes and herons).

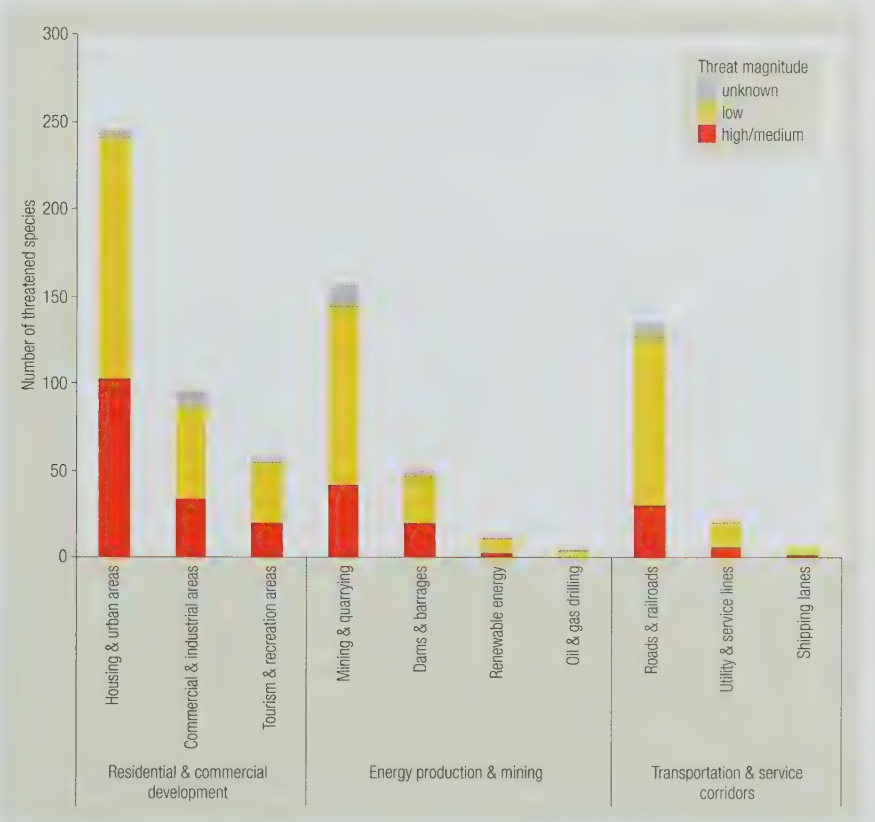


Figure 34
Residential development and mining are the types of infrastructure development having the greatest impact on threatened bird species.

Examples of significant mortality of birds caused by powerlines include:

- In Spain, 30% of juvenile Spanish Imperial Eagles (*Aquila adalberti*) **VU** are electrocuted on powerlines each year (Janss & Ferrer 2001).
- In Kazakhstan, a single 100-km section of powerline in Atyrau caused at least 311 raptor electrocutions in a single year, while no fewer than 932 Steppe Eagles (*Aquila nipalensis*) were electrocuted in one season along 1500 km of powerline north of the Caspian Sea (Moseikin 2003). Given that Russia and Kazakhstan hold at least 50,000–70,000 km of this type of powerline, this pressure alone may explain a large proportion of the raptor declines reported in this region.
- In Italy, at least 95 bird species suffer mortality from powerlines (Rubolini *et al.* 2005), with up to 87 dead birds per km of powerline per year (Fig. 35).
- In Hungary, over 30,000 birds are killed by powerlines and pylons every year. Raptors are among the most affected, including Saker Falcon (*Falco cherrug*) **VU** and Eastern Imperial Eagle (*Aquila heliaca*) **VU**. It is estimated that every year one in seven pylons kills a bird and one in eighteen kills a raptor (Demeter *et al.* 2004, BirdLife International 2008c).
- In South Africa, powerlines cause 1·25 collisions per km per year of Ludwig's Bustard (*Neotis ludwigii*) **EN**, equating to over 8200 casualties annually—a rate that demographic models indicate is not sustainable (Jenkins *et al.* 2010).
- In Wyoming, USA, 232 Golden Eagles (*Aquila chrysaetos*) and other migrants were killed on powerlines during 2007–2009 (costing PacificCorp US$1·4 million in fines and $9·1 million to make the powerlines safer: American Bird Conservancy 2010a).

Windfarms are an important source of green energy, but when sited without consideration for biodiversity they can cause significant mortality of birds through collisions, as well as disrupting movements between feeding, wintering, breeding and moulting areas. Birds do not seem to habituate or adjust behaviourally to windfarms in order to avoid the danger of collision: in fact, the longer windfarms are in operation, the worse the decline of certain bird species appears to become (Stewart *et al.* 2005). High-profile examples include the Smøla islands off the north-west Norwegian coast, where windfarms have killed several White-tailed Eagles (*Haliaeetus albicilla*) and caused the failure of almost 30 others to return to nesting sites; as the site is remote, other deaths may have gone undetected (BirdLife International 2006b). In Navarra, Spain, a single windfarm was estimated to kill eight Griffon Vultures (*Gyps fulvus*) per turbine per year (out of 22 birds of all species per turbine per year: Lekuona 2001), and windfarms have been shown to cause long-term population declines in Spanish Egyptian Vultures (*Neophron percnopterus*) **EN** (Carrete *et al.* 2009). At Cape Kaliakra in Bulgaria, windfarm developments threaten half a million soaring birds (including pelicans, cranes, buzzards, eagles and storks) that migrate along Europe's second-largest soaring bird migration route (BirdLife International 2005), while proposed windfarms in Wyoming, USA, threaten Greater Sage-grouse (*Centrocercus urophasianus*) **NT** (American Bird Conservancy 2009a).

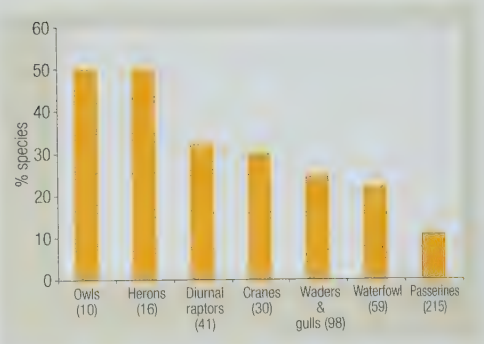


Figure 35
Powerlines in Italy cause mortality for a wide variety of species. Bars show the proportion of different species groups affected, based on 1300 reports of individual powerline casualties from eleven mortality censuses carried out in Italy between the late 1970s and 2001, total number of species involved given in parentheses. Source: Rubolini et al. *(2005).*

Changes in fire regimes

In rainforest, fires are naturally very rare, so birds and other biodiversity suffer substantially when human-initiated fires occur. Many bird species cannot survive in extensively burnt forest. For example, the population density of hornbills decreased by 28–63% in fire-damaged forest in Bukit Barisan Selatan National Park, Sumatra, because of the sparse canopy and scarcity of fruit (Anggraini *et al.* 2000). Burnt forest may take hundreds or even thousands of years to return to its original state (Chambers *et al.* 1998). Human activity increases the risk of fire and its negative impacts in several ways. Fragmentation of forests increases their edge-to-area ratio, making them less humid and more susceptible to fire. Roads allow access to areas previously protected by their remoteness. Fires from slash-and-burn cultivation often spread into areas of primary forest. Smouldering underground coal seams or layers of peat burn for years, re-igniting fires during the dry season: in 2003 as many as 1000 underground coal fires were burning in Indonesia alone (Bhattacharya 2003). Forest fires also cause substantial carbon emissions, contributing to climate change (see below): the 1997 fires in Borneo and Sumatra, Indonesia, destroyed 50,000 km^2 of forest (an area larger than Switzerland) and released as much carbon into the atmosphere as Europe emits from fossil fuel combustion in a year (Liew *et al.* 1998, Page *et al.* 2002).

In Australia, the landscape and wildlife have been moulded by human-induced fire since pre-history. However, in order to provide grazing, clear land or demonstrate ownership, Europeans burned habitats more frequently, destructively and extensively than Aborigines did traditionally. These changes in fire regime were a major factor in



Figure 36
It takes 10–15 years for numbers of Noisy Scrubbirds to recover after their habitat is burnt by fires. Source: Smith (1985).

the extinction of at least five bird taxa (Gill *et al.* 1999). Today, inappropriate fire regimes remain a considerable threat to Australia's threatened birds, particularly those of heathlands and savanna (Garnett & Crowley 2000, Olsen 2008). For example, Mallee Emuwren (*Stipiturus mallee*) **EN** requires heathlands unaffected by fires for at least ten years. At Ngarkat Conservation Park, 40% of the heathland in 1990 had been burned within the previous decade and was consequently unsuitable for the species. By 2006, further fires had rendered over 65% of the area unsuitable and the Mallee Emuwren population had declined by 80% (Paton & Rogers 2008). Noisy Scrub-bird (*Atrichornis clamosus*) **VU** is another good example, avoiding areas that are burnt more often than about every six years, and reaching highest densities only after 20–25 years of vegetation regrowth, so more frequent fires cause long-term declines (Fig. 36; Smith 1985). Since 2001, an increase in the number of wildfires has further reduced the species' breeding habitat within Western Australia (Tiller & Danks 2008).

Inappropriate water management

Wetlands—rivers, lakes, lagoons and marshes—are critical for biodiversity, including 12% of all threatened birds. Wetlands also provide a wide range of benefits and services for people's livelihoods and wellbeing, such as food, fibre, flood protection, water purification, cultural values and of course water supply. However, wetlands across the world are under a range of threats, including: drainage for agricultural or commercial development; damming, canalisation and other channel management practices that change flow regimes; and over-extraction of water that reduces river flow and causes lakes to shrink.

Large dams produce major ecological changes in river basins, destroying forests and other habitats, altering natural flooding regimes, and causing the loss of aquatic biodiversity both upstream and downstream, with impacts on water quality and species composition. Dams have significantly fragmented a high proportion (61%) of the world's river basins (World Commission on Dams 2000). In Africa, the Middle East and Europe, dams and other hydrological structures are judged to pose a threat to nearly 10% (304) of the 3701 IBAs in this region. Most of these sites (87%, 264) qualify as wetlands of international importance under the Ramsar Convention (Fig. 37). In Asia, actual or planned dam projects are likely to have significant impacts on at least ten globally threatened birds. Riverine waterbirds, especially those that nest on sand-bars, such as Indian Skimmer (*Rynchops albicollis*) **VU**, are affected particularly badly. Such species typically have very linear ranges, occupying a small area in total. They are therefore particularly susceptible to threats that may have consequences throughout their range. Canalisation also causes damaging changes in flow patterns. For example, the Danube Delta on the border of Romania and Ukraine is internationally important for more than 20,000 pairs of breeding waterbirds, and, in winter, up to 7% of the world population of Red-breasted Goose (*Branta ruficollis*) **EN**. However, it is now threatened by the construction of a 170 km long deep-water channel for shipping, which will have serious environmental impacts on the delta's wetlands (BirdLife International 2004d, 2009b).

Marshes, swamps and bogs are particularly susceptible to drainage, either to convert the habitat to use for agriculture or development, or as a by-product of over-extraction of water. For example, drainage of Iraq's Mesopotamian marshes (in combination with upstream dams and other developments) reduced the extent of the marshes by 90% between the 1950s and 2000, leading to the uplisting of Basra Reed-warbler (*Acrocephalus griseldis*) to **EN**. Fortunately, improved management and conservation efforts are now reversing the situation, with up to 39% of the marshes reflooded by 2005, but the future availability of water for restoration is in question and only a fraction of the former marshes may recover (Richardson & Hussain 2006).

Pollution

Pollution, in various forms, has direct and indirect negative impacts on birds, causing problems for at least 170 threatened species. Pollutants cause direct mortality, reduced reproductive success and indirect impacts through habitat degradation. The major pollutants are effluents from agriculture (in particular, pesticides), forestry, industry and oil spills (Fig. 38), but "pollution" of the night skies by lights affects a smaller number of threatened species, including Newell's Shearwater (*Puffinus newelli*) **EN** and Barau's Petrel (*Pterodroma baraui*) **EN**, which return to their colonies after dark and become disorientated by artificial lights. Similarly, radiation can be a problem in specific cir-



Figure 37
Wetlands of international importance for birds are threatened by dams, barrages and embankments across Africa, Europe and the Middle East.

cumstances: Barn Swallows (*Hirundo rustica*) around Chernobyl (the site of the world's worst nuclear accident in 1986) show increased genetic mutations and lower reproductive success and survival, and populations of a number of species in the area are probably only sustained by immigration (Møller & Mousseau 2006).

Agricultural pollution

While they are useful for food production and disease control, pesticides have substantial negative environmental impacts. One estimate suggests that, in the USA alone, 672 million birds are exposed each year to farmland pesticides, and 10% die as a result (Williams 1997). Monocrotophos, an organophosphate insecticide used in crop farming, is particularly toxic. Over 100,000 avian mortalities have been documented since the 1960s, including the mass poisoning of nearly 6000 Swainson's Hawks (*Buteo swainsoni*) in Argentina during 1995–1996 (Goldstein *et al.* 1999). Similarly, in Mongolia, 3500 km² of steppe were treated with the rodenticide bromadiolone, following a population explosion of voles. Even without systematic monitoring, over 340 dead or dying birds were seen at several localities, including 145 Demoiselle Cranes (*Grus virgo*) (Natsagdorj & Batbayar 2002), with the full scale of the impacts doubtless being much larger. In the African Sahel region, 13 million hectares were sprayed with organophosphorus insecticides during the last major desert locust (*Schistocerca gregaria*) outbreak in 2003–2005, which is likely to have had substantial, but undocu-

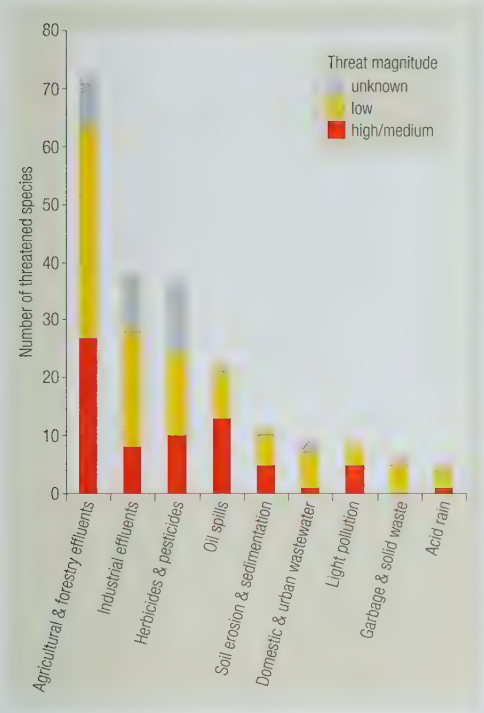


Figure 38
Effluents from farming, forestry and industry are the worst pollutants in terms of their impacts on threatened bird species.

mented, impacts on birds (Mineau 2009). Although levels of DDT and its metabolites in Osprey (*Pandion haliaetus*) eggs in Chesapeake Bay, USA, in 2009 were at less than half the levels reported in the 1960s–1970s, total organochlorine concentrations have declined only marginally (American Bird Conservancy 2010b).

Deliberate use of poison, with birds as the intended or incidental victims, is a common phenomenon in some parts of the world, for example when farmers attempt to prevent crop damage or persecute perceived predators of small livestock by lacing carcasses with toxic chemicals such as the carbamate pesticide, methomyl (Mineau *et al.* 1999). In two recent incidents in Botswana, over 80 individual vultures—including White-backed (*Gyps africanus*) NT and Hooded Vulture (*Necrosyrtes monachus*)—were deliberately poisoned by poachers in an attempt to eliminate vultures in the area, as protected area authorities quickly detect poaching activities through vulture concentrations at kills (BirdLife International 2009c). Similarly, in the Bunyala area of western Kenya, the pesticide carburofan is used to kill thousands of birds per month to sell for human consumption, despite the toxicity of the poison to humans too (BirdLife International 2009c).

Diclofenac is a non-steroidal anti-inflammatory drug used to treat livestock, but unexpectedly it has proved highly toxic to vultures that feed on the carcasses of animals recently treated with it (Oaks *et al.* 2004, Shultz *et al.* 2004). In South Asia species such as White-rumped Vulture (*Gyps bengalensis*) CR, once one of the most abundant large raptors in the world, have declined in numbers by over 99% since the early 1990s (Prakash *et al.* 2007). Modelling shows that even a rate of one contaminated carcass in every 130–760 is sufficient to account for the population crash (Green *et al.* 2004). Alarmingly, a second drug, ketoprofen, has recently also been found to be toxic to vultures; one in 200 carcasses in southern Asia contains the drug, and in 70% of these the levels are potentially lethal (Naidoo *et al.* 2010).

Lead-shot and land-based waste

Lead in shotgun pellets is intended to kill birds on impact, but because it is highly toxic and slow to break down, it has the unintended effect of killing birds many decades after its use. Every year, lead poisoning causes the deaths of many hundreds of thousands of waterbirds, which mistake spent pellets for food or for the grit they need to aid digestion. Up to 40% of all waterbirds in Europe and North Africa ingest at least one lead pellet per year: enough to kill a bird or increase its susceptibility to predation, starvation or disease (Beintema 2001, Fisher *et al.* 2006). Lead poisoning from hunted game is a threat to humans, too: c. 15% of waterbirds of species regularly eaten by people have lead levels in their blood well above those considered safe for human consumption (Beintema 2001).

Terrestrial birds are also affected: at least 59 such species are known to have been poisoned by ingesting lead shot, nine of which are threatened or NT (Beintema 2001, Fisher *et al.* 2006). In particular, scavengers and raptors are exposed to lead in dead animals or discarded offal. Lead ingestion accounts for up to 15% of post-fledging mortality in Bald Eagle (*Haliaeetus leucocephalus*) in North America (Beintema 2001) and remains the primary threat to California Condor (*Gymnogyps californianus*) CR, while Spanish Imperial Eagles are exposed to shot embedded in Greylag Geese (*Anser anser*), the primary prey in winter and a heavily hunted species (Pain *et al.* 2005a).

Raptors are also susceptible to other forms of anthropogenic pollution because they seek out bone fragments and small indigestible items in order to acquire calcium and help regurgitate food pellets. Increasingly, they also ingest toxic or sharp debris dumped by humans, and this can poison or choke them, and block or penetrate their guts. Nestlings are particularly at risk because they are less able to regurgitate indigestible items (Ferro 2000). Low breeding success in Griffon Vultures in Israel and Armenia has been linked to nestlings dying after eating metal objects (Ferro 2000). Similarly, six of eight California Condor nestlings that died or were removed from the wild had swallowed substantial quantities of glass shards, metal bottle-tops, ammunition cartridges, electrical wiring, plastic piping and rubber items. Two were found to have ingested their own body weight in such items. Most showed retarded feather development as a result of malnutrition resulting from blocked digestive systems, and one suffered from zinc poisoning (Mee *et al.* 2007).

Marine pollution and anthropogenic debris

Oil spills at sea are the most dramatic form of marine pollution, killing large numbers of seabirds and potentially wiping out entire populations where these are small or

localised. The wreck of the *Prestige* tanker off north-west Spain in November 2002 oiled up to 230,000 individual seabirds (García *et al.* 2003), and almost drove extinct the Iberian breeding population of Common Murre (*Uria aalge*) (now reduced to a handful of individuals at a single colony at Cabo Vilán: P. Arcos *in litt.* 2009). The Deepwater Horizon oil spill in the Gulf of Mexico off the coast of Louisiana, USA, in April 2010 had become the largest in US history at the time of writing, threatening at least ten IBAs (American Bird Conservancy 2010c). African Penguin (*Spheniscus demersus*) VU is particularly at risk from spills, as over 80% of its population breeds within 100 km of a major harbour, and the world's largest oil-shipping lane lies offshore of the entire breeding range. Wrecks in 1994 and 1998 led to the oiling of 10,000 and 20,000 penguins respectively. In addition, over 2% of these birds are oiled each year from smaller, unreported spillages and illegal discharges during tank-cleaning operations.

Other forms of marine pollution are less visually striking but with a much more widespread impact. For example, on average over 13,000 pieces of plastic float on every square kilometre of ocean (Derraik 2002, UNEP 2005). Entering the sea via offshore dumping, beaches and rivers, this debris reaches the remotest parts of the ocean and affects over 44% of seabird species through entanglement and ingestion (Laist 1997). Seabirds often mistake floating plastic items for prey, and ingest them. Remarkably, about 80% of large pieces of plastic washed ashore on beaches in the Netherlands show peck marks from birds at sea (Cadée 2002, Derraik 2002). Ingested plastic is ubiquitous in some seabird species: 95% of Great Shearwaters (*Puffinus gravis*) and 93% of Blue Petrels (*Halobaena caerulea*) have plastic in their digestive systems (Ryan 1987, Moser & Lee 1992), and plastic, nylon, rubber and metal have been found in 36% of Northern Fulmars (*Fulmarus glacialis*) and 29% of Black-browed Albatrosses (Mallory *et al.* 2006, Petry *et al.* 2007). Such debris is regurgitated to feed chicks, and can obstruct and physically damage a bird's digestive system, leading to malnutrition, starvation and death: 98% of nestling Laysan Albatross (*Phoebastria immutabilis*) VU and 73% of Southern Giant-petrel (*Macronectes giganteus*) have been fed debris including beads, buttons, cigarette lighters, toys, golf tees, rubber gloves, marker pens, aluminium foil and lightbulbs (Auman *et al.* 1997, Copello & Quintana 2003). Toxic chemicals called polychlorinated biphenyls (PCBs) also become concentrated on the surface of plastics at sea and are released when seabirds ingest them, with serious detrimental effects on reproduction, immune system and hormone balance (Derraik 2002). Some seabirds face the double whammy of marine and terrestrial pollution. For example, Laysan Albatrosses also suffer from lead poisoning from paint chips off abandoned military buildings on Midway Atoll, Hawaii, with up to 10,000 chicks per year being affected (Finkelstein *et al.* 2010).

Persistent organic pollutants and acid rain

Industrial chemicals like PCBs, residues of organochlorine pesticides like DDT, and unwanted by-products such as dioxins are collectively known as persistent organic pollutants (POPs). These toxins persist in the environment, and are now found almost everywhere, in terrestrial, freshwater and marine ecosystems. They concentrate in fatty tissues in organisms, and dramatically increase in concentration as they move up the food chain. POPs are linked to reproductive failure, deformities and physiological and behavioural dysfunctions in wildlife. In the heavily polluted Great Lakes region of the USA, predators such as Bald Eagle and Double-crested Cormorant (*Phalacrocorax auritus*) have suffered significant health impacts from POPs including eggshell thinning, deformities, cancers, hormone system dysfunction and immune suppression (Orris *et al.* 2000). Despite bans in many countries, these chemicals are still used in medicine, industry and agriculture around the world.

Similarly ubiquitous, sulphur and nitrogen pollution from vehicles, heating, powerplants, factories and agriculture can be transported large distances in the atmosphere before falling as acid rain and causing problems for terrestrial and freshwater habitats in particular. This has major economic impacts on forestry, agriculture and human health, as well as driving bird population declines through eggshell thinning. Long-term acid deposition depletes calcium in acid-sensitive soils, reducing the quality of eggshells and lowering reproductive success. In the UK, eggshell thickness has declined over the past 150 years in at least four species of thrush *Turdus* spp. owing to acid deposition (Green 1998), and acid rain has been implicated in population declines of several bird species breeding in the eastern USA (including Bicknell's Thrush *Catharus bicknelli* VU), particularly in high-elevation areas with low pH soils (Hames *et al.* 2002).

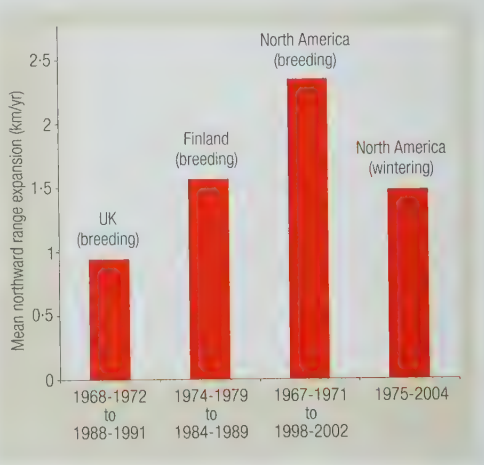


Figure 39
Birds in Europe and North America are being forced north by climate change. Values represent mean northward shift of the northward range boundary. Source: Thomas & Lennon (1999) (59 UK breeding species), Brommer (2004) (116 Finnish breeding species), Hitch & Leberg (2007) (25 North American breeding species) and La Sorte & Thompson (2007) (254 North American wintering species).

Climate change

Human-induced climate change, caused by greenhouse gas emissions resulting from fossil fuel burning and deforestation in particular, is now well established. Increasing temperatures, sea-level rises and shifts in precipitation patterns and snow cover are projected to continue at an unprecedented rate. If so, and if left unaddressed, these phenomena will inevitably have sweeping and dramatic effects on biodiversity. Although these may be positive for some species, e.g. Common Eiders (*Somateria mollissima*) in south-west Iceland appear to be benefiting from climate change (D'Alba *et al.* 2010), they are likely to be negative for the great majority of species, through impacts on their distribution, abundance and behaviour, and through changes in community composition and structure. Such impacts are already being felt: two recent meta-analyses examining more than 100 studies and over 1000 species have shown that over 80% of shifts in range or phenology (timing of biological events) have been in the direction expected from climate change, giving us a very high confidence that climate change is already impacting biodiversity (Parmesan & Yohe 2003, Root *et al.* 2003).

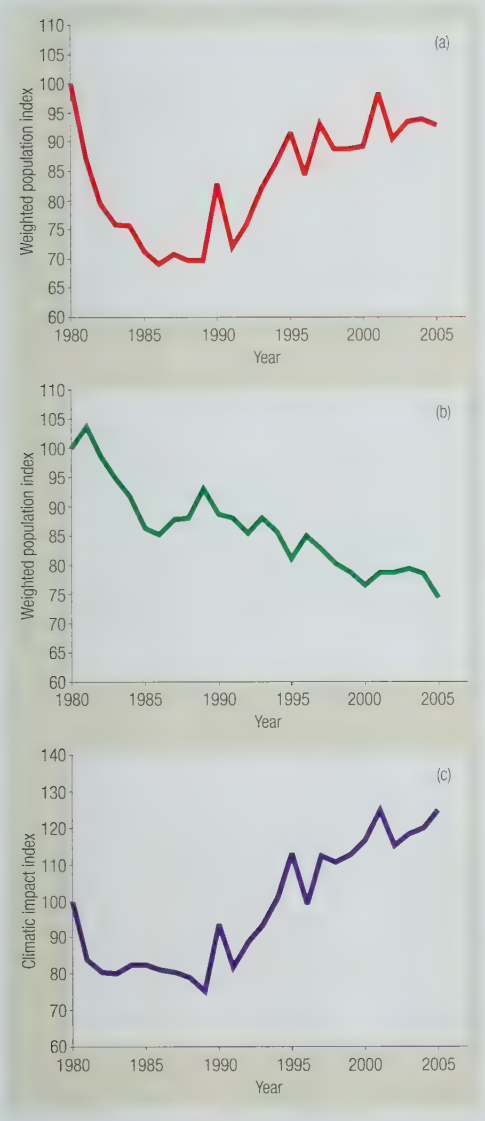


Figure 40
Climate change has had an increasing impact on European bird population trends since about 1990. The upper two graphs show weighted population trends of species predicted to (a) gain range in response to climatic change (30 species); and (b) lose range in response to climatic change (92 species). The Climatic Impact Index (c) shows the ratio of (a) and (b) and hence a positive trend indicates an increasing impact of climate change on population trends. All indices are set to 100 in 1980. Source: Gregory et al. *(2009).*

Documented impacts on birds

Over 400 bird species have already been documented as having experienced climate-driven impacts to date (BirdLife International unpublished data). Changes in migration times have been widely recorded. In Europe, migrants from sub-Saharan Africa have arrived 2·5 days earlier on average in the last 40 years, possibly so that they can cross the Sahel before the seasonal dry period. By contrast, migrants wintering north of the Sahara have delayed autumn passage by 3·4 days on average over the same period (Jenni & Kéry 2003). Similarly, in New York and Massachusetts, USA, migrants wintering in the southern USA arrived 13 days earlier on average in 1993 compared with 1951, while those wintering in South America arrived four days earlier (Butler 2003). In the southern hemisphere, migrants have arrived in south-east Australia 3·5 days earlier per decade on average since 1960, while departure dates have been delayed by 5·1 days per decade on average (Beaumont *et al.* 2006).

Some species have shown changes in timing of breeding: 63% of 65 breeding species in the UK nested earlier by 1995 compared to 1971, by nine days on average (Crick *et al.* 1997). Others, however, have not, and this causes them problems. Thus, the food supply for Great Tit (*Parus major*) chicks in the UK now peaks earlier owing to changes in vegetation phenology driven by increasing spring temperatures; but egg-laying by the tits has not advanced, presumably because the cues to which tits respond have not shifted in synchrony, so there is now a mismatch between food supply and timing of breeding (Visser *et al.* 1998). In some European Pied Flycatcher (*Ficedula hypoleuca*) populations in the Netherlands, such mismatches have driven population declines of c. 90% over two decades (Both *et al.* 2006). Similarly, short-distance (but not long-distance) migratory hosts of the brood-parasitic Common Cuckoo (*Cuculus canorus*) have advanced their arrival dates more than the cuckoo, and this mismatch may be contributing to the decline of cuckoo populations (Saino *et al.* 2009).

The altitudinal and latitudinal boundaries of species' ranges are also in flux (Fig. 39). Between 1979 and 1998, lowland and foothill species such as Keel-billed Toucan (*Ramphastos sulfuratus*) extended their ranges up mountain slopes in Costa Rica in response to elevated cloud-base levels (Pounds *et al.* 1999). Breeding birds in southern Finland extended their ranges north by an average of 19 km between 1974–1979 and 1986–1989 (Brommer 2004). In North America, the northern limit of 26 southerly species shifted 61 km northwards between 1971 and 1998 (Hitch & Leberg 2007), the winter distributions of 254 species shifted 44 km north during 1975–2004 (La Sorte & Thompson 2007), and the wintering ranges of landbirds in general shifted over 70 km north during 1966–2005 (Niven *et al.* 2009). In the southern hemisphere, too, species such as Pacific Baza (*Aviceda subcristata*) and Pied Butcherbird (*Cracticus nigrogularis*) in Australia have undergone significant southward range expansions (up to 200–300 km) since the late 1970s (Silcocks & Sanderson 2007), while White-throated Eared-nightjar (*Eurostopodus mystacalis*), which once moved north during the cooler months, now overwinters in south-eastern Queensland (Chambers 2007).

Climate change has had an increasing impact on bird population trends in Europe since about 1990, as shown by the Climatic Impact Index (Fig. 40). This shows that species expected to gain range in response to climatic change (based on climate envelope modelling) show positive population trends (based on systematic monitoring), and those expected to lose range in response to climatic change show negative trends (Gregory *et al.* 2009). Significantly, there have been three times as many declining

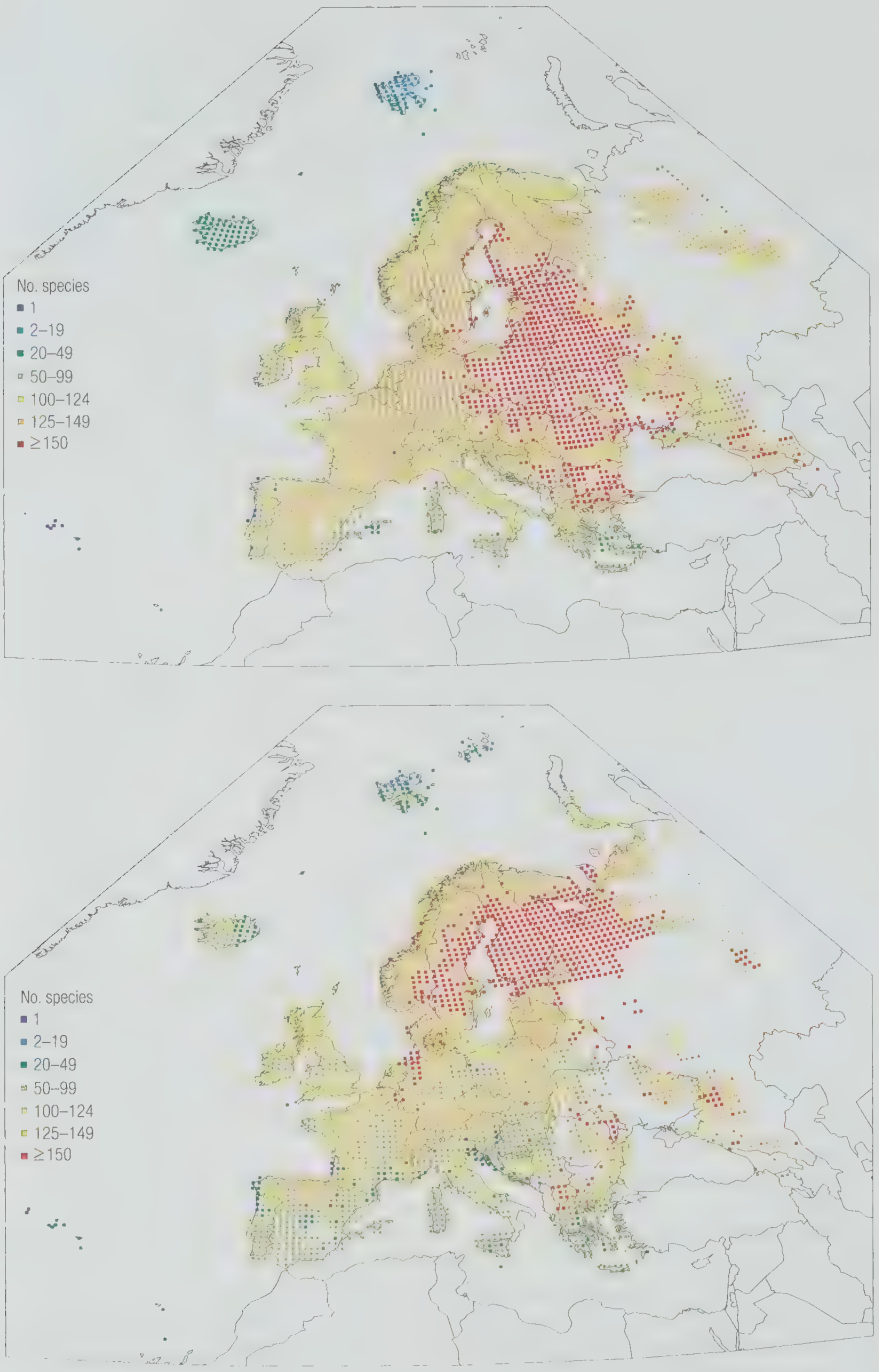


Figure 41
The area of highest species richness for birds in Europe is projected to shift north-east under climate change. Figures show simulated avian species richness for the present (top) and 2085 (bottom; based on HadCM3 climate model and assuming perfect dispersal). Source: Huntley et al. *(2007).*

species as the number benefiting from climate change. Among 100 European bird populations, declines during 1990–2000 were more likely for species that had not advanced their spring migration, presumably owing to mismatches mentioned above between breeding and food supply (Møller *et al.* 2008). These trophic mismatches may have been a major cause of population collapse in long-distance migrants in highly seasonal habitats in the Netherlands during 1984–2004 (Both *et al.* 2010).

For Australian seabirds the responses have also been mixed: breeding colonies along the Great Barrier Reef have suffered major declines linked to rising sea temperature and increasingly intense El Niño events, while temperate populations of species like Australasian Gannet (*Morus serrator*) in the Bass Straits have experienced considerable increases (Devney & Congdon 2007). More localised population changes include 90% declines in just seven years (1987–1994) in numbers of Sooty Shearwaters (*Puffinus griseus*) **NT** found off the western USA in the non-breeding season (attributed to changes in ocean surface temperatures and ocean currents associated with climate change: Veit *et al.* 1997).

Such distribution and population density changes alter bird community composition. In Germany, one study showed that, at a local scale, the proportion of long-



Figure 42
The percentage overlap and size change of the potential future ranges of ten bird taxa endemic to Europe, under a climate change scenario. Those indicated in red are of particular concern owing to substantial loss of range and low overlap between current and projected ranges. Source: adapted from Huntley et al. *(2007).*

distance migrant species decreased and the number and proportion of short-distance migrant and resident species increased between 1980 and 1992, possibly because higher winter temperatures benefit residents and intensify the competitive pressure on long-distance migrants (Lemoine & Böhning-Gaese 2003). In France, a 91 km northward shift in bird community composition (measured as the balance between low- and high-temperature dwelling species) was recorded between 1989 and 2006, a period during which the temperature increase corresponded to a 273 km northward shift. Birds are thus lagging c. 180 km behind climate warming (Devictor *et al.* 2008), and it might be expected that other less-mobile organisms are experiencing even more serious mismatches, although the evidence for this is not yet clear (Hickling *et al.* 2006).

Projected impacts on birds

Modelling studies indicate that the impacts documented to date are likely to be typical of the effects expected. Much research has focused on projecting how the combination of climatic conditions found in species' present ranges will change in future. This shows that while some species may benefit from climate change, many more are predicted to suffer because the area of suitable conditions for them will contract and/or shift too fast. One study showed that the breeding ranges of European species are projected to shift north-eastwards by 260–880 km depending on the emission scenario (Fig. 41; Huntley *et al.* 2007, 2008). On average, future ranges are expected to be 20% smaller than they are now, and to shift substantially, overlapping by only c. 40% with present breeding distributions. Species that are likely to experience both a substantial proportional range loss and shift, such as Marmora's Warbler (*Sylvia sarda*), are of particular concern (Fig. 42; Huntley *et al.* 2007, 2008). Another study in sub-Saharan Africa showed that the median degree of overlap between current and projected ranges in 2085 for 815 species of conservation concern is just 31·5%, but with substantial regional variation (Hole *et al.* 2009). At individual sites, average turnover in species composition is projected to be 10–13% by 2025 and 20–26% by 2085 (and 18–21% increasing to 35–45% by 2085 for species of conservation concern: Hole *et al.* 2009).

These range-shifts and other impacts will cause problems for migrants (Newson *et al.* 2008), especially those that have intercontinental migrations. By the end of the century, over half of all trans-Saharan migrant warblers will face longer migrations, some by over 250 km (Doswald *et al.* 2009).

The impacts of climate change will be particularly severe at the poles, parts of which are the fastest warming regions on earth (ACIA 2004, Turner *et al.* 2005). In the Antarctic, rising temperatures are likely to have profound implications for the sea-ice dynamics that govern the region's ecosystems. Retreating sea-ice has already been linked to declines in Antarctic krill, the backbone of the Antarctic food chain and a key prey species for many seabirds (Moline *et al.* 2004, Gross 2005). Particularly vulnerable are Emperor Penguin (*Aptenodytes forsteri*) and Adelie Penguin (*Pygoscelis adeliae*), both of which depend on pack-ice throughout their life cycles. A global mean temperature rise to 2°C above pre-industrial levels (projected to occur within 40 years) will render 50% of existing Emperor colonies and 75% of Adelie colonies unviable (Ainley *et al.* 2008). Population modelling for one Emperor Penguin colony at Terre Adélie projects a precipitous decline, with a 36% probability of extinction by 2100 (Jenouvrier *et al.* 2009). The contraction of sea-ice will have similarly negative consequences for Arctic wildlife. For example, Ivory Gull (*Pagophila eburnea*) NT is largely restricted to pack-ice when feeding. The Canadian breeding population of these gulls is already thought to have declined by 80% since the early 1980s (Gilchrist & Mallory 2005).

Bird species at the polar edges of continents will have limited opportunities for dispersing to new areas of suitable habitat, and will be among the hardest-hit by climate change. A study of 23 Arctic waterbird species showed that, on average, they may lose 35–51% of their breeding range by 2080 (Zöckler & Lysenko 2000): Dunlin (*Calidris alpina*) could forfeit up to 58% of its breeding habitat in this time-frame, and Red-breasted Goose up to 85% (Zöckler 1998). Another study of 27 northern landbirds in Fennoscandia projected range reductions of 74–84% by 2080 (Virkkala *et al.* 2008).

Mountain-top species have similarly restricted opportunities to disperse as unsuitable conditions move upslope. In north-east Queensland, Australia, the distributional extents of 13 bird species endemic to montane tropical rainforests are expected to shrink dramatically as suitable climate space retreats to higher altitudes: range sizes will reduce by 30% on average with a 1°C temperature increase, and 96% with a 3·5°C rise (Fig. 43; Houghton *et al.* 2001, Williams *et al.* 2003).

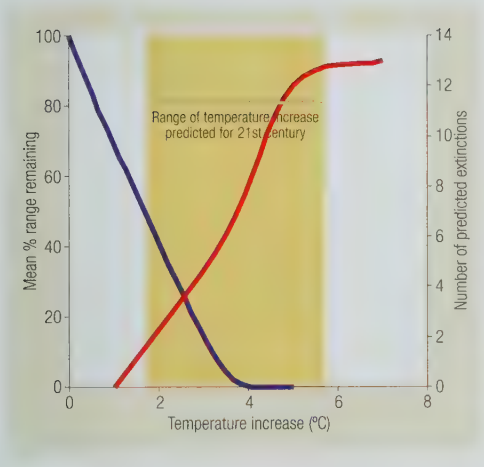


Figure 43
Extinctions of endemic montane forest birds in Australia are predicted to increase with increasing temperatures under climate change. Source: Williams et al. *(2003).*

Sea-level rise is projected to reduce or eliminate available habitat on low-lying islands and coasts. Species restricted to such situations, such as Cozumel Thrasher (*Toxostoma guttatum*) **CR** and wintering Orange-bellied Parrot (*Neophema chrysogaster*) **CR** will thus have their survival prospects further reduced (Bennett *et al.* 2007). Bermuda Petrel (*Pterodroma cahow*) **EN** is already suffering from wave damage to nesting sites during increasingly frequent and severe hurricanes (Madeiros 2008), and increased frequency of typhoons may be an important threat to breeding sites of Chinese Crested Tern (*Sterna bernsteini*) **CR** (Chen *et al.* 2009, Chan *et al.* 2010). Relatively few studies have examined this issue across suites of species, but Legra *et al.* (2008) found that at least eleven of New Guinea's endemic bird species could lose over 10% of their current range if sea-levels rise 1 m, with White-bellied Pitohui (*Pitohui incertus*) **NT** projected to lose 41% of its range under these circumstances.

Climate change is also likely to exacerbate other threats, such as habitat loss and invasive species. The anticipated sea-level rises will result in mass human migration and greater dependence on adjacent lands and resources, inevitably leading to major habitat conversion and the depletion and loss of many associated bird populations. In Australia, eucalypt woodlands are likely to suffer directly from increased fire frequency, and indirectly through the consequent spread of fire-adapted weeds such as gamba grass (*Andropogon gayanus*), which in turn promotes further fires. Modelling shows that this invasive species from Africa could become established across much of northern Australia, further threatening birds such as Gouldian Finch (*Erythrura gouldiae*) **EN** (Low 2007). In Hawaii, climate change may exacerbate threats from introduced avian pox and malaria, transmitted by introduced mosquitoes (see page 27 above). These are restricted to the lowlands, so cooler high-elevation forests remain the last refuge for 18 threatened bird species (mainly Hawaiian honeycreepers Drepanididae). Climate change is predicted to lead to a lifting of the cloud-base, and consequent upward shifts of montane cloudforests (Still *et al.* 1999) and hence the zone of malaria risk. The results of modelling this phenomenon for three critical protected areas on the islands of Hawaii, Maui and Kauai show alarming increases in the areas of high malaria risk, and reductions or disappearances of areas with low risk (Fig. 44; Benning *et al.* 2002): a temperature increase of 2°C will almost eliminate low malaria-risk forest in the Hakalau Wildlife Refuge on Hawaii (an important area for five threatened bird species). As the cloudforest zone is constrained in its upward shift because of previous clearance for pasture at higher elevations, reforestation above the reserve will be crucial to improving the endemic species' chances of survival. (In addition, modelling shows that control of introduced rats *Rattus* spp. at mid-elevations would facilitate the spread of malaria resistance in several native species: Kilpatrick 2005.)

A common theme across these examples is that the degree of global warming will determine the size of the extinction crisis caused by climate change. Some extinctions will probably result if global average temperatures rise by 2°C, but there will be some practical management options for conservation. However, both biodiversity and people will face a bleak future if temperatures rise significantly higher (IPCC 2007).

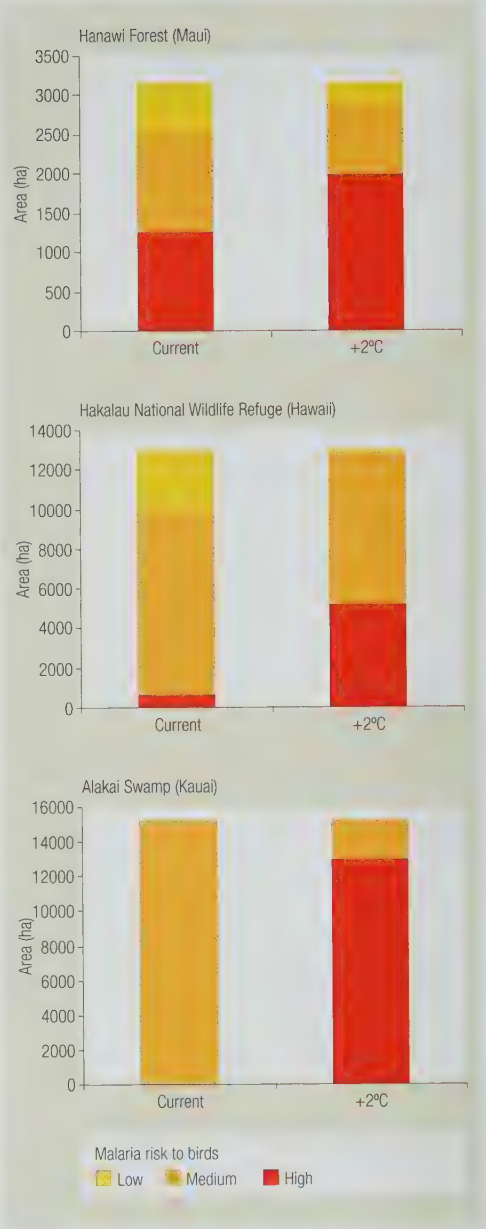


Figure 44
Climate change will exacerbate the threat from avian malaria to native forest birds in Hawaii. Bars show the area of forest with high, medium and low malaria risks for native bird species in forest reserves on three Hawaiian islands. Source: Benning et al. *(2002).*

Underlying drivers

There are a number of drivers behind these threats to birds and biodiversity. Most importantly, our economic systems currently fail to account for the substantial value of nature, instead favouring short-term benefits from converting intact habitats to human uses. On average, half of the total economic value of natural habitat is lost following its wholesale appropriation for a more intense human use. Habitat conversion does not make long-term economic sense; indeed, the benefits of conserving remaining natural habitats appear to exceed the costs by at least 100 to 1 (Balmford *et al.* 2002). However, conversion is often also encouraged by policies that introduce economically perverse incentives for environmentally damaging activities such as overfishing and wholesale deforestation. One reason for this is that it is difficult to agree on values for things that are not traded, or whose benefits lie in the future. Economies therefore ignore the value of goods and services derived from natural ecosystems (including climate regulation, soil fertility, crop pollination and water purification), even though one estimate puts it as high as US$33 trillion per year (Costanza *et al.* 1997) and another estimates that the value of services from terrestrial ecosystems lost each year is c. US$70 billion (TEEB 2008).

A good example of the important contribution birds make to such services comes from a study in the Serengeti, Tanzania. This showed that when fire disturbance opens up the canopy of riverine forest, frugivorous birds decline, reducing the proportion of

tree seeds digested by birds. As undigested seeds are more vulnerable to attack by beetles, seed germination rates, seedling density and tree recruitment rates all fall, leading to forest loss: 70–80% of riverine forest patches have been lost since 1950. Birds therefore play a key role in maintaining the forest, and their loss leads to its conversion to savanna (Sharam *et al.* 2009). Of more direct economic consequence, birds play a critical role in pollination, seed dispersal, control of insect and rodent pests, and carrion removal, as Sekercioglu (2006) pointed out in the Foreword to HBW 11. Examples include:

- Avian control of spruce budworm in spruce plantations in Washington State, USA, is estimated to be worth at least US$1500 per km^2 annually (Takekawa & Garton 1984).
- Pest control by birds in Canada's boreal forests was estimated to be worth C$5·4 billion in 2002 (Anielski & Wilson 2009).
- Predation of insect pests by birds in apple plantations in the Netherlands increases yields by two-thirds (Mols & Visser 2002).
- Avian control of the coffee berry borer (*Hypothenemus hampei*) on coffee farms in Jamaica has been estimated to be worth US$310 per ha (Johnson *et al.* 2010).
- Birds are important for pollination of at least 50 crop and medicinal plant species (Nabhan & Buchmann 1997).
- *Gyps* vultures in India play (or played) an economically important role in scavenging of animal carcasses. Their precipitous loss has led to increases in the feral dog population, with one (admittedly controversial) study estimating there have been 47,000 additional human deaths from rabies, at a cost to the Indian economy of US$34 billion (Markandya *et al.* 2008).
- Birds may also play a significant role in regulating some diseases. In the USA, a recent study showed that more diverse bird communities can reduce, through a dilution effect, the incidence in humans of West Nile virus. The virus has caused over 1100 human deaths, and associated healthcare costs were estimated at US$200 million for 2002 alone (Swaddle & Calos 2008).

Failure to incorporate the value of nature into economics is exacerbated by global imbalances in power and wealth. Poor people are often the most directly dependent on natural resources. For example, 1·4 billion people depend on forests for their livelihoods and food security (World Bank 2004). However, the poor are often compelled for their short-term survival to use natural resources unsustainably. They are often excluded from decision-making, denied their human and political rights, and displaced by commercial developers, agribusiness, political instability or insecurity. Vulnerable populations are forced to migrate, intensifying poverty, increasing conflict over land use, and placing further pressures on natural habitats. In such circumstances, they may be forced to use whatever resources they can, even in areas set aside for biodiversity protection.

Growing human populations and individual consumption levels are fundamental drivers of threats to biodiversity. When the first volume of HBW was published in 1992, the world population was just below 5·5 billion. By the time the series is completed in 2011, it will have reached 7 billion (UN 2008). In the time it takes to read this Foreword, the equivalent of a small town of 10,000 people will have been added to the world population. Unfortunately, the areas with the fastest-growing populations often coincide with areas of unique biodiversity. In sub-Saharan Africa, human population density is positively correlated with species richness of terrestrial vertebrates (Balmford *et al.* 2001), and similar congruence between the distributions of people and biodiversity have been found in Australia (Luck *et al.* 2004), North America (Luck *et al.* 2004), Europe (Araújo 2003) and within the tropical Andes (Fjeldså & Rahbek 1998).

However, in terms of human impacts on the planet, the growth in consumption is of more immediate concern than the alarming growth in population itself. In recent decades most of the latter has occurred in poorer parts of the world, where each individual consumes fewer resources. For example, the *per capita* "ecological footprint" (i.e. the area with globally averaged productivity required to produce the resources consumed by each individual) is 0·8 ha in India compared to 4·5 ha in Europe and 9 ha in the USA. In total, humans now consume each year 1·5 times as many resources as the planet can generate sustainably in a year, and this demand has grown by 71% since 1970 (www.footprintnetwork.org). Nevertheless, while current levels of global consumption derive largely from developed countries, the world's poor will place increasing demands on our planet in future, as countries develop and prosperity rises. For example, as developing nations become wealthier they eat more meat and dairy products. The *per capita* consumption of pork in China has almost doubled since 1990 (from 20 to 40 kg), and China is now the world's biggest importer of soy to feed its growing livestock sector. Similarly, increasing dairy consumption in India and the corresponding need for feedstock is challenging the country's ability to sustain soy exports (Mardas *et al.* 2009). Consequently, for example, the increasing wealth of both China and India is directly driving pressures on forests and *cerrado* in South America.

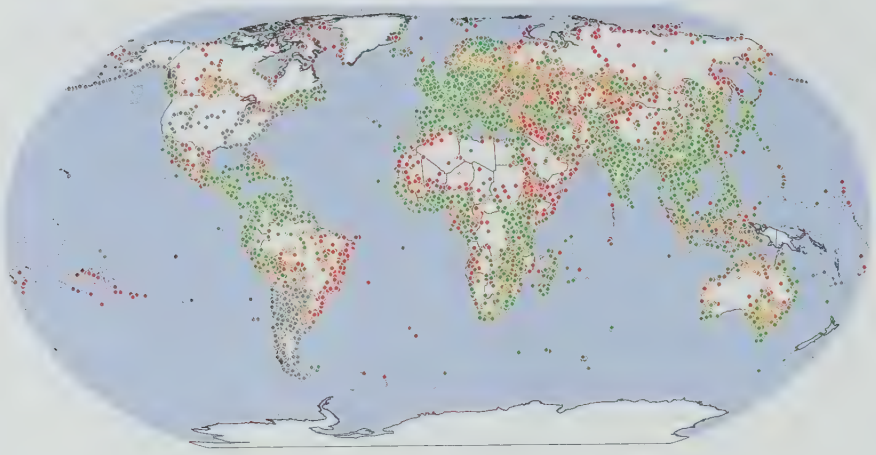


Figure 45
Over ten thousand IBAs have been identified across the world. Green indicates completely protected, amber indicates partially protected and red indicates unprotected sites. IBAs of unknown protection status are shown in grey. Note that initial IBA assessments have not yet been completed in the USA, Kyrgyzstan, New Zealand, Papua New Guinea, Solomon Islands, several other Pacific states and Antarctica.

What can we do?

Despite the depressingly poor state of the world's birds, and the multiplicity of threats and their magnitude reviewed above, there is a suite of conservation approaches available to tackle the current crisis that can and do work, provided sufficient resources and political will are applied. These include identifying, protecting and managing key sites (IBAs), combined with tackling threats at the broad scale (through appropriate legislation and land-use planning that takes biodiversity into account). Where these site-focused and landscape- or seascape-scale approaches are insufficient in the short-term (most often the case for species on the brink of extinction), species-specific research and interventions will also be needed.

Site protection

Protecting key places for biodiversity has been a cornerstone of conservation efforts for over a century. Tackling threats and implementing solutions is often most tractable at the site scale.

For birds, the Important Bird Area (IBA) approach to identifying priority sites using globally standardised criteria has been developed and implemented by BirdLife International since the 1980s. IBAs are identified using objective criteria based on the presence of species of global conservation concern, assemblages of restricted-range (see Stattersfield *et al.* 1998) and biome-restricted species, and large concentrations of congregatory species. IBAs are also effective at capturing other terrestrial biodiversity (e.g. Brooks *et al.* 2001, Eken *et al.* 2004, Pain *et al.* 2005b, Langhammer *et al.* 2007), so are an excellent first cut for the larger set of Key Biodiversity Areas—an extension of the IBA approach to other taxa. Wherever possible, IBAs are identified and documented at the national level through a multi-stakeholder process. To date over 10,000 IBAs of global significance have been identified in 206 countries (Fig. 45). Typically, IBA identification is followed by conservation planning, action on the ground, advocacy, capacity-building and monitoring.

Increasingly, IBAs are being recognised by governments as priorities for formal protection by designation as national parks, reserves, sanctuaries and other types of protected area (indeed, many sites were already officially protected when they were identified as IBAs). However, there is still a long way to go: the mean percentage IBA area protected has increased to 39%, while the percentage of IBAs that are completely protected has risen to 26% (Fig. 46). For both metrics, the rate of increase appears to have levelled off since the late 1990s, perhaps partly because the easiest sites to designate have been protected first, but also because of delays in information flow.

As well as national legislation, there are three global initiatives to promote the conservation and management of important sites: the Ramsar Convention on Wetlands, the World Heritage Convention and UNESCO's Man and the Biosphere Programme. Although many IBAs qualify under the criteria of these initiatives, only a minority have been designated to date (e.g. Fig. 47). The situation is similar for regional conventions, such as the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) under the Convention on Migratory Species (CMS). Although at least 2252 IBAs support globally significant numbers of one or more of the AEWA-listed species, nearly 40% of these sites still lack protection.

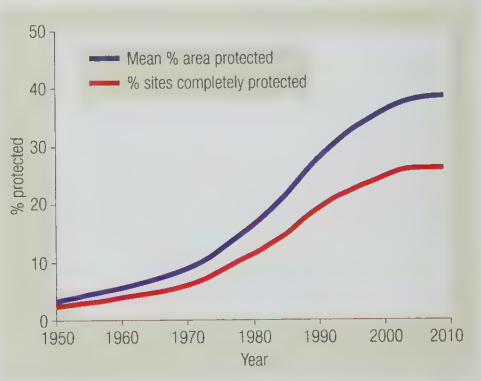


Figure 46
Protection of IBAs has increased over time, but many are still not officially protected. IBA Protection Index for 10,993 IBAs in 218 countries. Protected areas with unknown date of protection were assigned dates based on the temporal distribution of dated protected areas.

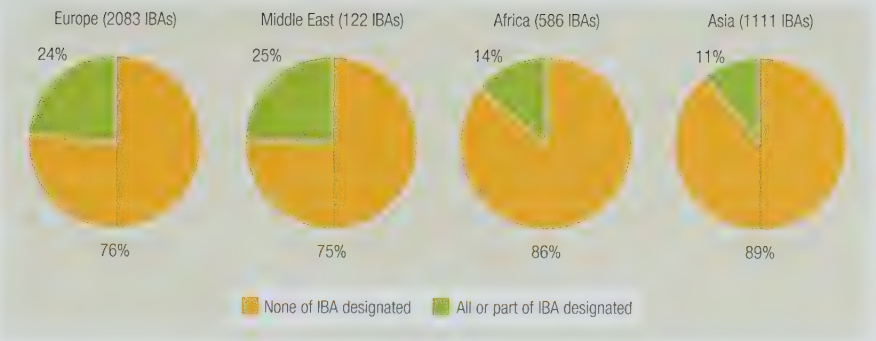


Figure 47
The majority of IBAs that qualify as Ramsar sites have not yet been designated as such.

In the EU, the Birds Directive requires all member states to create and properly manage a coherent network of Special Protection Areas (SPAs) for bird taxa of conservation concern. IBA identification criteria are deliberately aligned with SPA selection criteria, so the European Commission and Court of Justice have recognised national IBA inventories as "shadow lists" of SPAs. This has helped to increase the designation (partial or entire) of IBAs as SPAs from 23% to 64% during 1993–2008, despite growing numbers of IBAs and member states over this period (Fig. 48). However, over 1000 European IBAs still do not overlap with any SPA, and are therefore urgent priorities for designation. There is good evidence that such designation benefits the targeted species: Donald *et al.* (2007) found a significant positive correlation between the percentage of land area designated as SPAs in the original 15 member states and the mean population trends of bird species of conservation concern (those listed on Annex 1 of the Birds Directive: Fig. 49).

Similar evidence for the value of formal protection comes from monitoring IBAs in Kenya. IBA indices (which summarise data collected using BirdLife's standard IBA monitoring protocols) show that, compared to non-protected sites, IBAs with formal protection are in better condition, and have marginally lower pressures and better conservation responses in place, including better management planning and implementation (Fig. 50; Mwangi *et al.* 2010).

While formal protection of IBAs is often preferable, other approaches can also be effective. These include establishing community management of resources, ensuring that effective safeguard policies are applied, and securing thorough environmental impact assessments for development projects. In all cases, success requires long-term commitment and local community and stakeholder involvement.

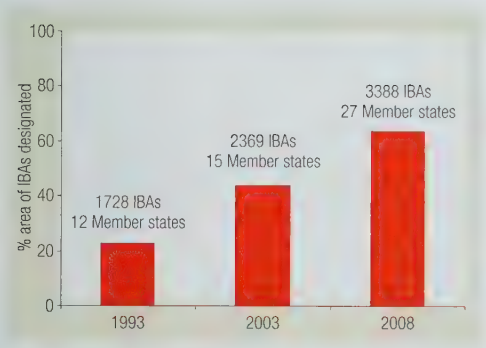


Figure 48
An increasing proportion of the area of IBAs has been designated as Special Protection Areas in the European Union, despite a growth in the number of countries and IBAs.

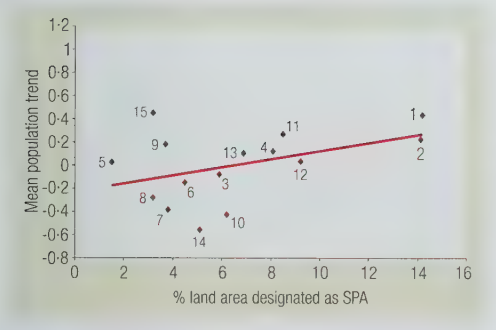


Figure 49
Population trends of bird species of conservation concern are positively correlated with the percentage of land area designated as Special Protected Areas in the European Union. Data for Annex I bird species in the original 15 EU countries. Key to countries: 1: Austria, 2: Belgium, 3: Denmark, 4: Finland, 5: France, 6: Germany, 7: Greece, 8: Ireland, 9: Italy, 10: Luxembourg, 11: Netherlands, 12: Portugal, 13: Spain, 14: Sweden, 15: UK. Source: Donald et al. *(2007).*

Managing sites

Managing IBAs often involves identifying which of the suite of threats outlined above impact the species for which the IBA is designated, and then tackling these with targeted interventions at the particular site. Site management commonly involves managing habitats to benefit particular species or suites of species. For example, Kirtland's Warbler (*Dendroica kirtlandii*) **NT** has strict requirements for breeding habitat, namely stands of young (5–23 year old) jack pine (*Pinus banksiana*) growing on well-drained soils. By 1971, the warbler population had declined to just 201 singing males confined to a small area in the Lower Peninsula region of Michigan, USA. Active habitat management then began, including clearing and replanting large areas of jack pine each year, and managing the fire regime. In combination with control of the brood-parasitic Brown-headed Cowbird (*Molothrus ater*), this has allowed the warbler population to increase to 1792 individuals by 2008, and to spread to Wisconsin and Ontario (Fig. 51; Probst *et al.* 2003). Habitat restoration, or even creation of new areas of habitat, can have dramatic effects. Within a year of the creation in 2006 of an artificial island at Kamfers Dam, South Africa, Lesser Flamingos (*Phoeniconaias minor*) **NT** colonised the site and in 2008–2009 raised 13,000 chicks, thereby creating only the fourth breeding locality in Africa and the sixth in the world (Anderson 2008, M. D. Anderson *in litt.* 2009).

Efforts to make forestry practices more sustainable, and to improve farming practices so as to reduce threats to forests, are common priorities for management of tropical forest IBAs. Mount Oku in the Bamenda Highlands, Cameroon, is a critical site for a number of species endemic to the Cameroon highlands, such as Bannerman's Turaco (*Tauraco bannermani*) **EN** and Banded Wattle-eye (*Platysteira laticincta*) **EN**. However, the site has suffered decades of forest loss and degradation. Since 1987, a community-managed project has been working with local people to establish agreed

forest boundaries, implement sustainable use of forest resources and improve agricultural practices. This has resulted in the rate of forest regeneration exceeding the rate of deforestation since 1995, and the IBA is gradually improving in condition (Fig. 52; BirdLife International 2004b).

The threat from alien invasive species can be successfully reduced or even eliminated at the site scale, particularly for small islands. Clipperton Atoll, c. 1000 km off the coast of Mexico, provides a good example. Historically, it was sparsely vegetated, with extremely high densities of plant-eating land crabs (*Gecarcinus planatus*), and tens of thousands of nesting seabirds. However, the introduction of feral pigs in 1897 devastated the seabird populations through predation of both eggs and crabs, the latter resulting in a dramatic increase in plant cover and a concomitant reduction in seabird nesting sites (Sachet 1962). Since pigs were removed in 1958, the ecological balance has been restored and there are now an estimated 11 million land crabs, little vegetation cover (Dodson & FitzGerald 1980), and, once again, one of the largest Masked Booby (*Sula dactylatra*) and Brown Booby (*Sula leucogaster*) colonies in the world (with c. 40,000 and 20,000 birds respectively). Unfortunately, rats have recently been discovered on Clipperton, probably introduced following shipwrecks of longline shark-fishing boats in 1999 and 2001 (B. Tershy *in litt.* 2003). They are the next target for eradication on the island.

Advances in technological solutions are being made in relation to the more challenging invasive alien species such as rodents. The development of advanced types of targeted poisons, and effective protocols (often involving helicopters) to distribute bait has led to numerous successful eradications from islands. Indeed, funding may now be the only limit on the size of island that can be tackled (the largest successful rat eradication to date took place in 2001 on the 113 km² Campbell Island, New Zealand, but in 2010 the eradication of rabbits, rats and mice will commence on the 128 km² Macquarie Island in the South Atlantic). Even when complete elimination is not practical or affordable, targeted trapping and poisoning can provide sufficient management to tip the balance towards survival for a threatened bird species.

Where unsustainable hunting is the key threat to priority species at an IBA, site management involving a combination of awareness-raising among hunting communities and strict law enforcement can produce impressive results. For example, the population of White-headed Duck (*Oxyura leucocephala*) **EN** in Spain had been reduced to just 22 birds confined to a single lagoon in Córdoba province, Andalucía, by 1977 (Green & Hughes 1996, Torres Esquivias 2003). In 1979, however, conservation management began, initially focusing on enforcing the prohibition of hunting. The population began to recover, and now numbers c. 2200 individuals (Fig. 53), with breeding in 13 provinces (Torres Esquivias 2003, Madroño *et al.* 2004). Effective protection from illegal hunting was undoubtedly the key factor, but habitat measures such as the removal of introduced fish, control of pollution and sedimentation, and regeneration of fringing vegetation were also significant.

Many IBAs come under pressure from commercial and infrastructure development. A soda ash extraction plant at Lake Natron, Tanzania, was approved recently after an environmental impact assessment failed to take account of the negative consequences the development would have on Lesser Flamingos, for which the site is the most important breeding colony in the world. Concerted protests by a coalition of community and environmental groups, including BirdLife partners, has at least delayed construction, but the threat remains (BirdLife International 2009d). Similarly, strong opposition succeeded in minimising the impact of a hotel development that would have destroyed or degraded a substantial proportion of the remaining habitat for Grenada Dove (*Leptotila wellsi*) **CR** on Grenada, Lesser Antilles (BirdLife International 2007a, D. C. Wege *in litt.* 2009). Proper assessment of the potential impacts would have precluded these plans ever getting off the drawing board.

Wetland IBAs often require actions tackling management of water supply and quality. At the Hadejia Nguru wetlands in north-east Nigeria—an important wintering site for Ferruginous Duck (*Aythya nyroca*) **NT** among other waterbirds—management is tackling the consequences of poorly regulated upstream water use, including dam construction, which has led to the spread of *Typha* reeds, causing choking of waterways and changes to water flows. Successful management, including channel clearance, has produced increases in both fish catches and waterbird populations (Langley 2009). In India, the formerly spectacular wetlands at Bharatpur (Keoladeo National Park) had all but dried up by 2000 following water extraction and damming upstream, leading to dwindling numbers of colonial waterbirds (such as Black-headed Ibis *Threskiornis melanocephalus* **NT** and Eurasian Spoonbill *Platalea leucorodia*) for which the site had been famous. Management is now underway to restore water flows into the park, including construction of a 16 km pipeline from the Goverdhan drain and the Gambhir River (Times of India 2008).

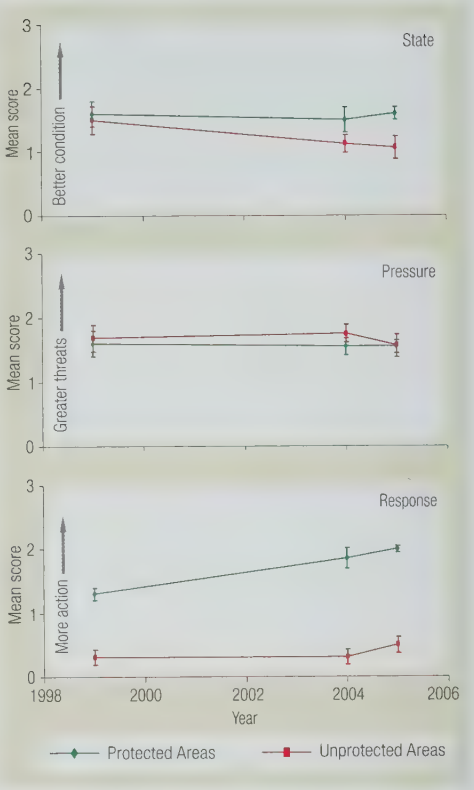


Figure 50
Protected IBAs in Kenya have marginally lower threats and are in better condition. Graphs show trends in state (condition), pressure (threats) and response (conservation action) scores for 20 protected and 16 unprotected IBAs during 1999–2005; protected areas include national parks, national reserves, forest reserves, game sanctuaries and national monuments; non-protected areas include private and trust lands. Source: Mwangi et al. *(2010).*



Figure 51
Kirtland's Warbler populations have increased over the last two decades in response to habitat management. Source: Probst et al. *(2003).*

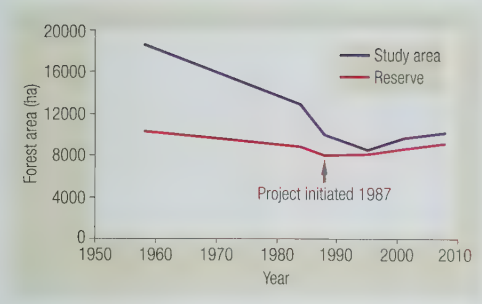


Figure 52
Forest cover on Mount Oku, Cameroon, has increased owing to protection and management. The figure shows total forest area (measured from satellite imagery and aerial photographs) within a study area and for the reserve as a whole. A community-managed forest project was initiated in 1987. Since 1995, the rate of regeneration (c. 2·3% per year) has significantly exceeded the rate of deforestation.

Broad-scale action

Some threats to the world's birds require interventions at the landscape scale or through regional, national or international approaches to complement local actions and make them effective in the longer term. Thus, while it may be possible to control or eradicate invasive alien species at individual IBAs, policies and programmes to limit the spread of these aliens are essential in order to prevent further introductions. Similarly, while measures may be effective at individual sites to restrict the hunting of birds for food or the trapping of birds for pets (e.g. through nest protection, anti-poaching patrols, and education and awareness-raising with local communities), they need to be complemented by action at broader scales to reduce demand, provide more sustainable alternatives, and manage national and international trade.

Other threats to birds can *only* be tackled effectively at the broad scale. For example, effective national policies, land-use planning and legislation that take the needs of biodiversity into account are the primary mechanism for tackling threats from unsustainable forestry and agriculture (including the expansion of biofuels), transport development, pollution and inappropriate water resource management (e.g. through dams and drainage). International interventions are needed to minimise threats from oil spills or fisheries bycatch (much of which takes place in international waters), or for which coordinated international action is essential (e.g. climate change).

Reforming agricultural policy

The threat from continental-scale agricultural intensification necessitates broad-scale policy responses. In Europe this requires reform of the EU's Common Agricultural Policy and greater use of agri-environment schemes (AES), under which farmers are paid to improve their land management practices to benefit biodiversity and the wider environment. Well-designed AES can deliver impressive results in reversing the decline of farmland birds and other biodiversity (e.g. Brereton *et al.* 2005, Knop *et al.* 2006, Wotton & Peach 2007). For example, the Eurasian Skylark (*Alauda arvensis*) declined rapidly in the UK from the mid-1970s to the mid-1980s, probably because of the change from spring to autumn sowing of cereals. This practice limits opportunities for nesting attempts later in the season, because the crop is then too tall, and diminishes overwinter survival by reducing the area of stubble (Wilson *et al.* 1997, Donald & Vickery 2000). Leaving small patches of bare ground ("Skylark plots") within autumn-sown cereals provides many of the benefits of spring-sown cereals at very low cost to the farmer. Implementation of such measures as part of an AES can increase Eurasian Skylark chick productivity by 50% (Donald & Morris 2005). There are many other examples showing that wildlife-friendly measures can be integrated with profitable commercial cropping.

Promoting sustainable forestry

The sustainable use of forests requires the application of commercial forest management practices that do not harm forests of high biological value, in combination with landscape-scale planning to integrate areas for protection, rehabilitation and commercial exploitation. In the 1970s and 1980s, Costa Rica had one of the highest rates of deforestation, and forest cover dropped to just 21% by 1987 compared to 75% only 50 years earlier (Kleinn *et al.* 2002). However, astute government policies and incentives launched in the late 1980s to protect the remaining forest and encourage re-forestation have increased forest cover to 51% today, showing that deforestation can be reversed and forest managed sustainably. One important mechanism to achieve sustainable forest management is high-quality independent certification schemes providing eco-labelling for timber and timber products. There are a number of such schemes, but the longest running and most extensive is that operated by the Forest Stewardship Council (FSC), which covers 1·2 million km^2 of forest in 82 countries (5% of the world's productive forests), with FSC-labelled sales worth over US$20 billion in 2008 (FSC 2009).

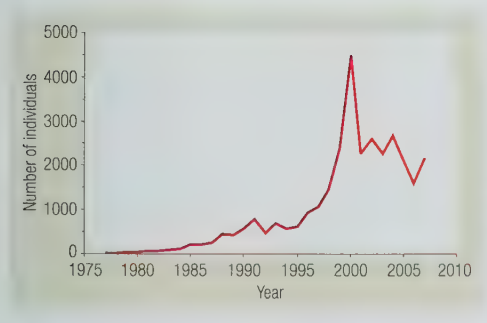


Figure 53
The Spanish population of White-headed Duck has recovered spectacularly since the 1970s following targeted conservation action. Recent fluctuations are linked to levels of spring rainfall. Source: Torres Esquivias (2003), V. Escandell in litt. *(2010).*

Controlling invasive alien species and limiting their spread

While there are many examples of successful control or eradication of invasive alien species in the wild, such measures need to be complemented by effective policies to minimise the spread of aliens through customs controls and the careful regulation of

shipping, air and land transport networks. While many countries (82%) have signed up to international or regional agreements that commit them to dealing with alien invasives, only 55% of all countries have relevant national legislation (McGeoch *et al.* 2010), and even fewer possess adequate action plans that are being effectively implemented. Key considerations here are first that the damage done by aliens can be expensive to nations in terms of resources, income and heritage by comparison with the measures needed to prevent invasion, and second that the difficulty and expense of eradicating a well-established alien is more or less in inverse proportion to the ease and costlessness with which it can be introduced, or indeed reintroduced, into an environment. The price of alien-free environments is eternal vigilance.

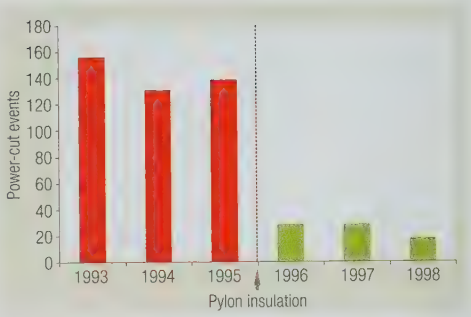


Figure 54
Providing adequate insulation reduces the number of power-cuts caused by bird electrocutions in Hungary. Data from 30 km of powerline in south-west Hungary. Source: Bagyura et al. *(2004).*

Minimising the impact of development projects

Threats to the world's birds from development projects need to be addressed by mainstreaming effective policies and procedures to ensure that biodiversity concerns are incorporated into the overall planning and implementation of large-scale human enterprises such as mines, transport infrastructure, windfarms, tidal barrages, dams, power stations, power distribution systems, new towns, factories, dockyards, airports and holiday complexes. All such development projects should only be permitted after rigorous and even-handed environmental impact assessments.

Some countries have taken welcome steps to incorporate biodiversity concerns into land-use planning: Mongolia has a comprehensive strategy for mining, infrastructure and tourism development that explicitly takes account of the country's IBAs in order to avoid detrimental impacts (BirdLife Asia 2009), and Namibia's plans to develop uranium mining across the country are taking account of the location of IBAs and other key sites for biodiversity (BirdLife International 2010b).

Wherever possible, biodiversity impacts should be avoided or else fully mitigated; and offsets should be considered only where negative impacts are unavoidable. Windfarms, as a specific example, need to be carefully planned and designed: they should not be built near populations or movement corridors of birds of conservation importance, and are generally most safely sited relatively far offshore, away from concentrations of seaduck.

Making electricity powerlines safer for birds can only be achieved through landscape-scale action. The Hungarian Ornithological and Nature Conservation Society, working in collaboration with electricity providers and government, has developed an insulating plastic cover for the metal cross-arms of electricity poles to help minimise avian electrocutions. Over 50,000 insulators have now been fitted, significantly reducing the frequency of both electrocutions and power-cuts (Fig. 54; Bagyura *et al.* 2004). Electricity companies have now signed a voluntary agreement to make all dangerous powerlines more "bird-friendly" by 2020 (BirdLife International 2008c). Similarly, in Spain, simple, inexpensive alterations to the design of powerline poles can cut annual mortality of juvenile Spanish Imperial Eagles by more than 50% (Janss & Ferrer 2001), while a study of communications towers in the USA has shown that removal of non-flashing lights from towers can reduce mortality by 50–71%, as well as lowering operating costs (Gehring *et al.* 2009).

Addressing the bird trade

Exploitation of species for the international bird trade is managed through the Convention on International Trade in Endangered Species (CITES), which bans trade between countries for some species (listed on its Appendix I), and sets limits on numbers for others (listed on Appendix II). However, these quotas are frequently set with inadequate evidence to support the presumption that commerce is sustainable, often because of lack of capacity at the national scale. Providing far better support in such circumstances, for basic research and monitoring of population sizes, trends, levels and impacts of trade, is probably the most urgent issue that CITES needs to address. The USA and EU have banned (or very heavily restricted) the import of wild-caught birds, partly in response to concerns over the sustainability of much of this trade, although some believe that this has created new smuggling channels which will now be all the harder to control (G. Scheres verbally 2009). In Indonesia, it has been argued that the keeping of cagebirds is so ubiquitous (e.g. 57% of urban households in Java and Bali have kept a bird in the last ten years) that softer policy approaches are needed in order not merely to avoid alienating potential supporters of bird conservation but actively to enlist their backing for improved self-regulation and management. Such approaches may include market-based mechanisms, certification schemes and volun-

tary regulatory systems to increase the contribution of captive breeding and hence reduce the pressure from harvesting of wild birds (Jepson & Ladle 2009).

Preventing unsustainable hunting

Curbing unsustainable levels of hunting of migrant birds in Europe, particularly in the Mediterranean, requires a combination of broad-scale awareness-raising and effective enforcement. The EU Birds Directive protects these species in theory, but implementation at the national scale is often weak. In Malta, national legislation permitting the shooting and trapping of spring migrants has not been changed, so the EU has instigated legal proceedings against the state. Even where the law is brought into line with EU requirements (as in Cyprus, where in 2009 for the first time a ban was imposed on the shooting of birds in May, an important month for the passage of spring migrants), observance of laws and regulations is poor and hunters remain defiantly entrenched in their old traditions. Successful conservation requires persistence, until public and political opinion sufficiently erodes the power base of the transgressors. In some contexts, however, particularly where the situation is urgent, real results may only be achieved through working directly with hunters. In Trinidad, hunters are being recruited to raise awareness among their own communities of the vulnerability of Trinidad Piping-guan (*Pipile pipile*) CR to try to reduce levels of exploitation. Similarly, in North Africa and the Middle East guidelines and codes of practice to promote sustainable hunting have been produced in association with hunters as part of a region-wide integrated attempt to start to reduce the threat from excessive exploitation (BirdLife International 2010c).

Minimising fisheries bycatch

To reduce incidental mortality in longline fisheries for many of the world's albatrosses, a suite of simple, cheap and effective mitigation measures have been developed. These can dramatically reduce the numbers of birds being killed. Studies have shown that the use of a "bird-scaring line" can reduce seabird mortality while also increasing fish catch because fewer baits are lost to birds (Brothers 1991, Løkkeborg 2001). Other effective measures include setting lines at night when birds are less active, and adding weights to lines to make them sink more rapidly out of the reach of seabirds (Robertson *et al.* 2006). Such measures, particularly when used in combination, can reduce seabird bycatch by 80–90%. Ensuring uptake of these measures requires communicating and demonstrating their benefits to fishermen in seabird bycatch hotspots, and working with national and regional fisheries management organisations (through which fish stocks are managed) to make these measures mandatory. While the Commission for the Conservation of Antarctic Living Marine Resources (CCAMLR) has made considerable progress (e.g. reducing albatross bycatch by over 99% around South Georgia: Croxall 2008), over 80% of global albatross distribution is outside CCAMLR waters, overlapping mainly with swordfish and tuna fisheries managed by the world's five tuna commissions. In 2004, only one of the tuna commissions had any requirements for vessels to reduce seabird bycatch (Small 2005), but by 2008 this had increased to four (Fig. 55).

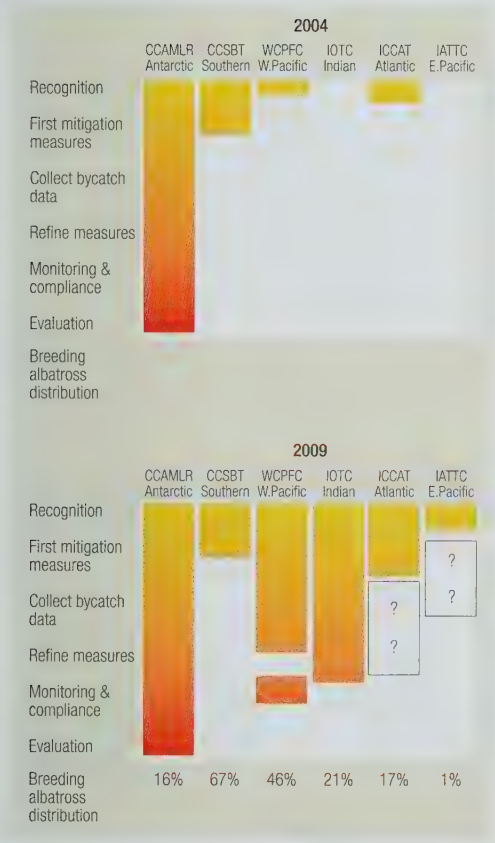


Figure 55
The world's five commissions for tuna fishing have made progress in addressing seabird bycatch, but further measures are required. Bars show measures implemented by each of the commissions, with warmer colours indicating more robust measures. CCAMLR: Commission for the Conservation of Antarctic Living Marine Resources; CCSBT: Commission for the Conservation of Southern Bluefin Tuna; WCPFC: Western and Central Pacific Fisheries Commission; IOTC: Indian Ocean Tuna Commission; ICCAT: International Commission for the Conservation of Atlantic Tunas; IATTC: Inter-American Tropical Tuna Commission.

Preventing pollution

Proper enforcement of robust legislation is the primary mechanism by which to reduce the threat to birds and other biodiversity from pollution in its various forms. Crucial elements include:

1) clean-air legislation to cut the sulphur and nitrogen pollution from vehicles, factories and agriculture that cause acid rain;
2) banning of dangerous pesticides and other persistent organic pollutants, and the promotion of non-toxic alternatives;
3) prohibiting the use of lead ammunition, particularly over wetlands, again with the promotion of safer alternatives;
4) targeted measures to minimise light pollution where this is an issue; and
5) national legislation and international agreements to promote safe tanker design and shipping routes to minimise the risk and impact of oil spills.

Localised pollution events such as oil spills require immediate and fully resourced responses to limit their impact, including the rescue, cleaning and rehabilitation of oiled birds. Encouragingly, such efforts appear to have improved over recent decades,

with the proportion of rescued oiled African Penguins released back into the wild in a healthy state having increased from 55% in the 1970s to 86% in 2000, and the overall population estimated to be 19% larger now than it would have been without rehabilitation efforts (Ryan 2003). Cleaning oiled birds is expensive (e.g. nearly US$1·5 million for the *Treasure* disaster in South Africa in 1998: Whittington 2003), but trivial relative to the profits of the companies responsible for the pollution.

Replacing and avoiding veterinary diclofenac

To address the specific threat to vultures from diclofenac, the governments of India, Pakistan and Nepal have now passed legislation banning its manufacture (but not its sale). Efforts are now focusing on replacing diclofenac with meloxicam, an alternative not toxic to vultures (Pain *et al.* 2008). In India, following publicity campaigns and lobbying, the government ordered a crackdown on companies selling diclofenac in 2008. In Nepal, vultures are being provided with diclofenac-free carcasses, and diclofenac use has dropped by 90% since 2006 following the introduction of measures to reduce its application, such as exchanging it with meloxicam near breeding colonies (BirdLife International 2008d). While diclofenac is being phased out, a captive breeding programme has been established, with 283 vultures in captivity at three breeding centres in India, one in Pakistan and one in Nepal by 2009 (Bowden 2009).

Promoting international environmental agreements

Many of the broad-scale actions needed by the world's birds require regional or international coordination. The world's governments have now endorsed many biodiversity-relevant international agreements to achieve this: over 500 such treaties exist to date. Among the most significant for birds are the Convention on Biological Diversity, CITES, the Ramsar Convention and the CMS and its agreements (on albatrosses and petrels, and African–Eurasian waterbirds). However, many countries have failed to ratify these treaties, and the lists of species the agreements target for particular action often require updating and expanding. Arguably, non-governmental organisations make significant contributions to the efficacy of the conventions, filling gaps too often left by governmental inadequacies. Most importantly, these political agreements need to be followed up with the necessary interventions, for example by drawing up and implementing species action plans through the CMS, or protecting key waterbird sites under the Ramsar Convention.

Mitigating and adapting to climate change

The threat to the world's birds from climate change will require global action. It is essential not just for birds but for all life on the planet that the average degree of warming is limited to 2°C, but this will require urgent and substantial measures across multiple sectors to reduce carbon dioxide and other greenhouse gas emissions. Even if this is achieved, extensive action will still be required to help birds adapt. For example, IBAs will need to be managed adaptively and as a coherent network of sites taking consideration of the shifts in species' ranges that are projected. A recent study estimated that by 2085 the African IBA network will retain suitable conditions for all but 7–8 "priority" species triggering IBA designation, and 88–92% of these priority species will retain suitable climate in at least one IBA in which they are currently found (Hole *et al.* 2009). This is good evidence that we must not give up on site-based conservation approaches just because the distribution of species and composition of communities are projected to become more dynamic. However, the considerable turnover in the complement of species at each site (e.g. >50% at 42% of African IBAs for priority species by 2085: Hole *et al.* 2009) means that it will be essential to manage IBAs in the light of these dynamics. For some sites, it will be important to promote the resilience of particular species through managing habitats to maintain their suitability as long as possible. For other IBAs, management must focus on developing suitable conditions for species expected to colonise (Hole *et al.* 2010). It will also be important to identify and protect new IBAs, and take action to facilitate the movement of species between sites, through maintaining or developing habitat corridors or stepping stones, and making the intervening land-use as biodiversity-friendly as possible; in extreme cases, translocation may be needed.

Potentially the most significant opportunity for broad-scale action to benefit biodiversity lies with the provision for financing forest conservation through Reduc-

ing Emissions from Deforestation and Forest Degradation (so-called "REDD") under the United Nations Framework Convention on Climate Change. Recognising the substantial contribution that deforestation makes to greenhouse gas emissions and hence climate change, governments have agreed on the importance of establishing a finance mechanism for generating the requisite flow of resources to reduce deforestation and forest degradation. The challenge will be to design a system of payment structures to create the incentives that ensure tangible, lasting, achievable, reliable and measurable emission reductions while maintaining and improving the other ecosystem services forests provide. While the approach is not without risks for biodiversity, well-targeted REDD financing to priority conservation areas could make an immense contribution to conserving birds and other biodiversity.

Species-focused action

For some threatened species, dealing with threats at individual sites and/or broad-scale interventions in the wider environment needs to be complemented by more targeted species-specific actions. Often this starts with research to understand the causes of an observed decline and to identify specific management responses, such as the control of introduced predators or provision of nest sites. Translocations of populations or reintroductions from captivity are usually a last resort, but can be remarkably successful. In some cases, "Species Action Plans" can be an effective way of identifying the key problems and solutions, coordinating activities and ensuring acceptance by all stakeholders, although the financing of the implementation is too often a neglected or deferred element in the process.

Innovative research

Novel research techniques are rapidly improving our ability to determine the true status of species and the causes of their declines. For example, satellite-tracking is being increasingly used to reveal the distribution, movements and ecology of species. Northern Bald Ibis and Sociable Lapwing provide illuminating examples.

Until recently, the Northern Bald Ibis was believed to survive in the wild only in south-west Morocco, with an additional semi-wild population in Turkey. However, in 2002, a small colony of seven individuals was discovered at Palmyra, Syria (Anon. 2002, Serra 2003). Although the birds appeared to breed successfully, few juveniles returned each year. Satellite transmitters attached to three adults in 2006 showed that they migrated on a 6000 km round-trip across seven countries, to winter in the Ethiopian highlands. Local researchers quickly located the three tagged ibises at the wintering grounds, along with the fourth adult bird, but there was no sign of the nine younger ibises. The challenge is now to protect the birds from hunting and harmful pesticides in winter and on migration, and to track young birds to determine where they overwinter (Lindsell *et al.* 2009).

Sociable Lapwing breeds on the grassland steppes of Kazakhstan and south-central Russia, and migrates through the Middle East to wintering areas in Israel, Eritrea, Sudan and, on a separate trajectory, north-west India. The species has suffered a very rapid population decline in recent decades, but research suggests that factors on the breeding grounds are not solely responsible for this. So, to understand better the migration routes and threats in the non-breeding season, individuals have been fitted with satellite transmitters in Kazakhstan since 2007. The birds were tracked to Turkey, and when scientists followed the signals they found a remarkable flock of 3200 birds, the largest recorded in over a century (BirdLife International 2007b). Other birds were located over the border in Syria, where they were found to suffer intense hunting pressure. The trackers showed that the birds left these sites in late October, eventually arriving in central Sudan after a total trip of more than 8000 km (Fig. 56; Anon. 2007). The discovery of the birds' migration route and wintering grounds is an important step towards safeguarding the species, and work to protect the stopover and wintering sites is now underway.

At sea, satellite tracking devices and geolocators are also being used to understand better the distribution of foraging seabirds, which is important for assessing where they overlap with fishing effort and hence where they might be at greatest risk from bycatch in fisheries (Fig. 32). BirdLife's Global Procellariiform Tracking Database now holds over 5000 locality records for 28 seabird species contributed by over 60 scientists and research groups from around the world (Fig. 57), and has been an effective tool in promoting the application of mitigation measures to reduce seabird bycatch (Croxall 2008).



Figure 56
Satellite tracking devices have revealed how Sociable Lapwings migrate from their breeding grounds in Kazakhstan (shaded cream), via staging areas in Syria and Turkey to wintering grounds in Sudan (shaded blue). Red and blue lines show the routes taken by two individuals in 2007.

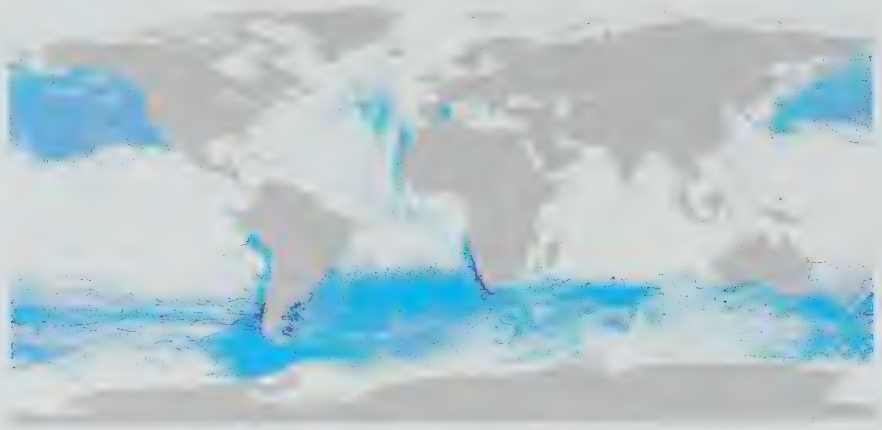


Figure 57
Satellite tracking devices and data loggers provide detailed data on the distribution of foraging seabirds in the open oceans. Different shades of blue indicate different species; the map is derived from 5114 locality records for 28 seabird species held in BirdLife's Global Procellariiform Tracking Database, and is reproduced with permission from the data holders.

Other technologies are also being harnessed to support bird conservation in innovative ways. For example, while the breeding range of the Aquatic Warbler (*Acrocephalus paludicola*) **VU** in Europe is well known, the wintering grounds were until recently poorly understood. Researchers analysed feathers from birds caught in Europe to examine the patterns of isotopes, and matched these to isotope maps of West Africa (where the birds grow new feathers while moulting in winter). This narrowed the search to a zone just south of the Sahara, and an analysis of past African records in combination with modelling of potentially suitable climatic conditions led researchers to likely areas bordering the Senegal River. In 2007, fieldworkers tracked down a population of 5000–10,000 birds in the Djoudj National Park, an IBA in north-west Senegal, which it is estimated may hold up to a third of the global population. Efforts are now underway to initiate monitoring and management of the park to benefit the species.

Two other fields of research that offer promise are remote camera trapping and automated sound recording, both of which potentially allow significant scaling up of survey efforts to overcome constraints posed by the availability of skilled fieldworkers. Technological advances, reduced costs and developments in statistical analysis are leading to increased use of remotely triggered cameras for surveying large ground-dwelling birds such as cracids and pheasants (O'Brien & Kinnaird 2008). Camera traps led to the rediscovery of Sumatran Ground-cuckoo (*Carpococcyx viridis*) **CR** and the first record for over a century of Giant Pitta (*Pitta caerulea*) **NT** in Kerenci Seblat National Park, Sumatra, Indonesia (Martyr 1997, Dinata *et al.* 2008), and are being used to census Jerdon's Courser (*Rhinoptilus bitorquatus*) **CR** in Andhra Pradesh, India (Jeganathan *et al.* 2002). Similarly, affordable devices now exist for automated recording of bird sounds, and software to detect and classify bird sounds automatically is ever-improving (Brandes 2008). Such technology has been used, albeit unsuccessfully, in the quest for convincing evidence that Ivory-billed Woodpecker (*Campephilus principalis*) **CR** survives in the USA (Fitzpatrick *et al.* 2005), and in surveys for seabirds and Puaiohi (*Myadestes palmeri*) **CR** on Kauai, Hawaii (American Bird Conservancy 2008a), and will no doubt become an increasingly useful tool for bird conservation research.

Species management

Once research has revealed the distribution, ecology and threats to species, intensive management—supplementary feeding, nest-site protection or provision, brood manipulation, control of invasive alien species, translocation, and/or captive breeding and reintroduction—may be required. Often a combination of techniques is used.

Seychelles Magpie-robin (*Copsychus sechellarum*) was reduced to just 12–15 birds on a single island by 1965 owing to a mixture of threats. In 1994, following some crucially important ecological research and a series of management experiments (Watson *et al.* 1992), a full recovery programme was initiated, involving habitat creation, supplementary feeding, nest defence, provision of nestboxes, control of introduced species and translocations to other islands (Bristol *et al.* 2005). As a consequence, the population now numbers at least 178 birds on four islands (Fig. 58) and the species has been downlisted from **CR** to **EN**. Similarly, the population of Mauritius Parakeet (*Psittacula eques*) was reduced to fewer than a dozen birds in 1986, including just three females (Thorsen & Jones 1998). The replacement of upland dwarf forest with plantations had left the population confined to a tiny remnant of native forest covering just 50 km^2. A recovery programme was initiated, including captive breeding, brood manipulation (e.g. movement of chicks from large broods to foster par-

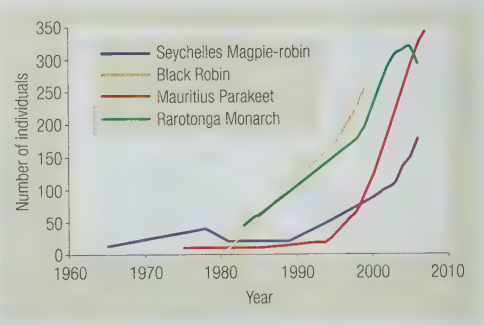


Figure 58
Intensive management has led to the recovery of four formerly Critically Endangered species. The slight drop in the Rarotonga Monarch population in 2006 was a consequence of poor breeding following cyclones in summer 2005 that reduced canopy cover and hence increased exposure of nests.

ents), provision of artificial nest cavities, and control of alien invasive predators and competitors such as crab-eating macaque (*Macaca fascicularis*) and black rat. By 2007, this had increased the wild population to over 340 birds and again the species was downlisted from **CR** to **EN**.

Translocation

Some threatened bird species have declined so severely that large parts of their historical range are no longer occupied. Even when the threats that led to such declines have been adequately mitigated, recolonisation of formerly occupied areas may not occur naturally. In such cases, and in particular for species on islands, it may be appropriate to translocate individuals in order to re-establish populations.

The breeding grounds of Bermuda Petrel were unknown until 18 pairs were found in 1951 nesting on a group of tiny rocky islets in Bermuda. Provision of artificial burrows and baffles fitted to natural burrows to exclude White-tailed Tropicbird (*Phaethon lepturus*) (the petrel's principal nest-site competitor) allowed the population to increase to 70 pairs by 2003 (Madeiros 2003). However, the breeding sites are highly susceptible to wave damage during hurricanes, so a second population has been established on the nearby island of Nonsuch, which is larger, higher and better protected from hurricanes and rising sea-levels. Since 2004, over 100 chicks have been moved to the new colony, and in 2008, the first birds returned to the island. Hopes are high that within the next few years they will start to breed on the island for the first time in nearly 400 years (Madeiros 2008). Similarly, a programme began in 2008 to translocate Short-tailed Albatross (*Phoebastria albatrus*) **VU** chicks from their current stronghold on Torishima Island, Japan, to the site of a former colony at Mukojima in the Bonin Islands, 350 km to the south-east. Currently, 80–85% of the world population breeds on the outwash plain from an active volcano and hence are highly vulnerable (BirdLife International 2008e). The establishment of a further population would substantially improve the survival prospects of this species.

Rimatara Lorikeet (*Vini kuhlii*) **EN** was until recently confined to the tiny (9 km^2) island of Rimatara in French Polynesia, plus two sites in the northern Line Islands of Kiribati, where the species had been introduced in historical times. The Rimatara population would be highly vulnerable if black rats were to be accidentally introduced, an event which is feared to be inevitable. Consequently, it was decided to establish a second population on Atiu in the southern Cook Islands (McCormack 2006), where the species had occurred until driven extinct two centuries previously by exploitation for feathers to decorate ceremonial headdresses. In 2007, 27 birds were translocated to Atiu, and the first breeding was reported in 2008, with some birds having already spread to the neighbouring island of Miti'aro, and the total population on Atiu numbering 40 birds by October 2009 (BirdLife International 2008f, G. McCormack *in litt.* 2009).

Captive breeding and reintroduction

For some species, the balance between rate of decline, size of population, intensity of threats and time required to mitigate them is such that it becomes appropriate (or even essential) to take some or all of the remaining birds into captivity. This is followed by a carefully managed programme of "conservation breeding", threat control and reintroduction. California Condor provides one of the best examples. Lead shot ingested from game carcasses unretrieved by hunters was responsible for the long-term reproductive failure of the species and a seemingly ineluctable decline in its numbers, so that by 1985 just nine individuals were left in the wild. The remaining birds were brought into captivity and integrated into a captive population by 1987. By 1992, the first captive-born juveniles were released in California, followed by releases in Arizona (1996) and Baja California, Mexico (2002) (Cade *et al.* 2004, Wallace 2005). There are now over 150 birds in the wild, but just seven wild chicks have fledged and no second-generation birds have yet matured. Released birds continued to suffer high mortality rates (Meretsky *et al.* 2000), primarily owing to lead poisoning, despite the banning of lead ammunition within the condors' range. Much work remains before the population can be regarded as self-sustaining, but the species would certainly have disappeared without intensive intervention.

Success stories

Other examples exist of birds brought back from the brink by concerted action involving measures described above. Black Robin (*Petroica traversi*) **EN** from the Chatham Islands, New Zealand, had declined to just three males and two females by 1980 owing to predation by introduced rats and cats, and deforestation. Nest protection, supplementary feeding, a cross-fostering programme (with the congeneric Tomtit *P. macrocephala*) and translocation from Mangere Island to South East Island successfully increased the population to around 250 birds by the late 1990s (Fig. 58). Although only 180 were estimated in 2007, it is uncertain whether this is a consequence of changing survey techniques or climatic impacts on productivity (D. Houston *in litt.* 2007). Similarly, Rarotonga Monarch (*Pomarea dimidiata*) **EN** was formerly common, but had declined to 38 birds on Rarotonga (Cook Islands) by 1987 (Robertson *et al.* 1994). Recovery work commenced in 1988, including intensive control of predators (particularly black rats) to reduce adult mortality and increase nesting success. By 2006, the population had reached 291 individuals (Fig. 58), including an introduced population of 36 individuals on the rat-free island of Atiu (200 km north-east of Rarotonga: Robertson & Saul 2007).

A critical measure of conservation success is whether conservation action has prevented any extinctions. One recent study (Butchart *et al.* 2006b) estimated that 16 bird species would have gone extinct during 1994–2004 were it not for conservation programmes that addressed their threats, reduced rates of population decline and/or increased population sizes. The mean minimum population size of the suite of species increased from 34 to 147 breeding individuals, while 63% of them had declining population trends in 1994, compared to 81% that were increasing by 2004 (Fig. 59).

A second study (Brooke *et al.* 2008) examined the rate at which species have moved through the IUCN Red List categories towards extinction during the same decade, and showed that conservation action has substantially slowed this trajectory. Among **CR** species, although three had gone extinct by 2004, 49 (28%) benefited from conservation action such that they declined less severely or improved in status. An additional 47 (27%) gained marginal benefits from conservation action. Hence, conservation action has for many species slowed, halted or even reversed the rates of decline driven by human-induced threats, and for a suite of 16 species saved them, at least temporarily, from extinction.

BirdLife's Preventing Extinctions Programme builds on these successes. It is spearheading greater conservation action, awareness and funding for the world's most threatened birds, through appointing "Species Guardians" (to implement the priority actions) and "Species Champions" (to provide the resources: see www.birdlife.org/extinction). To date, 55 Species Champions have been recruited, committing over US$3 million to implement action by 34 Species Guardians for 56 **CR** and **EN** bird species. Examples include Pingo D'Água, a local organisation implementing research, environmental education and advocacy for Restinga Antwren (*Formicivora littoralis*) **CR** at Cabo Frio, Brazil, and SOPI (Sociedad Ornitológica Puertorriqueña Inc.) carrying out surveys, community awareness and action planning for Puerto Rican Nightjar (*Caprimulgus noctitherus*) **CR**.

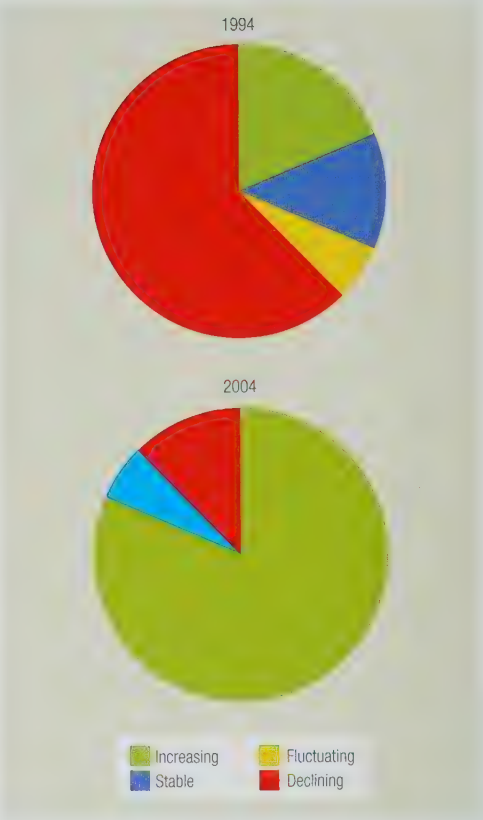


Figure 59
At least 16 bird species would have gone extinct without conservation action between 1994 and 2004. Pie charts show the population trends of these species at the start and end of the period. Source: Butchart et al. *(2006b).*

A growing challenge

There are many reasons to be optimistic despite the parlous state of nature in 2010, and notwithstanding the long catalogue of anthropogenic pressures on birds with which this essay begins. The success stories described above demonstrate that conservation can work: we have the knowledge and tools to turn around the fortunes of species at risk, provided adequate resources and political will are applied. There are also many heartening cases of threats being averted: a canal that would have wiped out much of the habitat of Jerdon's Courser in India was re-routed in response to public outcry (BirdLife International 2008g); the Augustow Primeval Forest and the magnificent Rospuda Valley in Poland have been saved from the threat of the Via Baltica road development (BirdLife International 2010d); governments of India, Nepal and Pakistan have banned the manufacture of the veterinary drug diclofenac which is deadly for vultures; both Cyprus and Malta have prohibited hunting of spring migrants (BirdLife International 2009e, 2009f); and the USA decided not to allow the expansion of industrial fishing into the Arctic north of the Bering Strait (BirdLife International 2009g).

Furthermore, there are plenty of examples of bird species and their habitats receiving better protection: local communities on the Fijian island of Kadavu are working to tie forest conservation in IBAs to the development of sustainable agricultural prac-

tices (BirdLife International 2009h); Timor-Leste has declared its first national park, which will provide sanctuary for 100 Critically Endangered Yellow-crested Cockatoos, among other biodiversity (BirdLife International 2008h); Brazil and Uruguay have become the most recent countries to endorse the Agreement on the Conservation of Albatrosses and Petrels (ACAP 2010); and Mexico has passed a law banning the capture and export of wild parrots (American Bird Conservancy 2008b).

Finally there are encouraging signs of businesses and governments taking the issue of biodiversity conservation more seriously: TransCanada Corporation has committed almost US$1 million to support community caretakers for Canadian IBAs (BirdLife International 2009i); Rio Tinto Alcan is supporting conservation of Kakapo (*Strigops habroptila*) as a BirdLife Species Champion (BirdLife International 2008i); Bayer CropScience has withdrawn from the USA market disulfoton and methamidophos, two organophosphates that are already banned in many other parts of the world (American Bird Conservancy 2009b); and Ecuador has changed its constitution to recognise the rights of nature (American Bird Conservancy 2008c).

Nevertheless, the scale of the challenge is continuing to grow, and for all the conservation achievements over the past half-century or so, the global community of people passionate about birds must now seriously scale up their response to meet this increased challenge. Most high-profile success stories for species to date have been on small islands, where the problems are in some respects more tractable. Improving the status of threatened species with broader ranges on larger land-masses is generally considerably more challenging and expensive. The cost of implementing all the actions described in the Hawaiian Crow five-year recovery plan, which includes broad-scale habitat restoration, has been estimated at over US$14 million (USFWS 2003b). If saving all CR birds came with the same price-tag, the bill would come to US$2·7 billion—a substantial figure, but still less than the sum spent by the USA every four days on the war in Iraq.

Furthermore, recent work has shown that population sizes of several thousands (not hundreds) of individuals are required for a species to have a reasonable probability of riding out environmental fluctuation and stochastic events in the long term (Traill *et al.* 2009). This raises the bar higher than many conservation projects have hitherto aimed, and emphasises further the size of the challenge we face. Moreover, this is all to be set against a background of ever-increasing consumption by expanding human populations. In this context, economies that do not account adequately for the value of biodiversity will continue to promote the destruction of natural habitats and the intensification of land-use, thus deepening the biodiversity crisis. Fundamental changes are needed in the way that we plan and regulate economic development (particularly the agricultural sector), and a much higher level of government resolve and leadership is essential. Experience to date shows that the free market alone is unlikely to deliver what is required, as evidenced, for example, by the limited uptake so far of certification schemes for sustainable forest management.

Inspiring, engaging and empowering people

Ultimately, biodiversity will only be conserved if enough people care about nature and recognise its importance for human livelihoods and wellbeing, as well as its intrinsic value. Changes in attitudes and approaches are needed at local, regional and global scales among individuals, communities, businesses and governments. This is of course as easy to say as it is difficult to achieve. The world is dominated so strongly by conflicting economic, national, religious, tribal and criminal interests, and is defined so powerfully by priorities relating to war, profit, personal advancement, poverty and disease, that the notion of "changes in attitudes" is almost risible. However, as biodiversity loss, climate change, human migration, overpopulation, water shortages, declining soil fertility and other products of human mismanagement of the planet increasingly discomfort voters and governments, such changes towards a more holistic pattern of production and consumption may indeed begin to occur.

At the local scale, action on the ground can be achieved through empowering local people. Across the world, a diverse network of "IBA Local Conservation Groups" has developed in recent years, each sharing a commitment to conserve the biodiversity of a particular site, and carrying out activities including monitoring, local advocacy, education and awareness, and development of livelihoods linked to biodiversity conservation. For example, in the Middle East, the traditional *hima* system is being revived by such groups, under which local communities manage natural areas and protect them from over-exploitation, through combining a mixture of strict protection and sustainable use. In Lurg, Australia, almost 18,000 volunteers have been involved in

tree-planting and habitat restoration for the Regent Honeyeater (*Xanthomyza phrygia*) EN over the last 15 years (Dooley 2009).

At the other end of the scale, the corporate sector has an enormous impact on the global environment, particularly those businesses directly involved in agriculture, forestry or extraction of minerals or fossil fuels. Conservation organisations are increasingly developing strategic partnerships with industry to help businesses minimise their environmental damage, enabling them to secure a "licence to operate" and engage with the concept of sustainable development while also providing collaborative support for much-needed conservation action on the ground.

Across the world, the number of people interested in, inspired by and taking action for birds and their conservation is growing. The BirdLife partnership of more than 100 national non-governmental organisations has expanded from an estimated 1·7 million members in 1994 to well over 2·3 million members worldwide today, providing a powerful voice for the environment in many countries. Many additional individuals belong to local conservation organisations. The largest BirdLife partners are found in wealthier countries where there is a tradition of birdwatching. However, partners are growing fast in many developing countries. For example, Nature Uganda has few members compared to the country's population (c. 22 million people) but the membership is increasing rapidly (Fig. 60). Nature Uganda also engages with many additional people in rural areas around IBAs, and many school and college students.

The rise of the internet has made it much easier for large numbers of people to get involved in conservation, in particular through "citizen science" projects mobilising large numbers of volunteer recorders to monitor species and sites (Greenwood 2007). Projects range from reporting relatively simple lists of bird sightings to long-term sophisticated monitoring. About 400,000 people each year participate in the UK's Big Garden Birdwatch by counting garden birds for one hour on a set weekend in January, providing an annual picture of how different species are faring (RSPB 2008), while 60,000 observers contribute to National Audubon's North American Christmas Bird Count (LeBaron 2009), and almost 10,000 people are involved in *Birds in Backyards* surveys in Australia (J. Sutfin *in litt.* 2010). More generally, the Worldbirds website (www.worldbirds.org) brings together bird data collection and reporting systems from most countries across the world. It enables people to participate in their own language and add lists of the species they have seen at particular sites, and to find out where to see species and the latest sightings at different locations. More sophisticated monitoring systems with specific census methodologies also commonly engage large numbers of volunteers: over 3000 people contribute to the North American Breeding Bird Survey each year (G. Butcher *in litt.* 2009), 5000 observers collected over 7·3 million records for *The Atlas of Southern African Birds* (Harrison *et al.* 1997), over 7000 people have contributed over 7·1 million bird records to the *Atlas of Australian Birds* (J. Sutfin *in litt.* 2010), over 10,000 people are involved in national bird population monitoring schemes in Europe, and 15,000 observers in 110 countries count 30–40 million waterbirds at 10,000 sites every year as part of the international waterbird census (S. Delany *in litt.* 2009).

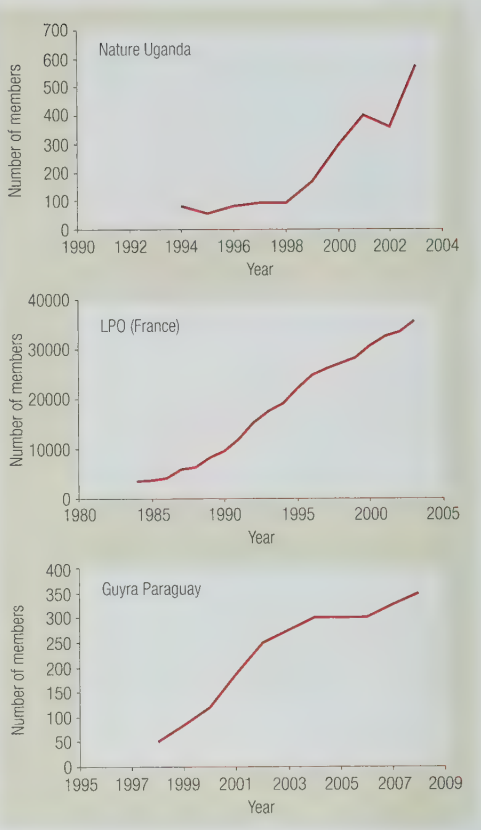


Figure 60
Membership is growing in BirdLife Partners in both the developed and developing world. Graphs show data for NatureUganda (Uganda), Ligue pour la Protection des Oiseaux (France) and Guyra Paraguay (Paraguay).

The view from 2010

Thanks to the contributions of thousands of people and hundreds of organisations—and indeed to the synthesising endeavours of the many authors of HBW itself—we know much more about the state of the world's birds than we did when HBW began almost two decades ago. We also understand better the pressures upon the world's birds, and the actions needed to tackle them. The public and decision-makers have become far more aware of the enormous environmental challenges that society faces, particularly in the light of climate change. There is also a greater understanding of the need to maintain biodiversity to deliver the ecosystem services on which human populations, particularly the world's poor, depend. Despite this, the state of the world's biodiversity is getting worse. Data from birds—the best known class of organisms—show that we have failed to meet the 2010 target of significantly reducing the rate of biodiversity loss, set by the world's leaders a decade ago (Butchart *et al.* 2010). We now need governments to back up their commitments to conserve biodiversity and safeguard the environment with adequate resources and genuine political action. Readers of HBW can play their part, by minimising their own consumption and impacts, demanding environmentally sustainable policies from their governments, promoting the importance and urgency of responses to the biodiversity crisis, raising awareness, and supporting BirdLife partners and other conservation and environmental organisations at home and abroad.

Our lives are enriched by the extraordinary spectacles that birds provide, with their stunning plumages, dazzling courtship displays, beautiful songs, intriguing behaviours, graceful flight and remarkable migrations. If we want to allow future generations the chance to experience these delights and to benefit from the ecosystem services that biodiversity provides, then we need to get serious about making positive and significant changes in the way we live our lives and value the environment in our decisions.

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Note:

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Introduction to Volume 15

The present volume covers only eight families, but includes some of the most-studied of all species, as well as some of the most familiar birds in most parts of the world. As ever, we encourage readers to look back at the Introductions to previous volumes for explanations of some of the guiding principles and norms followed in HBW.

With the series approaching completion, and all but one volume of the world's birds covered in some detail, it seems an appropriate time to start taking an overview of the state of our knowledge about birds. To this end, we are delighted to be able to present a detailed and up-to-date summary of the current state of bird conservation, including an evaluation of how far conservation efforts have progressed in recent years. For this major contribution, we have been extremely fortunate to be able to call upon the expertise of BirdLife International and four of its star players, Stuart Butchart, Nigel Collar, Alison Stattersfield and Leon Bennun, with significant additional contributions from a number of other colleagues. It should come as no surprise to anybody that humans are ultimately responsible for virtually all of the declines detected. Despite the considerable efforts by BirdLife and its many partners over many years now, the overall picture remains fairly grim. That said, there are motives for optimism too, and all the more reason for all of us to push the decision-makers to hear our voices and act responsibly for everyone's future. In Volume 7 we carried a foreword on extinct species. It is up to all of us to ensure that in 20 years' time we are not obliged to ring up Errol Fuller and ask him to write us another foreword to cover a mass of species that have gone extinct in the interim.

Please note that in a few places the taxonomy and nomenclature followed by BirdLife differ slightly from the HBW versions; it was considered counterproductive to alter standard BirdLife usage for this foreword. The differences are very minor, but in cases of any doubt, readers are invited to refer to the index of the volume in question, and thence to the relevant species account.

Of the families included herein, one in particular requires a few special remarks. The family Drepanididae is exceptional in the number of forms that have become extinct in recent centuries, and even more so with so many of the remaining species currently considered globally threatened, with some that may be on the brink of extinction, or sadly perhaps beyond it. In HBW7, Errol Fuller's foreword on Extinct Species dealt with several of the Drepanididae (pp. 56–61). However, this is a family which has undergone frequent, often large-scale taxonomic upheavals, with the result that the HBW7 foreword does not fit well with the taxonomy now followed in the current volume, which should be considered the definitive HBW taxonomy for this family. In order to complete the illustrative coverage of the extinct species in this family, on page 647 we include an extra text-plate of extinct species, painted by H. Douglas Pratt. In conjunction with the plate of HBW7, page 58, all 16 of the recently extinct members of the family are depicted. Please note that the akialoa illustrations in Pratt's 2005 monograph were completed nine years prior to publication, and should not be considered accurate in the light of subsequent work.

In addition to the complications related to changed taxonomy and the several extinctions, there are numerous cases of confusing nomenclature in Drepanididae, which combine to make things all the more difficult to follow and compare. Where such confusing cases affect species herein treated as extant, they are dealt with in the respective species accounts. However, several affect species officially considered Extinct, which as a result have no species accounts in the main HBW text. A selection of the potentially most confusing names are included in the text-plate caption, in order to help identify the taxa labelled with different names. This in no way aims to be a comprehensive list but rather is an attempt to help readers identify taxa referred to in other publications under sometimes very different names. Thus, for example, if a reader

finds in some other publication reference to a taxon called *Hemignathus obscurus lichtensteini*, a glance at the Index and then at the text-plate caption reveals that under HBW taxonomy this form is known as *Akialoa ellisiana*. While it may seem a touch miserly to include only the more confusing cases, there are so many synonyms in this family that a comprehensive list would have taken up too much room for the caption, but more importantly would have swamped the reader with numerous quite unnecessary cases, in our opinion making it more difficult to follow.

Having more than enough potentially confusing cases to deal with already, it was decided not to attempt to cover the numerous much older extinct forms so far described, especially as such cases are all the more open to uncertainty, as exemplified by the bogus taxa "*Oreomyza perkinsi*" (probably of hybrid origin) and "*Sassius simplex*" (an artifact of skins).

Linguistically, the plural of Hawaiian words, including bird names, does not operate by adding an "s", as in some of the world's more widely spoken languages, and usage among Hawaiian ornithologists has adapted to blend in with local norms. However, as HBW is a global handbook—with the whole planet as its "study area"—the editors felt that it might not be appropriate to adopt regional usage in some cases but not others, where such usage might cause confusion to readers unfamiliar with it. We apologize in advance for any possible shortcomings there may be in this respect, and hope that readers will understand our reasoning. Any deficiencies in such usage should be imputed firmly to the editors, and not to the author, who kindly explained the system to us.

Within this same family text, on page 632 there is a reference to the family "Mohoidae". These five extinct species were already covered in the aforementioned foreword (see HBW7: 48–51), but as members of the Meliphagidae, following earlier usage. However, by the time HBW covered Meliphagidae (HBW13), DNA studies had shown this placement to be false. The authors of Meliphagidae for HBW asked that they be removed, because to retain them there, albeit nominally, would have given a very false impression of the whole biogeography of that large family. For the purposes of HBW, these species should therefore now be considered to make up the extinct family Mohoidae.

Turning to the other families, few other explanatory notes are required here. In Parulidae, it was decided not to include Bachman's Warbler (*Vermivora bachmanii*) in the main body of the text with its own species account and so on. When planning the list of species to be covered in the foreword on Extinct Species for HBW7, it was agreed to treat this species as Extinct. Although BirdLife still, today, lists it as Critically Endangered, no new information has emerged in the interim to justify the reversal of our decision made during the planning of HBW7; we can only hope that we are proved wrong! The illustrations and text for this species are to be found in HBW7, page 61.

Regular readers will know that HBW does not map introduced ranges. However, this volume presented the particularly awkward case of the House Finch (*Carpodacus mexicanus*). This species is indigenous to western North America, but was introduced to the east (New York) in about 1940, subsequently spreading rapidly until it joined up with the western populations in the 1990s. As this spread is so recent, there is plenty of literature available to enable the drawing of a map showing only the earlier, "natural", western range. However, because the two are now in contact, and birds of western descent will undoubtedly have passed into the "introduced" eastern range, it seemed inappropriate and perhaps even somewhat false to make such a distinction, so in this case the whole North American continental range is mapped. What really makes this case unusual is the fact that the introduced range is now contiguous (or arguably overlapping) with the natural range, whereas the introduced ranges normally omitted from the maps in HBW are typically distant from their respective original ranges. Sticking by our normal HBW principle, the House Finch's distant Hawaiian range is not mapped.

As regards references to Vieillot *Hist. Nat. Ois. Chant.* **1–6**, the dates and issue numbers used in the current volume (**1/2** – 1805; **3/4** – 1807; **5/6** – 1808) are provisional, until evidence for the single issues are better understood. The dates are the best conclusion to date deriving from datails given in Peters' Check-list (Mayr & Greenway 1962, Paynter 1968), the web source Zoonomen (http://www.zoonomen.net/avtax/n/h.html; download 11 July 2010), J. T. Zimmer's (1926) *Catalogue of the Edward E. Ayer Ornithological Library*, Field Museum of Natural History, Chicago, and C. D. Sherborn's (1922–1932) *Index Animalium* (*1801-1850)*, Trustees of the British Museum (Natural History).

Finally, in response to readers' questions, we should just like to recap on the colours used in the HBW maps. These can be considered to represent: yellow – breeding; blue – non-breeding; green – species present all year round.

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PASSERIFORMES

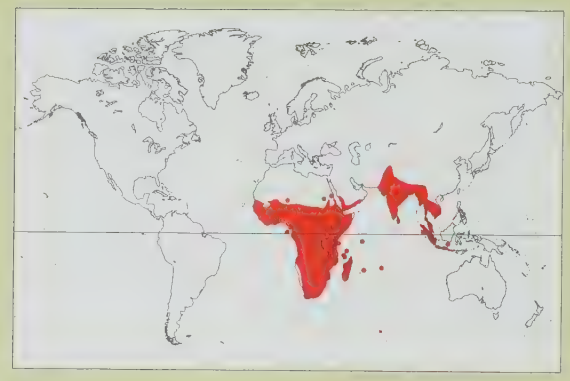
- Eurylaimi
  - Eurylaimidae (Broadbills)
  - Philepittidae (Asities)
  - Pittidae (Pittas)
- Furnarii
  - Furnariidae (Ovenbirds)
  - Dendrocolaptidae (Woodcreepers)
  - Thamnophilidae (Typical Antbirds)
  - Formicariidae (Ground-antbirds)
  - Conopophagidae (Gnateaters)
  - Rhinocryptidae (Tapaculos)
- Tyranni
  - Cotingidae (Cotingas)
  - Pipridae (Manakins)
  - Tyrannidae (Tyrant-flycatchers)
- Acanthisittae
  - Acanthisittidae (New Zealand Wrens)
- Menurae
  - Atrichornithidae (Scrub-birds)
  - Menuridae (Lyrebirds)
- Oscines
  - Alaudidae (Larks)
  - Hirundinidae (Swallows)
  - Motacillidae (Pipits and Wagtails)
  - Campephagidae (Cuckoo-shrikes)
  - Pycnonotidae (Bulbuls)
  - Chloropseidae (Leafbirds)
  - Irenidae (Fairy-bluebirds)
  - Aegithinidae (Ioras)
  - Ptilogonatidae (Silky-flycatchers)
  - Bombycillidae (Waxwings)
  - Hypocoliidae (Hypocolius)
  - Dulidae (Palmchat)
  - Cinclidae (Dippers)
  - Troglodytidae (Wrens)
  - Mimidae (Mockingbirds and Thrashers)
  - Prunellidae (Accentors)
  - Turdidae (Thrushes)
  - Muscicapidae (Old World Flycatchers)
  - Platysteiridae (Batises and Wattle-eyes)
  - Rhipiduridae (Fantails)
  - Monarchidae (Monarch-flycatchers)
  - Regulidae (Kinglets and Firecrests)
  - Polioptilidae (Gnatcatchers)
  - Cisticolidae (Cisticolas and allies)
  - Sylviidae (Old World Warblers)
  - Picathartidae (Picathartes)
  - Timaliidae (Babblers)
  - Paradoxornithidae (Parrotbills)
  - Pomatostomidae (Australasian Babblers)
  - Orthonychidae (Logrunners)
  - Eupetidae (Jewel-babblers and allies)
  - ...
  - ...
  - Pachycephalidae (Whistlers)
  - Petroicidae (Australasian Robins)
  - Maluridae (Fairy-wrens)
  - Dasyornithidae (Bristlebirds)
  - Acanthizidae (Thornbills)
  - Epthianuridae (Australian Chats)
  - Neosittidae (Sittellas)
  - Climacteridae (Australasian Treecreepers)
  - Paridae (Tits and Chickadees)
  - Remizidae (Penduline-tits)
  - Aegithalidae (Long-tailed Tits)
  - Sittidae (Nuthatches)
  - Tichodromidae (Wallcreeper)
  - Certhiidae (Treecreepers)
  - Rhabdornithidae (Rhabdornis)
  - Nectariniidae (Sunbirds)
  - Melanocharitidae (Berrypeckers and Longbills)
  - Paramythiidae (Painted Berrypeckers)
  - Dicaeidae (Flowerpeckers)
  - Pardalotidae (Pardalotes)
  - Zosteropidae (White-eyes)
  - Promeropidae (Sugarbirds)
  - Meliphagidae (Honeyeaters)
  - Oriolidae (Orioles)
  - Laniidae (Shrikes)
  - Malaconotidae (Bush-shrikes)
  - Prionopidae (Helmet-shrikes)
  - Vangidae (Vangas)
  - Dicruridae (Drongos)
  - Callaeidae (New Zealand Wattlebirds)
  - Notiomystidae (Stitchbird)
  - Grallinidae (Mudlarks)
  - Struthideidae (Australian Mudnesters)
  - Artamidae (Woodswallows)
  - Cracticidae (Butcherbirds)
  - Pityriaseidae (Bristlehead)
  - Ptilonorhynchidae (Bowerbirds)
  - Paradisaeidae (Birds-of-paradise)
  - Corvidae (Crows)
  - Buphagidae (Oxpeckers)
  - Sturnidae (Starlings)
  - Passeridae (Old World Sparrows)
  - Ploceidae (Weavers)
  - Viduidae (Whydahs and Indigobirds)
  - Estrildidae (Waxbills)
  - Vireonidae (Vireos)
  - Fringillidae (Finches)
  - Drepanididae (Hawaiian Honeycreepers)
  - Peucedramidae (Olive Warbler)
  - Parulidae (New World Warblers)
  - Thraupidae (Tanagers)
  - Cardinalidae (Cardinals)
  - Emberizidae (Buntings and New World Sparrows)
  - Icteridae (New World Blackbirds)

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PLOCEIDAE (WEAVERS)



- Small to medium-sized passerines with slender to heavy bill; plumage often yellow with black, or red and black, and frequently sexually dimorphic; many species with distinctive breeding plumage, some males with long ornamental tail feathers.
- 10–50 cm.

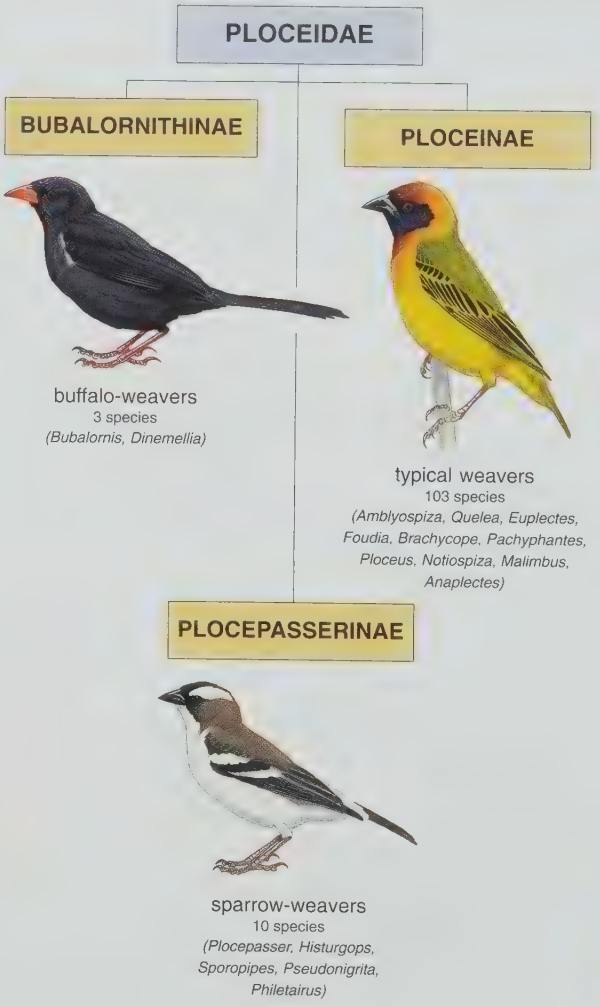


- Africa, tropical Asia and Indian Ocean islands.
- Forest, grassland, macchia, marshes and reedbeds, scrubland, orchards and gardens.
- 17 genera, 116 species, 207 taxa.
- 13 species threatened; none extinct since 1600.

Systematics

The weavers have for long been recognized as a group of Old World seed-eaters found chiefly in the Afrotropics, but ideas concerning their closest relatives, and which seed-eating species should be incorporated within a single family, have changed considerably over the years. The family name Ploceidae was proposed by C. J. Sundevall in 1836. A few years later, however, G. R. Gray, in his compilation of bird genera, included this group as a subfamily, Ploceinae, of the finch family (Fringillidae), which incorporated both Old World and New World seed-eaters. Gray's Ploceinae included the genera *Textor* (= *Bubalornis*), *Ploceus*, *Pyromelana* (= *Euplectes*), *Sycobius* (= *Malimbus* in this arrangement) and *Philetairus*. The long-tailed *Euplectes*, corresponding to Gray's genus *Coliuspasser*, were grouped by him with some of the waxbills (Estrildidae) and Palearctic finches, while *Plocepasser* was placed with the buntings in the subfamily Emberizinae. Subsequently, the primary subdivision recognized was between the nine-primaried seed-eaters in the families Fringillidae and Emberizidae, and the ten-primaried ones in the Ploceidae and Estrildidae. In 1890, in the catalogue of the birds of the British Museum, R. B. Sharpe placed the family Ploceidae in his section Sturniformes, along with the starlings (Sturnidae), the woodswallows (Artamidae) and the larks (Alaudidae). Sharpe, like G. E. Shelley a few years before him, defined two subfamilies on the basis of the relative size of the outermost primary feather; in this arrangement, the subfamily Viduinae incorporated not only the whydahs and indigobirds, but also the estrildids and the current ploceid genera *Philetairus*, *Pseudonigrita*, *Plocepasser*, *Quelea* and *Euplectes*, while the Ploceinae contained the ploceid genera *Bubalornis*, *Dinemellia*, *Sporopipes*, *Histurgops*, *Amblyospiza*, *Ploceus*, *Malimbus* and *Foudia*, along with the estrildid genus *Spermophaga*. Later, A. Reichenow maintained this system, but added the newly described genera *Anomalospiza* and *Brachycope* to the Ploceinae, the former currently placed in the Viduidae.

J. P. Chapin, in 1917, provided the first critical review of the classification of the weavers. He noted that they were conventionally separated from the family Fringillidae, containing the Northern Hemisphere finches, on the basis of the size of the tenth, outermost primary. This is vestigial in all fringillids, and has moved to the dorsal surface of the wing, whereas that of ploceids, although often much reduced, is present in the normal position as the outermost flight-feather. The relative development of the tenth primary was also used as a criterion for subdividing the weavers into two or three groups, yet its relative size varies widely within some of the genera; for instance, the tenth primary of the Southern



Subdivision of the Ploceidae

[Figure: Tim Worfolk]



Buffalo-weavers are the largest of the ploceids, weighing up to 85–90 g. Before the ***White-billed Buffalo-weaver*** *was split from the Red-billed Buffalo-weaver* (Bubalornis niger), *the subfamily Bubalornithinae was considered to consist of two monospecific genera. Where the two* Bubalornis *species are uniformly dark, the White-headed Buffalo-weaver* (Dinemellia dinemelli) *is distinctively patterned, with a white head and body and dark brown wings and back. The males of* Bubalornis *possess a remarkable penis-like phalloid organ.*

[*Bubalornis albirostris*, Lake Baringo, Kenya. Photo: Martin B. Withers/ FLPA]

Red Bishop (*Euplectes orix*) is less than 10% of the length of the ninth primary, whereas that of the Black Bishop (*Euplectes gierowii*) is more than 40% of the length of the ninth. Chapin wrote "I am sure we can find a much better basis of classification, founded upon a combination of characters, instead of a single one". He used the mouth markings of the nestlings to separate weavers and waxbills, which constituted the two subfamilies of his family Ploceidae, and he proposed a separate family for the buffalo-weavers (Bubalornithinae) on the basis of their distinctive skull characters. Chapin then compared his arrangement with the earlier proposals of Shelley, in 1886, and Reichenow, in 1914.

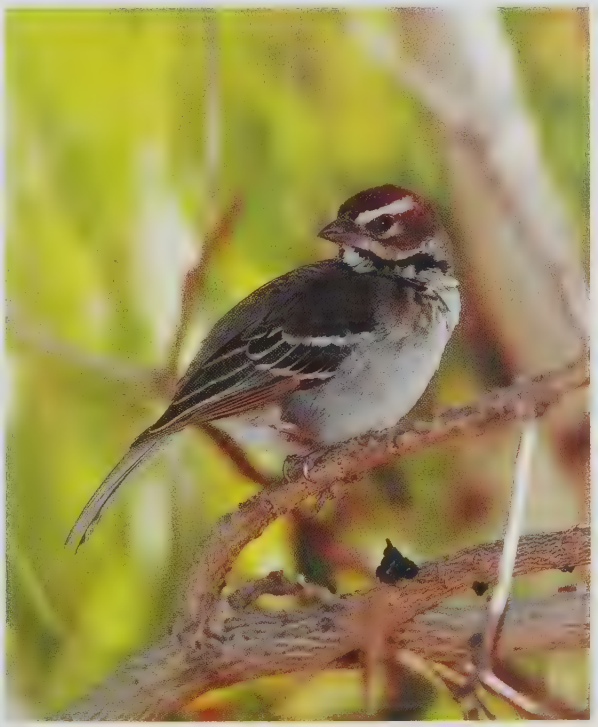
A detailed examination of skeletal specimens led P. Sushkin to support most of Chapin's conclusions. Sushkin did, however, include the sparrows (Passeridae) in his study, and found many similarities to the weavers, while he also felt that the buffalo-weavers showed clear links to other members of the family. His tentative proposal was to treat the Ploceidae as six subfamilies: these were Bubalornithinae, containing the buffalo-weavers; Plocepasserinae, the sparrow-weavers; Passerinae, the sparrows; Sporopipinae, the scaly-feathered finches; Ploceinae, the "true weavers"; and Estrildinae, the waxbills. This system was followed by W. L. Sclater in his 1930 checklist of the birds of the Afrotropical Region, then known as the Ethiopian Region, and by Chapin in his final volume on the birds of the Belgian Congo (DRCongo). It appears that nobody has re-examined skeletal material, even though Sushkin had emphasized that he had not seen sufficient material of some genera, and that he regarded his conclusions as provisional.

Successive arrangements of subfamilies were accompanied by regular reassignments of the species to particular genera. Shelley and Reichenow did not include *Phiretairus*, *Quelea* and *Euplectes* in the Ploceinae, placing these genera instead with the waxbills in a subfamily Estrildinae. In a monograph with beautifully coloured plates, J. Delacour and F. Edmond-Blanc reviewed the bishops and widowbirds, then usually divided into two genera, the short-tailed *Euplectes* and the long-tailed *Coliuspasser*, respectively. They argued that the similarities between these two groups were much greater than the differences, and proposed an inclusive genus *Euplectes*, which has been adopted by most subsequent authors. Later, R. E. Moreau, who had extensive field experience of some of the African species, reviewed past generic arrangements within the whole family, in particular the species in the genus *Ploceus*. He noted that it was difficult to find any characters to justify a separation of *Malimbus* from *Ploceus*, and that, since *Malimbus* was the older generic name, the uniting of these two groups could require replacement of the family name also. Moreau did not propose "lumping" *Ploceus* with *Malimbus*, but he generally favoured large inclusive genera, and his list has formed the basis for most subsequent systematic treatments of the Ploceinae. Moreau was also responsible for the African section of the family Ploceidae in J. L. Peters's *Check-list of Birds of the World*, for many years the standard reference for all avian systematists.

Early field observations of the displays of some *Euplectes* species led J. T. Emlen to suggest that comparative behaviour would be informative of their relationships. Two major studies in the 1960s provided a range of new information. N. E. Collias and E. C. Collias, who studied the Village Weaver (*Ploceus cucullatus*) for more than 50 years, produced a review of the nest structure and nest-building behaviour of the family which was based on their field observations in Africa, as well as on studies of museum collections. At the same time, J. H. Crook was carrying out

The four species in the genus Plocepasser, *including the* ***Chestnut-crowned Sparrow-weaver****, are the most sparrow-like of the ploceids. Indeed, they have sometimes been placed in the sparrow family, Passeridae, but differ most notably in the morphology and musculature of the tongue. In this genus, as in all genera making up the sparrow-weaver subfamily, Plocepasserinae, the sexes are alike in plumage.*

[*Plocepasser superciliosus*, Jemma Valley, Ethiopia. Photo: Jürgen Schneider]





*The legs of more terrestrial ploceids, like the **Rufous-tailed Weaver**, are proportionately longer than those of mostly arboreal species. The monotypic genus* Histurgops *is part of the sparrow-weaver subfamily, Plocepasserinae. Like the buffalo-weavers (Bubalornithinae), all the birds in this subfamily are found in savanna, thornveld and dry woodland, occupying the most arid habitats of any ploceid. Many of them use their nests throughout the year, to escape from extremes of temperature.*

[*Histurgops ruficauda*, Tarangire National Park, Tanzania.
Photo: Ketil Knudsen]

field studies of the courtship behaviour of many representatives of the family, in the tradition of comparative behavioural studies in relation to the ecology and evolution of animal species. Crook's outstanding monograph on the behaviour, ecology and mating systems of the weavers has formed the basis for all subsequent research on these birds. Also at this time, J. Nicolai used both field and aviary data to describe the brood parasitism of the whydahs and indigobirds, and proposed that they might have been derived from ploceid ancestors, specifically the *Euplectes* lineage. He cited, in particular, vocal similarities in support of this phylogenetic relationship. While similarities in some types of vocalization may be informative in this context, resemblances in both calls and song can also be a consequence of learning.

In their atlas of speciation in African passerines, B. P. Hall and Moreau also discussed the generic classification of some weavers with unclear affinities. They based their conclusions on museum skins and geographical distribution, and their primary data source was the British Museum bird collection. Many parts



*The feathers which provide the **Speckle-fronted Weaver** with its distinctive head pattern are black with white tips, creating the speckled effect which gives the species its name. Its congener, the Scaly-feathered Finch* (Sporopipes squamifrons), *similarly gets its name from its forehead and crown feathers, which are black with white margins. At just 11 cm and 10–22 g, these species are amongst the smallest of the ploceids.*

[*Sporopipes frontalis emini*, Samburu National Park, Kenya.
Photo: Arthur Morris/ VIREO]



*The **Grey-headed Social-weaver** and the Black-capped Social Weaver* (Pseudonigrita cabanisi) *are restricted to eastern Africa. Their ranges overlap to some degree, and in places birds of both species may nest in the same tree. It has been pointed out that the grey crown and black bill of the Grey-headed are more or less the inverse of the black crown and white bill of the Black-capped. This may represent character divergence that helps the birds recognize their own species in the confusion of a mixed colony.*

[*Pseudonigrita arnaudi dorsalis*, Serengeti National Park, Tanzania. Photo: Pete Morris]

of Central Africa, however, are not well represented in this collection. The novel aspect of this work was the grouping of species within genera as members of a superspecies or a species group on the grounds of morphological similarities and complementary distribution patterns.

Anatomical studies examined the structure of the horny palate and the digestive tract in seed-eating birds, and these concluded, on the basis of overall similarity in characters, that the Ploceidae were distinct from the estrildids and the fringillids. Tongue morphology and musculature supported the separation of the sparrow-weavers from the true sparrows, whereas the musculature of the wings and hind limbs suggested that the sparrows could be incorporated into the Ploceidae. Pterylosis, the pattern of feather distribution on a bird's body, proved most informative at the family and subfamily level, clearly separating the Ploceidae from the viduids and estrildids.

The search for new informative characters followed developments in biochemistry and molecular biology. A survey of egg-white proteins as a potential source of taxonomic information revealed broad similarities within large groups of birds, and was clearly not an appropriate technique for resolving any major controversies in avian systematics. The chemical composition of preen-gland oils has been investigated in the Ploceidae, among other bird groups. It appears that differences are informative at the family and generic level, although there are some convergent similarities between groups which may be only distantly related. The available data do, however, separate the Ploceidae and both the Estrildidae and the Viduidae from the Passeridae, the Fringillidae and the Emberizidae, the last containing the buntings and the New World sparrows.

On the basis of their studies of DNA–DNA hybridization, C. G. Sibley and J. E. Ahlquist produced a major re-arrangement of the traditional subdivisions of the weavers and their relatives. In their hierarchy, the family name became the Passeridae, which included five subfamilies: Passerinae (sparrows), Motacillinae (wagtails and pipits), Prunellinae (accentors), Ploceinae (weavers, buffalo-weavers and sparrow-weavers), and Estrildinae (waxbills and viduids). Several recent studies, using both molecular and mitochondrial DNA, do include all of the aforementioned groups within a single clade, while the weavers and waxbills appear to be more closely related to each other than they are to any of the other divisions of the proposed superfamily Passeroidea. Until further molecular-genetic studies have been undertaken, however, it is considered better to follow the more traditional view that these subdivisions should be accorded family rank, and to regard the Ploceidae as a family separate from the Estrildidae. Within this family Ploceidae, it is useful to retain the three subfamilies Bubalornithinae, Plocepasserinae and Ploceinae as a basis for discussion. In addition, for the Afrotropical species, which account for some 90% of the ploceid species, it is deemed most sensible to follow the nomenclature used in *The Birds of Africa*, published in 2004. As Sibley and Ahlquist sampled a selected subset of the

The genus Quelea *belongs to the subfamily Ploceinae, the typical weavers.* Quelea *species are sexually dimorphic; this **Red-headed Quelea** is a male in breeding plumage. Non-breeding males lack the red head, and resemble the females. A study of the Red-billed Quelea* (Q. quelea) *suggests that the very variable plumage ornamentation of breeding males is not, as in many species, an indicator of the "quality" of the individual bird, but a way of enabling neighbouring territorial males to identify one another in tightly packed breeding colonies.*

[*Quelea erythrops*, KwaZulu-Natal, South Africa. Photo: Hugh Chittenden]









The genus Euplectes *contains both the short-tailed bishops, and the long-tailed widowbirds. Even by bishop standards, the tail of the* ***Northern Red Bishop*** *is extremely short, being all but hidden by the uppertail- and undertail-coverts.* Euplectes *species are strongly sexually dimorphic in plumage during the breeding season, when the males have black body plumage with patches of bright red, yellow, or white. The red plumage parts of the Northern Red Bishop can sometimes be more orange, which has led to the alternative common name of the Orange Bishop. In captivity, the intensity of the red coloration can be altered by modifications to the diet, because the carotenoid pigments which produce the red and yellow plumage tones are derived from compounds taken in with food. At the end of breeding, males moult into an eclipse plumage similar to that of the female (below left), though they may still be distinguishable by their slightly larger size. There is some evidence that males, free from parental duties, begin their moults earlier than females. The male does not moult into its breeding plumage until its second year (below right).*

[*Euplectes franciscanus.*

Above: Pirang, Gambia. Photo: Steve Garvie.

Below left: Kotu, Gambia. Photo: Steve Garvie.

Below right: Bilen Lodge, Awash Saba, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

Ploceidae, the data which they derived from their analyses are not suitable for assessing the limits of the genera recognized.

Ploceus is currently one of the largest bird genera, containing more than 60 species in most checklists. In the past it was divided into several separate genera, and subgeneric groupings have been suggested by most reviewers. H. E. Wolters is the only recent author who has suggested a major subdivision into different genera. Although he espoused a cladistic approach, using shared derived characters as the informative elements, it is not clear from his publications which characters were used to separate genera. A cladistic analysis of this genus and other members of the weaver family by A. J. F. K. Craig and N. Barker, using 60 morphological and behavioural characters, supports the view that the genus *Ploceus* as currently constituted is not monophyletic, but the provisional results of this analysis are not robust, and must await new data before new generic divisions can be suggested with confidence. Critical data, particularly skeletal specimens, are lacking for many of the species. Nevertheless, the broad patterns do indicate interesting areas for detailed investigation: *Malimbus* appears not to be separable from *Ploceus* (*sensu lato*); the Madagascan and Asian members of *Ploceus* fall in different clades; *Amblyospiza* has no close relatives within the family; the sparrow-weavers and buffalo-weavers form distinctive, basal clades; and the genera *Euplectes*, *Quelea* and *Foudia* constitute a clear subdivision within the family. R. B. Payne and his coworkers, in a wide-ranging study of the possible relatives of the brood-parasitic viduines, have examined DNA from a number of members of the subfamily Ploceinae; they found *Amblyospiza* to be highly distinctive, and within the genus *Euplectes* the yellow-and-black Yellow-crowned Bishop (*Euplectes afer*) proved to be basal to the group. A recent molecular phylogeny of the *Euplectes* species presented by M. Prager and her associates used *Amblyospiza* as an outgroup. This study supported a close relationship between the three genera *Euplectes*, *Quelea* and *Foudia*, with the latter two as sister-taxa. These authors also found a separation between the two groups traditionally recognized as separate genera, namely the long-tailed widowbirds and the short-tailed bishops, with the Yellow-crowned Bishop and Golden-backed Bishop (*Euplectes aureus*) as early offshoots without close relatives. The Red-collared Widowbird (*Euplectes ardens*), however, appears as a long-tailed bishop, while the Yellow Bishop (*Euplectes capensis*) is a short-tailed widowbird. There is additional support for the position of the Red-collared



Male Euplectes *widowbirds acquire long tail feathers during the breeding season. In some widowbirds, research has suggested that tail length contributes to success in attracting females. However, a study of the* ***Yellow-mantled Widowbird*** *suggests that tail length is more significant in competition between males: birds with experimentally shortened tails were less likely to acquire or retain territories. Although most males of the nominate race have a yellow mantle, in west Kenya and Uganda the mantle is often black, and intermediate forms occur.*

[*Euplectes macroura macroura*. Photo: D. Avon/ardea.com]

Widowbird based on earlier studies of the carotenoid pigments; none of the "superspecies" proposed on morphological grounds is supported by this molecular study, nor are many of the affinities between isolated geographical populations. Clearly, many new questions are raised by these findings, and it can be expected that further studies of the family as a whole will undoubtedly lead to rearrangements at the generic level.

There are two mysterious *Ploceus* species from the Ituri region, on the north-eastern edge of the Congo Basin. Chapin described the Yellow-legged Weaver (*Ploceus flavipes*) from a specimen shot in the forest canopy by one of his hunters; he did



The genus Foudia *includes six species, all native to the islands of the western Indian Ocean. Evidence suggests the genus originated in Africa and spread via the Seychelles. The* ***Red-headed Fody*** *has four races in the Comoro Islands, and a fifth, which may be a separate species, in Aldabra. The bird seen here is a breeding male of the race* algondae*, from Mayotte. This race is smaller than the nominate, with orange rather than scarlet on the head and rump.*

[*Foudia eminentissima algondae*, Mayotte, Comoro Islands. Photo: Pete Morris]



*The **Compact Weaver** is the sole member of the genus* Pachyphantes. *Some authors prefer to place it in* Ploceus, *but it has a peculiar nest construction shared only with the equally enigmatic Thick-billed Weaver* (Amblyospiza albifrons), *and it has been suggested that the two should be considered congeneric. The female Compact Weaver has a bright breeding plumage differing from that of the male (shown here) only in crown coloration. As a result, museum specimens are often incorrectly sexed.*

[*Pachyphantes superciliosus*, Bwindi-Impenetrable Forest National Park, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

not see the bird alive. Nine specimens of this species are known to exist in museums, all collected in the years 1910–1959; there have been two claimed sightings in the Okapi Faunal Reserve, one in 1990 and the other in 1994. The Yellow-legged Weaver is an all-black weaver, but with dull yellow legs, apparently a unique character within the Ploceidae. N. Gyldenstolpe proposed a monotypic genus *Rhinoploceus* for this species on the strength of the unusual nasal tubercle, but, compared with that of a range of other ploceids, the nasal structure is not highly distinctive. Most subsequent authors have placed this weaver in either *Ploceus* or *Malimbus*, the two genera which include black-plumaged species, although, in the case of *Malimbus*, other colours are always present in one of the sexes. On the basis of plumage characters and measurements, along with the sparse occurrence of single specimens at long spatial intervals, this taxon could be a hybrid between two all-black ploceids, Vieillot's Black Weaver (*Ploceus nigerrimus*) and Maxwell's Black Weaver (*Ploceus albinucha*). In the Ituri, the former is common and widespread, whereas Maxwell's Black Weaver is uncommon, and close to the eastern limit of its distributional range. While new field data are unlikely at this stage, the proposal that the Yellow-legged Weaver is a hybrid could be tested on the existing museum material.

Also from the Ituri region, the Golden-naped Weaver (*Ploceus aureonucha*) was described by M. Sassi from specimens collected by R. Grauer. Currently, no more than six specimens are known, three collected in 1910, two in 1921 and one in 1926. Chapin collected two specimens from a flock, which apparently consisted entirely of subadults. A sighting in 1986 was reported as being of "a flock of up to 60 birds", although, as these were dimly seen in the forest canopy, this should perhaps be rephrased to refer to "a flock of about 60 birds, some of which were tentatively identified as Golden-naped Weavers". There was another report, in 1993, of a pair feeding two fledged young, and then a sighting of two birds in western Uganda in 2006. Again, it is plausible that this taxon could represent a hybrid, the most likely combination, based on plumage characteristics and measurements, being Vieillot's Black Weaver and the Yellow-mantled Weaver (*Ploceus tricolor*). Yet the clustering of specimen records, and the potential sightings of several similar birds together, would seem to count against this explanation. It is perhaps more probable that the Golden-naped Weaver represents subadult plumage stages of the Yellow-mantled Weaver: the six specimens show some individual variation, but the iris colour is given as "brown", whereas adults of the putative parent species have a yellow or red iris; also, the tail is notably short, and the wing averages shorter than that of the Yellow-mantled Weaver, whereas tarsus and bill measurements are comparable. This is typical of the body proportions of juvenile or subadult individuals. Once again, the material to test this suggestion is already at hand, in museum collections in Vienna and New York.

Natural hybrids have been reported for some *Ploceus* species in Africa which commonly associate in mixed colonies. The



An informal subgroup within Ploceus *is the complex of masked weavers. The relationships of many of these taxa are not too clear, and different authors have lumped several forms together using a "broad" species concept, while others have attempted to reflect suspected relationships through superspecies, and some forms herein considered races have elsewhere been proposed to merit species rank. All in all, there remains much scope for taxonomic study. The **Northern Masked Weaver** is perhaps one of the forms with a more stable taxonomy, as it is not normally proposed for lumping, splitting or inclusion in a superspecies.*

[*Ploceus taeniopterus*, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

most frequent of these appear to be hybrids between Vieillot's Black Weaver and the Village Weaver, a cross which is represented in several museum collections. There is also a hybrid Northern Masked Weaver (*Ploceus taeniopterus*) × Black-headed Weaver (*Ploceus melanocephalus*), collected by Chapin. The individual from Uganda described by J. Ash in 1986 as a new species, *Ploceus victoriae*, is almost certainly a hybrid between the Black-headed Weaver and the Northern Brown-throated Weaver (*Ploceus castanops*).

The importance of hybridization under natural conditions in the wild has been much debated. The "biological species concept" originally implied that, if the regular occurrence of natural hybrids between animal taxa described as separate species was evident, the taxa concerned should be treated as conspecific, but it is now widely recognized that, in certain regions, areas of such interbreeding between well-defined species are a normal phenomenon, and these "hybrid zones" may remain stable over many years. In the case of colonial, polygynous weavers, the males appear willing to court any weavers in non-breeding plumage which remain within their territory, and the role of the female in mate selection and species discrimination is presumed to be critical. Where conspecific males are rare, as at the margins of the distributional range, vagrant females may be expected to select the "next best" option, rather than to remain unmated.

There are several compilations of bird hybrids, drawn mainly from the avicultural literature, which include a number of ploceids. Unfortunately, it is in many cases difficult to be sure that the female partners were correctly identified, and the changes in nomenclature over the years present additional uncertainty. Hybrid weavers are most easily identified when they are of the male gender, as they then exhibit clear intermediate plumages; female hybrids have probably often been overlooked. Current genetic techniques should enable much better characterization of the occurrence of hybrids in natural populations, and can be applied also to many of the museum specimens which have been tentatively identified as hybrids in the past.



Several male Ploceus *weavers show orange on the head, sometimes extending onto the throat. But the* ***Orange Weaver*** *is the most lavishly orange, this colour covering its entire underside right down to the undertail-coverts, and its rump too. The nominate race is found in mangroves and estuaries around the coast of West Africa, and along major rivers; it also occurs on offshore islands. The race* rex, *which has a larger black area in front of its eye, appears to be entirely landlocked. It occurs in papyrus swamps in East Africa, around the basin of Lake Victoria.*

[*Ploceus aurantius rex*, Entebbe, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

Morphological Aspects

Weavers range from a body mass of about 10 g, as in the Slender-billed Weaver (*Ploceus pelzelni*) and some *Euplectes* species, to as much as 85 g, the top weight recorded for the White-headed Buffalo-weaver (*Dinemellia dinemelli*). None is truly tiny, nor are any near the upper end of the size range for passerines. The sexes often differ considerably in size, with the males larger than the females, and in some cases a single measurement, such as wing length, can be used to determine the sex of most individuals in a particular population. All members of the family have ten primaries, with the outermost reduced to 10–40% of the length of the adjacent, ninth primary; six secondary remiges; three



The chestnut cap of the ***Brown-capped Weaver*** *is confined to the adult male, the female having an all-black head, and the juvenile male a black head with reddish-brown tips on the crown feathers. Although the eastern and western populations are separated by the entire width of the Congo Basin, museum specimens from the two sides of the divide do not appear to show any significant differences, and the species is treated as monotypic. The disjunct range is probably the result of a warming climate combined with human activity, isolating the species in remaining areas of montane forest and bamboo.*

[*Ploceus insignis*, Karen, Nairobi, Kenya. Photo: Dave Richards]



*The nominate race of the **Black-billed Weaver** has a narrow yellow breastband, which is missing in the race* stephanophorus. *The Black-billed Weaver is often grouped in a superspecies with the Black-necked* (Ploceus nigricollis) *and Spectacled Weavers* (P. ocularis), *both of which have yellow undersides. All three species have black bills, and all share the black "spectacles" which extend back from the lores to end in a point at or near the ear-coverts. In the Black-billed, the adults of both sexes have a red or red-brown iris, whereas the iris of the Spectacled is creamy yellow, and that of the Black-necked appears to be somewhat variable.*

[*Ploceus melanogaster stephanophorus*, Bwindi-Impenetrable Forest National Park, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

tertials; and a tail of twelve rectrices. Most species undergo a complete post-juvenile moult, so that, within the first year, the young resemble the adults. Among some late-moulting individuals, however, the flight-feathers may not be replaced in their entirety, and there is still a lack of adequate information on the moult sequence for a number of species. Many adult weavers have a red, yellow or creamy-white iris; the juveniles of all such species initially have a dark eye, which usually changes colour by the end of the first year. In some instances, this colour change in the iris occurs in males only, as in the Cape Weaver (*Ploceus capensis*). Some species which are sexually dimorphic in plumage nevertheless show the same distinctive adult eye colour in both sexes, as illustrated by the Spectacled Weaver (*Ploceus ocularis*).

Leg proportions differ between the more arboreal species and the more terrestrial ones, longer legs also characterizing the swamp-dwellers, but there are no real "ground birds" in this family. Simple leg length, however, is less informative than are details of the relative length of individual toes and claws. Ploceid bills vary from being straight and dagger-shaped, either slender throughout or much deeper at the base, to being more cone-shaped, the latter bill being typical of a seed-eater. Here, too, bill length alone is insufficient to characterize the likely diet and habitat of a species. B. Leisler and his colleagues used measurements of 17 different morphological features to demonstrate how 70 different ploceids were grouped according to diet and habitat. They found better discrimination of groups in respect of habitat, with birds of the forest interior separated from the others, whereas broad overlap was evident between birds of wooded savanna and those inhabiting tall grasses and waterside vegetation, and partial separation of the birds typical of short-grass savanna. They also noted a constant trend for increasing tail length to be accompanied by the development of more rounded wingtips. Geographical variation in morphology in the genus *Euplectes* appears not to follow common patterns across different species; particularly large-billed forms are not found in the same regions, but there is some indication that populations of several species on the Ethiopian Plateau are longer-winged than are those in other areas. There is still a great deal of scope for comparative morphological studies of this family.

Variations in head and bill proportions may provide the best guide for separating similar weaver species in the hand, but, for the present, this remains an art with few experienced practitioners. In many parts of Africa, five or more species can occur together at the same site, with several congeneric species present, and considerable sex- and age-related variation in size and plumage. It is no exaggeration to state that every major museum collection is likely to contain misidentified representatives of the genera *Ploceus* and *Euplectes*.

Bare, unfeathered areas, which are common in some bird families, such as the starlings, are most unusual in the weavers. Both



*The seasonal change in plumage in the male **Chestnut Weaver** is accompanied by a change in bill colour, from brown to black. This change is controlled by an androgen (male sex hormone), and the bill of the female remains brown throughout the year. Weavers of arid habitats, like the Chestnut Weaver, have a significantly longer moult than those of more humid regions, and they grow their primaries one at a time. Adult male Chestnut Weavers also start their primary moult significantly earlier than females, and take longer to complete it, taking some 206 days as compared with 189.*

[*Ploceus rubiginosus rubiginosus*, Karen, Nairobi, Kenya. Photo: Dave Richards]



The five weavers found in Asia all belong to the genus Ploceus. *All are restricted to grasslands of various kinds. The* ***Black-breasted Weaver*** *is generally found in grasslands subject to periodic flooding, such as the floodplains of the Ganges and Indus. Non-breeding adult males lack the yellow on the crown, and the black breastband may be reduced to a patch at either side, although this is very variable. The male is often described as having a white chin and throat; the cheeks and ear-coverts may also be white. It is not clear whether this is a regional difference, or age-related.*

[*Ploceus benghalensis*, Gujarat, India. Photo: Arpit Deomurari]

the White-headed Buffalo-weaver and, in Asia, the Baya Weaver (*Ploceus philippinus*) have an area of bare, dark skin around the eye, and the Sakalava Weaver (*Ploceus sakalava*) of Madagascar has an area of pinkish skin around the eye. In none of these three species is there any indication of a seasonal change in either the extent or the coloration of this bare patch. All female weavers do, however, develop a typical brood patch, losing much of their ventral feathering to produce an area of highly vascularized skin during the incubation period. This is a very useful feature for confirming the sex and breeding status of an individual in the hand, as brood patches have not been found on male ploceids, even of those species in which the sexes share the incubation duties.

Most male weavers are brightly coloured, with yellow or red plumage often combined with black. Marked sexual dimorphism in coloration is frequent, with the females much duller than the males, and in the case of, particularly, the polygynous savanna-dwellers there is a seasonal plumage change, the males in the non-breeding season moulting out of their breeding, or nuptial, plumage and adopting an eclipse plumage which resembles that of the females. Females may also be more intensely coloured in the breeding season, and in one species, the Compact Weaver (*Pachyphantes superciliosus*), both sexes have a very distinctive nuptial plumage. The bill colour may also change seasonally, the switch from brown to black being under the influence of androgens such as testosterone in males, as illustrated by the Southern Red Bishop, the bill colour of which provides a direct index of testis development. Castrated males of this species still undergo the normal seasonal plumage changes, but the bill remains horn-coloured at all times. On the other hand, males of species with a blue bill, once they have reached adulthood, retain this coloration throughout the year, as demonstrated by the Fan-tailed Widowbird (*Euplectes axillaris*). In contrast, control of the bill-colour changes in the Red-billed Quelea (*Quelea quelea*) is dependent on oestrogen; red is the normal bill colour for this species, but breeding females have a yellow bill.

The pigments involved in ploceid plumage appear to be melanins, which produce black and brown tones, and carotenoids, giving yellow and red. Carotenoids are derived from chemical compounds taken in with the food, and consequently captive individuals are often paler than normal, but the intensity of the coloration can be modified by appropriate additions to the diet. In the avicultural literature, the Northern Red Bishop (*Euplectes franciscanus*) is often referred to as the "Orange Bishop", since aviary birds tend to be orange, rather than deep red, in breeding plumage. A preliminary analysis of the carotenoid pigments identified the red pigments astaxanthin, α-doradexanthin, adonirubin (phoenicoxanthin) and canthaxanthin in samples from the genera *Euplectes*, *Foudia* and *Quelea*, and the yellow pigments lutein and zeaxanthin in species of *Euplectes*, *Ploceus* and *Quelea*. It appears that the yellow pigments are acquired directly from food sources, whereas the red pigments are a product of dietary precursors which have been modified by metabolic processes in the bird. The pigments are evidently stored in the liver. Laboratory studies have shown that the Yellow-crowned Bishop is unable to manufacture red C4 keto-carotenoids from yellow dietary precursors, whereas the Southern Red Bishop can do so.

At the beginning of the twentieth century, there was vigorous controversy concerning the mechanism of seasonal changes in bird plumage. Several authors, including the aviculturist A. G. Butler and the zoologist F. M. Fitzsimons, were adamant that a moult was not involved, and that the feathers of weavers and other birds could change colour. Field observers and collectors soon countered these claims, which were based mainly on observation of cagebirds. G. L. Bates, working in West Africa, and H. Lynes, in the Darfur region of Sudan, gave clear descriptions of the successive moults and plumages of the weavers which they had handled. Fully grown feathers are dead tissues, with no internal blood supply, and there is, therefore, no possible source for the deposition of new pigments at a later stage. For all weavers exhibiting a seasonal change in appearance, this occurs through a moult of the feathers in particular tracts; wear of the feathers may subsequently modify their appearance, but this is always a minor component. From the 1930s to the 1960s, there was a brief flurry of interest in the response of ploceids in the genera *Quelea* and *Euplectes* to gonadotropic hormones, which induced birds in non-breeding plumage to grow new black feathers matching those of the breeding dress in areas from which the feathers had been plucked. The "weaver finch test" was suggested as a possible biological assay for the presence of luteinizing hormone, but advances in laboratory techniques for measuring hormone levels accurately soon rendered this a mere historical curiosity. At the cellular level, experiments showed that luteinizing hormone stimu-



*The **Nelicourvi Weaver** and the Sakalava Weaver* (Ploceus sakalava) *of Madagascar are considered to form a superspecies; indeed, they have sometimes been treated as conspecific. They have different habitat preferences, the Nelicourvi being found in rainforest and secondary forest up to 1950 m, and the Sakalava in dry, open lowland country. Two other Madagascan members of the family, the Red Fody* (Foudia madagascariensis) *and the Forest Fody* (F. omissa), *form a similar species pair. The Red Fody is found in open country, and the Forest Fody in primary evergreen forest.*

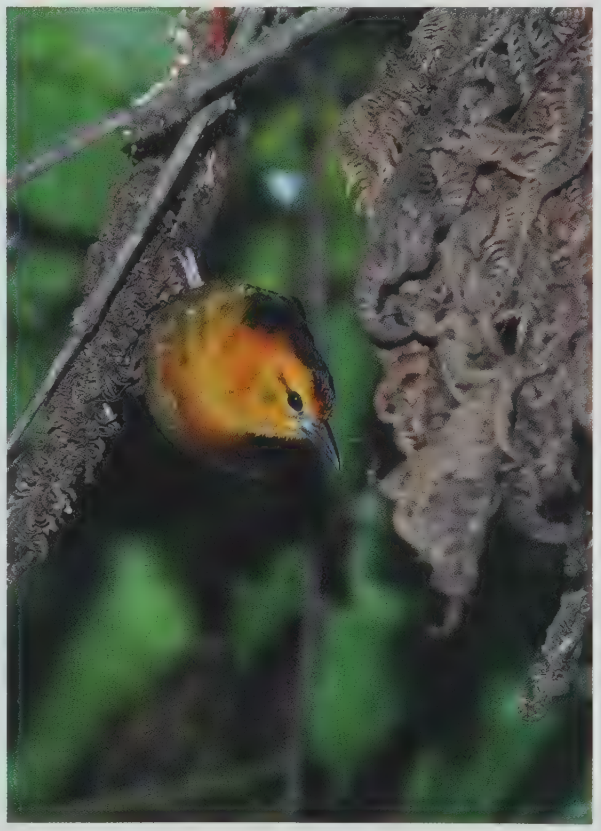
[*Ploceus nelicourvi*, Perinet Special Reserve, Madagascar. Photo: Adam Riley]

lated the activity of the enzyme tyrosinase and increased melanin-granule production. In the Baya Weaver, too, luteinizing hormone is responsible for the seasonal changes in plumage of males.

Male Red-billed Queleas exhibit distinctive colour morphs in breeding plumage, the breast colour varying from yellow to red and the colour of the facial mask varying from white to black. Comparisons of the plumages of fathers and those of sons suggest that breast colour is heritable, as is the mask colour, but the two traits do not display any sign of being correlated. It appears that this species has two separate colour-based signalling systems, the complex variability in plumage identifying individuals, whereas the intensity of the coloration of the bare parts, including the bill, eyering and legs, reflects the quality of the individual. While there has been much theoretical interest in the idea that carotenoid pigments may be a good guide to the quality and "fitness", in a genetic sense, of individual males, it was concluded from field and laboratory experiments on some *Euplectes* species that the red plumage areas were important in male–male signalling, but apparently played no significant role in mate selection by females. For the Village Weaver, aviary experiments showed that males which had the wings dyed black were less successful in attracting females than were "normal" males. This manipulation, however, had changed the overall plumage pattern, which is particularly significant for a species for which wing-beating displays at the nest form an important element in courtship, and it would seem to have little relevance to the role of carotenoids in mate selection.

Most of the sexually dimorphic weavers have a partial prenuptial moult, which involves only the body plumage. Often, it is only the male that changes in appearance, but in some cases both sexes have brighter plumage during the breeding season. At the end of the breeding season there is then a complete postnuptial moult, during which the body plumage is replaced by the eclipse plumage, and at the same time the wing and tail feathers are renewed. Among the bishops and widows of the genus *Euplectes*, the species which have a long black tail during the breeding season shed this at the postnuptial moult; the next prenuptial moult then includes the tail feathers, but the wing feathers are replaced once a year only. Thus, in those species whose males have black wing feathers, these are retained by adults throughout the year.

Generally, there is a complete post-juvenile moult, so that, for the Fan-tailed Widowbird, the plumage sequence for a male would be as follows. First, the fledgling emerges from the nest in a distinctive plumage, much more buffy than that of the adult, and with a brown bill. Within three months of hatching, it undergoes a complete moult in autumn in which the characteristic juvenile plumage is lost, being replaced by feathers not distinguishable from those of the adult female. In the third stage, at approximately one year of age and in its second autumn, the young male undergoes its second complete moult, but it now ac-



*Arguments continue over whether the **Sao Tome Weaver** should be included in the genus* Ploceus, *or given its own genus* Thomasophantes, *in which some authors place it. Those in favour of a monotypic genus point out that its plumage is not dominated by yellow and black like most* Ploceus *species; that it has a shorter tail; that it has a different posture and movements; and that its songs and calls are utterly unlike those of any other species in* Ploceus.

[*Ploceus sanctithomae*, Lagoa Amélia, São Tomé. Photo: Fabio Olmos]

quires the black wing feathers of the adult male; the bill remains brown. Finally, in the bird's second spring, the bill turns blue, and both the body and tail feathers are replaced by the adult breeding plumage. The blue bill is now retained all year, and the black wing feathers are replaced by new black ones once a year at each postnuptial moult, while the body and tail feathers alternate between the breeding plumage and the non-breeding plumage, following the prenuptial and postnuptial moults, respectively.

For most weaver species, the full plumage sequence has not been studied, and it is likely that the age at which breeding plumage is first acquired varies both individually and from one species to another. It is probable that, in some cases, it will take more than two years for full plumage to be gained, and there is evidence that, for such species as the Long-tailed Widowbird (*Euplectes progne*), both wing length and tail length increase with age for several seasons. There is an unusual situation in the genus *Malimbus*, the juveniles of which differ from both the male and the female parents not only in coloration, but also in pattern. This presumably has some significance in the social behaviour of these species, most of which are little known.

Timing and duration of the complete annual moult differ widely within the family from one species to another. For seasonally breeding species within southern Africa, the timing of moult varies regionally with the breeding season, showing a particularly marked disparity between the winter-rainfall region of the south-western Cape and the predominantly summer-rainfall areas to the north and east. There is also evidence of a difference between the sexes in the starting date of the moult in sexually dimorphic species, males, free from parental care, beginning their moult significantly earlier than females, which are still tending late broods. The average duration of moult, however, is generally similar for males and females of the same species, and for populations in different regions. One exception appears to be provided by the Red-billed Quelea, for which the mean duration of the moult varied from 75 days in Namibia to 124 days in the Eastern Cape, in South Africa. This requires further investigation, but it may relate to the more sedentary quelea population in the Eastern Cape; in the Northern Hemisphere, a very rapid moult is typical of some high-latitude migratory populations, whereas moult occurs more slowly in populations of the same species at more temperate latitudes. Interrupted or suspended wing moult, which seems to be a feature of nomadic and migratory species, is regularly reported for Red-billed Queleas, but not for any other ploceids. In contrast, resident species in the arid regions, where breeding may be opportunistic, rather than seasonal, may undergo a protracted wing moult with single growing primary feathers still present during a breeding cycle, and complete replacement of the wing feathers could take as long as 300 days. This pattern has been described for the Sociable Weaver (*Philetairus socius*) and the White-browed Sparrow-weaver (*Plocepasser mahali*).

The two buffalo-weavers of the genus *Bubalornis* possess a unique structure termed the "phalloid organ". This is a feathered rod of connective tissue lying on the abdomen just in front of the cloaca. Its shape immediately suggested to local inhabitants a penis-like structure, and correspondents from West Africa informed D. Bannerman that these objects were ground up by local people to make "strong man medicine". The first anatomical investigations, more than a century ago, clearly established, however, that the phalloid organ was a solid structure with no perforation or internal connection with the reproductive system. In southern Africa, some informants told early travellers that it was used as a means of hooking up sticks, which the bird then carried to the nest, but such behaviour has never been observed by modern ornithologists. The organ is present on both males and females, although it is about three times larger on the male. Recent observations and film sequences of buffalo-weavers in aviaries have shown that, during mounting, the male leans backwards, and his phalloid organ is apparently rubbed against the cloacal region of the female. For most bird species copulation is a very brief affair, yet with buffalo-weavers it can last for more than 20 minutes. Observers have suggested that stimulation of the phalloid organ may be essential for the male to achieve ejaculation. Why no other bird has developed a comparable structure remains unknown.

For birds in general, the preponderance of vocal and visual displays indicates that vision and hearing are the primary senses, in contrast to many mammals, for which the sense of smell is the dominant source of information. Apparently, the requirements of flight have promoted the development of the brain areas concerned with vision to a much greater degree than was the case with the birds' reptilian ancestors. The bright plumage of families such as the weavers has led to the assumption that birds see colours in much the same way as humans do. The colour vision



The ***Bar-winged Weaver*** *has sometimes been placed in the genus* Ploceus*, but is generally considered to differ enough in plumage and morphology to justify its own genus,* Notiospiza*. With its slender bill, dark upperparts and pale underparts, it looks more like a flycatcher (Muscicapidae) than a weaver, and in fact it appears to be mostly, if not exclusively, insectivorous. The female is like the male (shown here), but with much less yellow wash on her underparts.*

[*Notiospiza angolensis*, Mutinondo Wilderness Area, N Zambia. Photo: Geoff McIlleron]



The ten Malimbus *species form a well-defined group, being mostly black and red, except for one black-and-yellow species. The sexes are very similar, although the males have more extensive red (or yellow) areas; the male* ***Blue-billed Malimbe*** *is also significantly bigger than his female. All inhabit lowland forests in Central and West Africa. Examination of the generic arrangements of the Ploecidae actually suggests that there are insufficient character differences to justify separating* Malimbus *from* Ploceus*, but there are no proposals to lump the two genera.*

[*Malimbus nitens*, near Limbe, Dikolo, Cameroon. Photo: Doug Wechsler/ VIREO]

of most bird species has not, however, been studied. Laboratory experiments by G. Dücker indicated that, in food-related contexts, both male and female Village Weavers showed a preference for yellow and black, the dominant colours in the breeding plumage of this species. In the case of the Northern Red Bishop, however, a preference for red was evident for the males only, both when in breeding plumage and when in eclipse plumage. Injection of estradiol, a female hormone, reduced this preference in males, whereas treatment with male hormones did not affect the response of females. Coloured oil droplets are present in the retina of both Village Weavers and Northern Red Bishops, but there were no differences in droplet type or distribution between the sexes of Northern Red Bishops that could be related to their different colour preferences. Clearly, there is still much to learn concerning the physiology of ploceids' responses to colour. Many bird species are now known to be sensitive to light in the ultraviolet region of the spectrum; this has not been investigated for weavers, although some preliminary tests on the plumage of museum specimens of several weaver species suggested that there is little significant reflectance in the ultraviolet range.

Research on the hearing abilities of some songbird species has produced the generalization that birds have better time resolution than do humans. Thus, they could potentially recognize as separate sounds successive elements in a song which human hearing would fuse into a single note. This would imply that rapid bursts of chattering song may be more informative to a weaver than appears likely to human ears. There has, however, been no critical investigation of the auditory physiology of ploceids. With regard to olfaction, the old view that "birds have no sense of smell" has changed dramatically, both anatomical and experimental data showing that some birds make regular use of olfactory information in a food-finding context, and that it certainly influences other facets of their behaviour. No weaver species were included in general surveys of the size of the olfactory region in bird brains, but the few seed-eaters sampled, from the families Fringillidae, Passeridae and Emberizidae, had proportionately the smallest olfactory lobes of all. Nevertheless, repellent chemicals such as dimethyl anthranilate, which appears to be aversive in both taste and odour, have been used successfully to reduce seed consumption by captive Red-winged Blackbirds (*Agelaius phoeniceus*), an icterid species of North and Middle America. Unlike the case of starlings, there are no observations suggesting that weavers selectively include aromatic plant material in their nests, and this further implies that a sense of smell may not play a large role in their lives. The discovery of toxic compounds in the tissues of some New Guinea passerines, the pitohuis (*Pitohui*), a genus currently placed in the whistler family Pachycephalidae, has stimulated interest in the idea that birds, like other animal groups, may use chemicals to deter predators. A review of birds which have odours detectable by humans, and which are regarded as unpalatable to people, included only one ploceid, the Sao Tome Weaver (*Ploceus sanctithomae*), on the strength of comments on the musty odour of museum skins noted by Bannerman. Recent researchers on São Tomé who have handled this species in the field do not, however, recall any distinctive odour, and this may have been an artefact of storage conditions, rather than a property of the living bird.

Bright colours can serve as warning signals for distasteful or poisonous organisms, and this prompted H. B. Cott to propose that conspicuous plumage and habits of birds could have an aposematic function. Together with C. W. Benson, he attempted to test this proposal with African birds, a panel of colleagues tasting the fried pectoral muscle of different species. The ploceids included in the survey were the White-browed Sparrow-weaver, the Red-headed Weaver (*Anaplectes rubriceps*), the Red-billed and Red-headed Queleas (*Quelea erythrops*), Holub's Golden Weaver (*Ploceus xanthops*), the Southern Masked Weaver (*Ploceus velatus*), the Spectacled Weaver, the Yellow-crowned, Yellow and Southern Red Bishops, and the Fan-tailed, White-winged (*Euplectes albonotatus*) and Yellow-mantled Widowbirds (*Euplectes macroura*). For these species, the suggestion that birds with conspicuous plumage and behaviour may be distasteful was not supported, and the *Euplectes* species, all of which were represented by males in breeding plumage, were rated as being particularly tasty. A more recent reanalysis of the data supported this finding, and suggested that sexual selection might be the key to the evolution of colourful plumages in this group. The judgement of a human tasting panel, however, is hard to equate with the taste preferences of the possible natural predators of these birds. Moreover, the toxic chemicals detected in the pitohuis were most concentrated in the skin and feathers, so that future tests would need to include whole carcases, and not just breast muscle, offered to an appropriate range of predatory animals.



*Although the **Red Fody** is solitary and territorial on its breeding grounds, the species is otherwise very gregarious, feeding and roosting communally. Feeding flocks can number in the hundreds on rice and other seed crops, where the bird can be a serious pest. Preferring open habitats, it has benefited from the conversion and degradation of Madagascar's forests at the expense of its congener, the Forest Fody* (Foudia omissa). *It has been introduced to many other Indian Ocean islands, and may be spreading within the Comoros without human assistance. Hybrids between introduced Red Fodies and other fody species have been recorded, and may present a conservation threat for some species.*

[*Foudia madagascariensis*, Praslin Island, Seychelles. Photo: B. Liedtke/ CD-Gallery]





*Groups of **Red-billed Queleas** ringed or marked together at breeding colonies have been recovered together many months later and hundreds of kilometres away, showing a degree of colony cohesion within flocks that can number in the millions. However, DNA and morphological analysis of populations in southern Africa found no evidence of significant genetic differentiation, suggesting that when birds from different local groups come together, they interbreed freely. Although each of the subpopulations making up the three recognized subspecies has its own migration pathways, the pattern of movement is very variable from year to year, depending on regional variations in rainfall. Red-billed Queleas breed in the wet season and spend the dry seasons where there are adequate supplies of wild grass seeds, moving when the rains cause the grass seeds to germinate. A paper published by the UN's Food and Agriculture Organization in 2006 contended that farmers often perceive the quelea as more of a menace than it really is; and that while they claim that quelea populations are increasing at the expense of their crops, they seldom have supporting evidence. Instead, quelea numbers fluctuate primarily according to rainfall in their breeding areas, as they always have done. Far from increasing in numbers, the paper suggests queleas may be at risk if their breeding habitats continue to be lost to agriculture.*

[*Quelea quelea lathamii*, Chobe National Park, Botswana. Photos: Martin Harvey/ DRK]



*Four weaver species, including the **Baglafecht Weaver**, have been observed actively "anting"—wiping live ants through their feathers. The formic acid exuded by ants may help rid the feathers of ectoparasites such as lice. However, this has been observed too rarely to be considered part of normal preening behaviour. Observations of captive Village Weavers* (Ploceus cucullatus) *revealed that they preened themselves at irregular intervals throughout the day, especially during the warmer hours and in the evening before retiring.*

[*Ploceus baglafecht*, Tanzania. Photo: David Hosking/FLPA]

Habitat

Within Africa, weavers range from sea-level to forests and grasslands high in the mountains. They occur in wetlands and rainforest, as well as in arid zones on the fringes of the true deserts. The Asian members of the family represent a subset of these choices, all five species being restricted to grassland and savanna areas. In addition, there is often some seasonal change in habitat selection, with particular sites chosen for nest-building, whereas in the non-breeding season the birds may range through very different areas within the same broad biome. On the Indian Ocean islands, the resident weavers have a more limited range of habitats available to them.

Some broad trends are evident within the taxonomic groups. The members of the subfamily Plocepasserinae are all birds of dry thornveld and woodland, and occupy the most arid habitats



*Weavers are among the most regular visitors to garden birdbaths in Africa, and they have been recorded bathing during rain. In a study of the behavioural energetics of **Village Weavers** in an aviary with freely available water, the birds bathed three to five times a day, mostly in the afternoon and evening. Dust-bathing has never been recorded in African weavers, even in the species of arid and semi-arid habitats, like the sparrow-weavers. However, it has been observed for the Baya Weaver* (Ploceus philippinus) *in India.*

[*Ploceus cucullatus*, Photo: Michael Krabs/ www.photolibrary.com]



The terms used to describe weaver calls and other vocalizations make it clear that, by and large, they are not great songsters. The song of the ***Slender-billed Weaver****, for example, is described as chattering and swizzling, with a buzzing "bzzzzt" also recorded. Field guides often refer unhelpfully to "typical weaver" songs or calls. However, long-term studies of the Village Weaver* (Ploceus cucullatus) *indicate an extensive vocal repertoire, with different songs for courtship, territorial defence and advertisement; moreover, the males have individually distinctive calls that their mates recognize.*

[*Ploceus pelzelni pelzelni*, Queen Elizabeth National Park, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

of any of the family. The Bubalornithinae likewise are found in thornveld and relatively dry woodlands. Within the largest subfamily, Ploceinae, there are five monotypic genera, in general terms all species of savanna woodland and open country, and a further five genera each with several species. The genus *Foudia* is restricted to the Indian Ocean islands, most of its six species occurring in forest and woodland, which were the original habitats. One, the Red Fody (*Foudia madagascariensis*), is found in more open habitats, including cultivated areas; this may represent a recent adaptation, which perhaps developed after the first Asian settlers arrived in Madagascar, 2000 years ago. *Quelea* and *Euplectes*, generally thought to be closely related, together comprise 20 species of grassland and open savanna, the individual species differing primarily in the extent to which they are dependent on wetlands and their associated vegetation for breeding sites. Some populations of *Euplectes* are restricted to high grassland plateaux, for instance in Ethiopia and Malawi. In contrast, all ten *Malimbus* species are inhabitants of lowland forest in the central and western regions of Africa, and they do not extend into the montane forests higher up the mountain slopes. They differ from one another most significantly in the vertical strata which they occupy within the forest, ranging from the canopy down to the understorey.

There are two *Ploceus* species in Madagascar, one in the forests which has much in common with some of the African forest weavers, and the other an open-country species more reminiscent of the Asian weavers, all of which are currently placed in this genus. This leaves more than 50 African species, which can be found in virtually all habitats except treeless grassland. The forest weavers include species of lowland and coastal forests, as well as species restricted to the high montane forests, with discontinuous distributions that must reflect past habitat changes in the forested regions. For example, the Brown-capped Weaver (*Ploceus insignis*) currently occurs in the west on Bioko, in the highlands around Mount Cameroon and in the west Angolan highlands, but it is absent from the Congo Basin. To the east it reappears in the highlands of the Albertine Rift in south-east DRCongo, in the Imatonga and Dongatona Mountains of extreme southern Sudan, and in isolated highland areas in Uganda, Kenya and Tanzania. In Kenya, Brown-capped Weavers can still be found on Mount Marsabit, today an "island" of montane forest surrounded by quite arid country. Presumably, during wetter, cooler periods in the past, forests of the type which is today restricted to the montane zone were widespread in the intervening regions, which would have enabled this species and many others to disperse widely through their favoured habitat. Subsequent climate change, probably combined with human activity, has left these animals isolated in relict patches of suitable habitat.

In polygynous species like the ***Black-winged Bishop*** *only the male sings, although the female may have a call to solicit copulation. Studies of Northern Red Bishops* (Euplectes franciscanus) *have found that parts of the brain involved in song control are much larger in males than in females. However, in some monogamous forest-dwelling species like the Dark-backed Weaver* (Ploceus bicolor)*, both sexes sing throughout the year, often in a duet which is thought to help confirm the pair-bond, as well as advertising the territory.*

[*Euplectes hordeaceus*, Senegal. Photo: Ignacio Yúfera]



Then, there are species of woodland and savanna, including some which venture at least seasonally to the edges of the arid belts. Others seem to be limited to the permanent swamps and seldom move far from them. In south-central Africa, there is a complex of what could be termed "masked weavers", in a general sense, associated with the southern Congo Basin. These appear to be well separated through their habitat preference from species with a similar plumage pattern in the nearby drier terrestrial savannas. Both the taxonomy and the biology of these species have been little studied to date, and the current isolation of some populations can probably be related to changes in drainage patterns in the catchments of the major rivers of the region, notably the Zambezi, Lufira, Lualaba, Luapula and Chambeshi Rivers. Some *Ploceus* species thus seem to be habitat specialists with little flexibility, whereas others have adapted readily to man-modified habitats and are exploiting both the feeding and the nesting opportunities on offer. The only *Ploceus* which occurs naturally in Arabia, Rüppell's Weaver (*Ploceus galbula*), is restricted to the wetter and more mountainous south-western sector.

Weavers are all dependent on supporting structures for their nests. These can be relatively short grass stems in dense open grassland, or reeds and papyrus growing in standing water, but in arid regions with little ground cover ploceids rely on scattered trees for nest-sites. In such habitats, the nests are used also as regular roosting sites by buffalo-weavers, sparrow-weavers and the other small social-weavers in the Plocepasserinae. Physiological studies of both White-browed Sparrow-weavers and Sociable Weavers have revealed that the protection provided by the nest is important in winter, when ambient temperatures commonly fall below freezing at night in regions such as the Kalahari Desert, in southern Africa. One of the smallest members of the family, the Scaly-feathered Finch (*Sporopipes squamifrons*), weighing on average 12 g, occurs in these same semi-desert regions with their frosty nights, and for this species a covered nest shared with other warm bodies is probably crucial. The act of sheltering in the nest also enables birds to avoid the hottest times of the day in summer. Few forest or savanna species of the Ploceinae ever utilize the nests outside the breeding season, even though some nests remain intact until the following year without any further maintenance.

General Habits

No weavers lead solitary lives, although the monogamous species associate with only a single other bird through most of the year, except for the period during which the fledged young accompany the adults. All the species which breed in colonies, and many which nest in more dispersed territories, associate in feeding flocks of varying size during the non-breeding season, at which time they also roost communally. These roosts often contain birds of several different species, sometimes all ploceids, but frequently including members of other families, such as the starlings. In southern Africa, the African Pied Starling (*Lamprotornis bicolor*), the introduced Common Starling (*Sturnus vulgaris*) and the Wattled Starling (*Creatophora cinerea*) often associate with *Ploceus* and *Euplectes* species when roosting in winter. Such roosts are frequently over water in reedbeds or bulrushes, sites where, in the winter months, the temperature in these low-lying areas drops rapidly at night. Clearly, protection, rather than thermal regulation, is the major concern. A single roost can hold hundreds, thousands or, in the case of the Red-billed Quelea, millions of individuals. Virtually nothing is known of the internal organization of these roosts, such as how closely the birds are clustered together, whether individuals preferentially roost near familiar conspecifics, and whether the sexes and the age-classes are separated. Studies of the Common Starling by M. Hausberger and others have shown that the huge winter roosts of this species are by no means a random accumulation of individuals; there are significant associations between individuals which sing a common dialect and therefore originate from the same nesting regions.

P. Ward's experiences with the Red-billed Quelea led to a theoretical paper, co-written with A. Zahavi, in which the authors suggested that roosts could serve as "information centres" for birds feeding on food which is patchily distributed in the surrounding habitat. They postulated that this might happen not by the direct and deliberate transfer of information through vocal or visual signals, but in a more subtle way: birds which had foraged without much success on the previous day would observe those individuals which, on the next morning, flew out confidently in a set direction, and would then follow these in the hope that they were heading for a foraging area which had been productive on



This picture captures the popular idea of a foraging weaver, perched on a grass stalk eating seeds. The seeds of guinea grass (Panicum maximum), *weeping lovegrass* (Eragrostis curvula) *and other grasses do feature alongside maize among the plant foods most commonly eaten by the* ***Southern Red Bishop***, *but like other weavers, this species takes insect food too, especially when it has young to feed. It is opportunistic, catching winged termites in flight, and feeding on kelp flies and small crustaceans in seaweed along the shoreline of the Western Cape, in South Africa.*

[*Euplectes orix*, West Coast National Park, South Africa. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]



Many weaver species are nomadic opportunists, taking advantage of the seasonal abundance of wild grass seeds by gathering in huge numbers to feed. Cereals, the domesticated forms of wild grasses, provide a similar seasonal abundance, which inevitably attracts weavers. In the Horn of Africa, ***Rüppell's Weaver*** *forms post-breeding flocks reportedly numbering tens of thousands. This species is said to damage sorghum crops in the north of Somalia, but is regarded as less of an agricultural pest than some other weavers, especially the Red-billed Quelea* (Quelea quelea). *Large flocks of weavers forage in "roller-feeding" fashion, with birds from the back constantly flying to the front.*

[*Ploceus galbula*, Tihama, Yemen. Photo: Hanne & Jens Eriksen]

the preceding day. Some experimental studies of captive queleas, and field observations of larger birds such as herons (Ardeidae), suggest that the idea is plausible, although it is still unconfirmed for any weavers in the wild.

Most members of the subfamily Ploceinae seem to enjoy bathing in water, and some of the smaller species will also bathe in wet foliage. Dust-bathing, which is common among sparrows, seems not to have been recorded, not even for the sparrow-weaver group, for which opportunities to bathe in water are likely to be more restricted. At any garden birdbath in Africa, weavers will be among the most regular customers. C. J. Skead noted bathing activity in his garden over several years, and found that Cape Weavers would bathe even in misty or rainy conditions, with air temperatures down to 13°C. On hot days, in temperatures of more than 25°C, some individuals only bathed, some only drank water, while others in the same party both bathed and drank during



As well as seeds of cereals and other grasses, the typical diet of the ***Red-collared Widowbird*** *includes beetles, ants, caterpillars and termites. This male in breeding plumage may be searching the flowers for insects; if so, they would be for his own consumption, since males play no part in feeding the young. Red-collared Widowbirds frequently forage on the ground. Feeding flocks of 50–100 birds have been recorded, including males in breeding plumage.*

[*Euplectes ardens ardens*, Wakkerstroom, South Africa. Photo: Warwick Tarboton]



Many weaver species have been recorded consuming nectar, but in the spiny forests of south-west Madagascar, the ***Sakalava Weaver*** *eats the whole flowers of the cactus-like endemic* Alluaudia. *This species takes insects and spiders, which are gleaned from the branches of trees, but it is primarily a seed-eater, and sometimes feeds on rice spilt on the ground. This male in breeding plumage offers a decent view of the bare skin around the eye, a feature unusual in weavers.*

[*Ploceus sakalava minor*, Mangily, Madagascar. Photo: Samuel Hansson]

their visits. Temperature is unlikely, therefore, to be the sole factor influencing bathing.

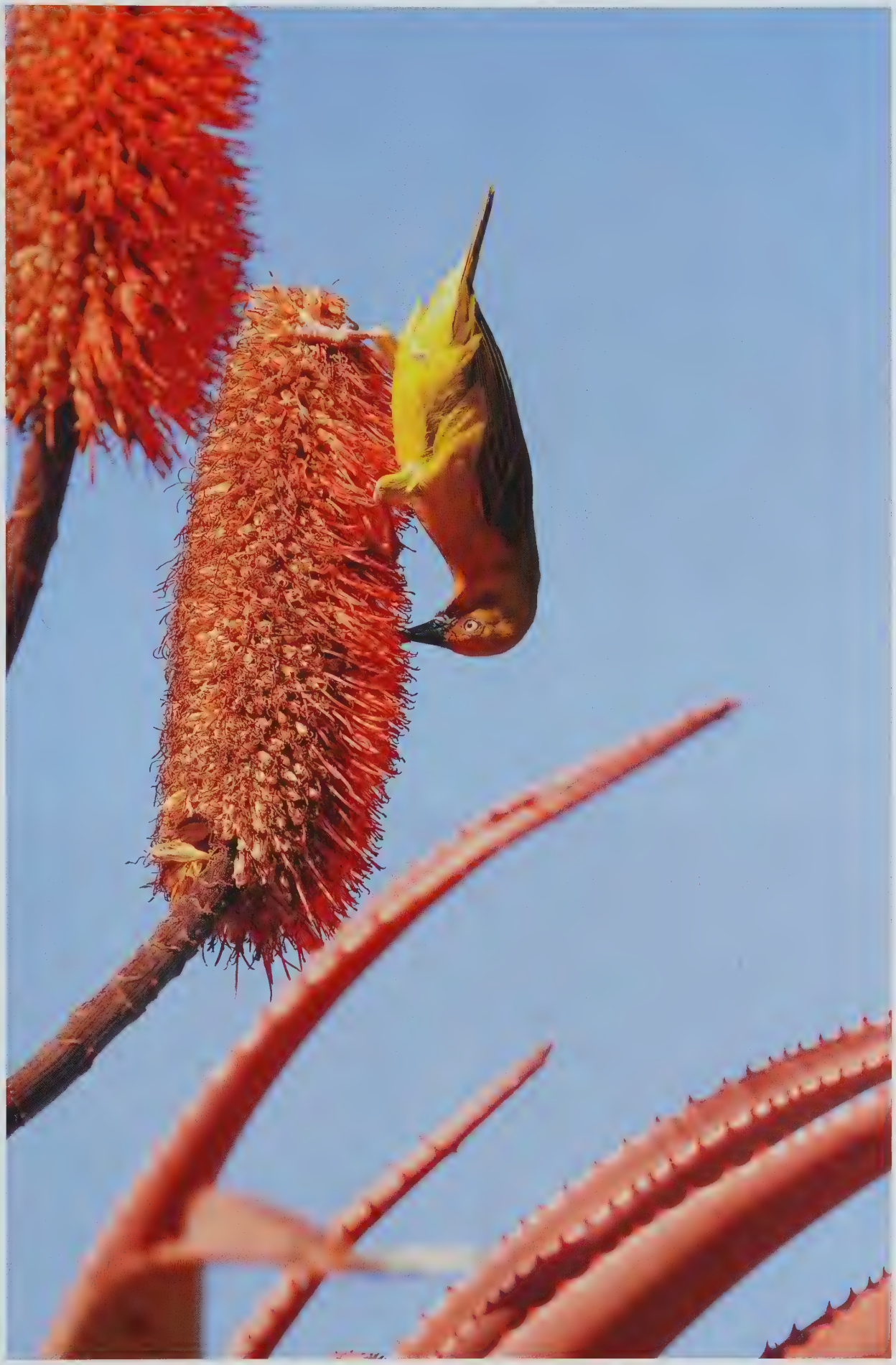
Much less usual is anting, another activity possibly associated with plumage care. Passive anting, in which a bird, usually while on the ground, takes up a posture with the wings held spread, resembling the sun-bathing posture, and allows ants (Formicidae) to crawl through its plumage, has not been reported for any weaver species. Active anting, whereby the bird picks up ants in the bill and "wipes" them through selected areas of the plumage, has now been observed for 20 African ploceine species. For four of these, namely the Baglafecht Weaver (*Ploceus baglafecht*), the Cape Weaver, the Village Weaver and the Southern Red Bishop, this behaviour has been recorded in the field. For the remaining 16, it has been recorded only in captivity: in this case, the species involved are the White-billed Buffalo-weaver (*Bubalornis albirostris*), the Thick-billed Weaver (*Amblyospiza albifrons*), Rüppell's Weaver, Vieillot's Black Weaver, the Black-necked Weaver (*Ploceus nigricollis*), the Chestnut Weaver (*Ploceus rubiginosus*), the Yellow-crowned Bishop, the Red-collared Widowbird, the Northern Red and Black-winged Bishops (*Euplectes hordeaceus*), Jackson's Widowbird (*Euplectes jacksoni*), the Yellow-mantled and Long-tailed Widowbirds, the Red Fody, and the Red-billed and Red-headed Queleas. Since the ants selected by the birds have always been members of the subfamily Formicinae, which produce formic acid when disturbed, this behaviour has long been linked to preening and feather care. Formic acid is toxic to insects and to many micro-organisms, and one popular suggestion is that treating the feathers with formic acid kills ectoparasites, and possibly also rids the plumage of fungi and bacteria which damage feathers. Nevertheless, many ornithologists with years of field experience in Africa have never witnessed such behaviour, and attempts to elicit anting from captive birds also indicate that it is rare, is not obviously related to the presence of ectoparasites, and within a group of conspecific birds is not carried out by all individuals. The non-functional explanation, that anting behaviour is simple indulgence in sensory stimulation, akin to tobacco-smoking or other drug use by humans, is commonly disregarded, but this proposal has never been tested or refuted.

All weavers for which the relevant information has been recorded use the indirect method of head-scratching. They lower the wing, and then lift the leg on the corresponding side over the wing in order to scratch the head. They probably have good reason to scratch, as their nests are often infested with biting lice (Mallophaga) and mites (Acarina). In Africa, birds of many species, including ploceids, occasionally have ticks, sometimes engorged, on the head area. None of these are bird ticks, but tend to be tick species with a wide range of potential hosts, which include hares (Leporidae) and such birds as guineafowl (Numididae). It is very rare to find more than one or two ticks on any individual bird. Louse flies (Hippoboscidae), a family of flies having a tough, flattened body and strongly clawed feet and which includes such well-known agricultural pests as the sheep ked (*Melophagus ovinus*), can occasionally be seen as they scurry through the feathers, particularly on the wings. They are blood-feeding insects, but their impact on the birds is not known, and it is not clear whether they can be involved in disease transmission.

Like other birds, weavers are hosts to blood parasites, including *Plasmodium*, the principal cause of avian malaria, which is transmitted by mosquitoes (Culicidae). Unfortunately, bird parasitology has in many regions advanced little beyond lists of recorded hosts, with no information either on the biology of most internal parasites or on their effect on the host population. It has been suggested that some montane bird species in Africa are excluded from lowland forests because they are highly susceptible to malaria, which is prevalent at the lower altitudes. This seems plausible on the basis of Hawaiian studies (see page 644), but as yet there is no direct evidence that it applies to any African species.

Voice

The Ploceidae are not notable songsters, and, for most of the colonial weavers, the male's song which accompanies his displays at the nest is best described as being a harsh, repetitive chatter. Nevertheless, the birds do devote a considerable amount of time to vocalizing, but, compared with their visual displays, this aspect of their courtship has been neglected. Even the contact calls of different species are distinctive, and can be recognized by human observers. Those species exhibiting a seasonal plumage change sing only during the breeding season, and this vocal activity appears to be closely linked to testis activity; no song has been reported



Aloes flower in the winter, when other sources of nectar and foods such as insects are in short supply. Their copious though rather dilute nectar is a valuable food source for a number of Ploceus *species. The relationship between bird and plant can be of mutual benefit: the* ***Cape Weaver*** *is believed to be the main pollinator of several aloe species, as well as of the iconic bird-of-paradise flower* (Strelitzia reginae). *A study of an* Aloe marlothii *forest at Suikerbosrand Nature Reserve, South Africa, found that overall bird abundance increased two-to-three-fold during August, at the peak of flowering. The Cape Weaver and the Southern Masked Weaver* (Ploceus velatus) *were among the seven species which fed on the nectar most frequently. Omnivores and insectivores such as the Cape Weaver tended to feed on the nectar in the morning, and fruit- and seed-eating species later in the day; this "temporal niche partitioning" may help to reduce competition. However, the authors of the study saw few aggressive interactions between the birds feeding on the nectar, perhaps because there were more flowers available in the forest than the birds could possibly visit. The numbers of specialist nectarivores, such as sunbirds, did not increase, possibly because the concentration of the nectar was too low.*

[*Ploceus capensis*, Elands Bay, South Africa. Photo: Rodrigo Pérez Grijalbo]



Fruit is an occasional or regular item in the diet of most ploceids, including those like the ***Little Weaver*** *which mostly eat insects and seeds. A classification of sub-Saharan bird species describes Weyns's Weaver* (Ploceus weynsi) *as an obligate frugivore, and another twelve* Ploceus *species as partial frugivores, along with the Ibadan Malimbe* (Malimbus ibadanensis), *the Thick-billed Weaver* (Amblyospiza albifrons) *and the White-billed Buffalo-weaver* (Bubalornis albirostris). *Many others were listed as opportunist frugivores.*

[*Ploceus luteolus*, Lake Bogoria, Kenya. Photo: Theodoulos Poullis]

from females in this group. Young males at the end of the breeding season do show some testis activity, often visibly associated with bill-colour changes, but they do not develop breeding plumage. They then spend time in weaving and singing, although they do not build complete nests. It is not clear if these apparently simple songs mature merely through practice, or whether learning from hearing adult songs, and perhaps imitating the songs of colony-members, plays a role in normal vocal development.

Dark-backed Weaver (*Ploceus bicolor*) pair-members, which appear to remain together throughout the year and for several breeding seasons, develop a musical duet which the two partners sing simultaneously. There are local dialects in this song which appear to remain stable over many years and, furthermore, large-scale differences between geographically separated populations are evident. Thus, southern African birds start their song with a few clear, flute-like elements as an introduction, this being followed by a rasping harsh call, and then the main melody of musical notes. A song bout always opens with the introduction, after which several sequences of harsh calls and main melodies may follow. Dark-backed Weavers from Kakamega Forest, in



The forest-dwelling malimbes are mainly insectivorous. They differ from one another most significantly in the forest strata and the techniques they use when foraging. The ***Red-headed Malimbe*** *feeds mainly in canopy, and seldom below 25 m. It moves like a nuthatch (Sittidae), probing and prying bark and moss with its bill, and also hammering like a small woodpecker (Picidae). The Blue-billed Malimbe* (Malimbus nitens) *forages as low as 1–5 m above the forest floor, probing and pulling apart tangles of vines and clumps of dry leaves. The Red-vented Malimbe* (M. scutatus) *forages the highest, particularly in the thin outermost twigs where it gleans in manner of a tit (Paridae).*

[*Malimbus rubricollis*, Ibadan, Oyo State, SW Nigeria. Photo: A. P. Leventis]



The proportions of invertebrates and seeds in the diet of the ***White-browed Sparrow-weaver*** *vary both regionally and seasonally. In South Africa, up to 50% consists of insects, especially harvester termites (Hodotermitidae), beetles, ants, caterpillars and moths. This weaver species forages primarily on the ground, running or hopping in pursuit of prey, turning over stones or dung pats, and digging in the soil. It also hawks flying insects, particularly the winged form of termites, but as seen here, it is easier to capture them as they emerge from their nests.*

[*Plocepasser mahali melanorhynchus*, Kenya. Photo: Ron Cartmell/ VIREO]

Kenya, commence a song bout with a more complex introduction of two whistled notes, a harsh call and a further three whistled notes; thereafter, the sequence of harsh calls followed by the main melody can be repeated several times. In contrast, individuals from Cameroon and from coastal Kenya lack the introductory phrase, and each song bout, separated from the next by a clear interval, consists of a harsh call followed by the main melody. Hand-reared Dark-backed Weavers produced their first "subsong" when only 14 days old, and they later copied whistles from their human tutor, giving accurate renditions which were well synchronized with his whistles. These observations, together with the pattern of dialects recorded in the field, suggest that song-learning by this species occurs during the period when the young are still in a family group with their parents. Presumably, learning to synchronize song with a partner is an ability retained throughout life, allowing for the establishment of new pair-bonds at any age.

It is likely that this system, with song throughout the year and both male and female singing, will be found to be the norm for other monogamous forest-dwelling species. The monogamous Spectacled Weaver is a bird of open woodland, rather than forest. Both sexes of this species utter a descending call of several notes, sounding more like a song than like a regular contact call, throughout the year. The male, however, also has a short chattering song, which he uses at the nest and when the partners meet away from the nest; this vocalization has not been heard outside the breeding period.

In the case of the buffalo-weavers and sparrow-weavers, it appears that song is more frequent during breeding periods, but is not restricted to a particular time of year. The dominant male White-browed Sparrow-weaver sings a long and varied song at dawn when he awakes, and occasionally also at other times of the day. He may sing from the entrance to his roosting nest, and also from prominent perches. Neighbouring dominant males reply, indicating that this song type clearly has some territorial function, and it presumably serves for individual recognition. All members of the sparrow-weaver group, however, share a shorter song, which they employ during territorial defence when intruders appear during the day. In this instance, the birds may sing while perched side by side, low down and even on the ground, as well as from elevated perches.

These few examples suggest that much more research on the vocal behaviour of the Ploceidae is warranted. For most species, there is still no inventory of their "vocabulary", and no indication of the context in which particular calls are given. Similarly, song acquisition has scarcely been studied. Studies of captive Dark-backed Weavers indicate that the song is learnt from the parents or other individuals encountered within the first year; by the time the bird is two years old, the song type has stabilized. Although the two sexes of this species sing identical songs, there is sexual dimorphism in brain morphology, the vocal centres



Foraging on floating aquatic plants, this ***Northern Brown-throated Weaver*** *may have found the fish trapped or already dead. This species is found in waterside vegetation along lakes and rivers, particularly papyrus* (Cyperus papyrus)*, and its feet show adaptations typical of papyrus specialists. Another weaver of waterside habitats, the Kilombero Weaver* (Ploceus burnieri)*, was observed feeding on smoked fish at a temporary fishing camp, entering the covered smoking platform to peck at the fish.*

[*Ploceus castanops*, Lake Victoria, Uganda. Photo: Nick Davies]



Like the sparrows (Passer) *they so resemble,* ***Sociable Weavers*** *are now regular visitors to camps and picnic sites, where they are assured of a regular supply of food scraps. The proportions of plant and animal food in their natural diet shifts dramatically according to seasonal availability, from 16% insects and 84% seeds at one extreme to 80% insects and 20% seeds at the other. Sociable Weavers forage on the ground, mostly hopping, sometimes running, after insect prey. An examination of the metabolic rate and water flux of Sociable Weavers found that they expend far less energy than other bird species of arid environments, and use just 4·6 ml of water per day, one of the lowest values reported for a bird of this size. Studies of closely related White-browed Sparrow-weavers* (Plocepasser mahali) *found that they foraged on the ground throughout the day in frequent bouts, spending more than half the hours of each day looking for food. In between, they sat in trees to rest or preen. While foraging they ate small seeds off the ground, or nibbled green or brown grass seeds off the heads of living, growing grasses. They also bit off green grass shoots to nibble at the succulent growing base.*

[*Philetairus socius*, Etosha National Park, Namibia.
Photo: Ignacio Yúfera]

associated with song being 1·5 times larger in males than in females. Studies of other songbird species in which song is normally restricted to males have shown that song-control centres become enlarged under the influence of male hormones, and appropriate hormone treatment can induce female domestic canaries (*Serinus*) to sing. In addition, in birds with a marked seasonal breeding cycle, the song-control regions of the brain may increase in size in parallel with gonad development, and then decrease in size again as the gonads regress at the end of the breeding season. Studies of Northern Red Bishops held in captivity have confirmed that two brain regions known to be involved in song control in other species (the caudal nucleus of the hyperstriatum ventralis HVc and the robust nucleus of the archistriatum RA) are much larger in males than they are in females, and these areas also increase in size when the males are in breeding plumage. In the case of the White-browed Sparrow-weaver, only the dominant male of which sings the most complex song type, birds which achieve dominance within the group enlarge the relevant brain areas as they "graduate" to singing the new song elements. In this species, therefore, there is dimorphism in brain structure both between males and females and between dominant and subordinate males, but there is no conspicuous seasonal variation in the song-control regions of the brain, since the birds sing throughout the year.

Food and Feeding

The popular image of weavers is that these are seed-eaters, and, while most of the open-country species are indeed largely granivorous, all species for which adequate data are available take arthropod food, as well as seeds. The young are often fed largely on insects for the first few days, this being true even of those species which are typical granivores. Some weavers take a wide range of animal food, up to the size of small vertebrates, as well as fruit and other vegetable material, so that they could be categorized as omnivorous. The Seychelles Fody (*Foudia sechellarum*) may be unique in the family in its habit of feeding on the eggs of white-eyes (Zosteropidae) and small terns (Sternidae). A division into forest insectivores and savanna granivores is far too simplistic. There are clearly seasonal differences as well, and some granivorous weavers regularly join mixed-species flocks of insectivores in African woodlands during the dry season.

Many weaver species will take nectar, in Africa particularly from the aloes (*Aloe*) which flower in the winter, when other food may be scarce. In South Africa, the nectar-feeding species include both insectivorous and omnivorous members of the genus *Ploceus*, as well as predominantly granivorous species, and other seed-eating weavers such as the *Euplectes* bishops. Male Cape Weavers in South Africa often have the chestnut face mask covered with bright orange pollen after visiting aloes, and these generalist nectar-feeders are now considered to be the major pollinators of this group of plants. Both Cape and Village Weavers will feed on pollen at crane flowers (*Strelitzia regina*), and they appear to be the main agents of pollination for this plant, as they are of the right weight required to depress the flower so that the stamens emerge from their covering.

Beak shape and size provide a general guide to the proportion of seeds in the diet of a particular species. The massive bill of a Thick-billed Weaver can crack sunflower (*Helianthus*) seeds, and also the seeds of forest trees when, during the winter months, the birds forage far from their reedbed breeding areas. Nevertheless, these weavers will catch insects on the wing and feed them to their young, and they have been recorded also as eating small frogs. Within the genus *Ploceus*, the Little Weaver (*Ploceus luteolus*) and the Slender-billed Weaver are very similar in plumage and in size, both weighing approximately 12–14 g. The bill of the Slender-billed Weaver, however, is significantly longer and much more slender, being suited to gleaning insects from leaves in the manner of a white-eye, whereas its congener has a shorter, thicker bill and includes many seeds in its diet.

Like other granivores, weavers remove the husk from seeds before eating them, and they have ridges on the palate designed to hold the seed in place while they perform this task. Once swallowed, seeds pass first to the crop, an extension of the oesophagus, where they can be stored and then progressively passed down to the gizzard for processing. Seeds in the crop are still intact and can be identified, whereas material that has been crushed in the gizzard is very difficult to recognize. Individuals returning to a roost in the evening typically have the crop full, bulging from the side of the neck, and the contents are often visible through the



*Wild-caught individuals of the **Scaly-feathered Finch** have been known to survive for up to 62 days without access to drinking water. This species has the capacity to produce water metabolically on a diet of dry seeds. Many other weavers of arid zones will drink if water is available, but otherwise seem to obtain the water they need from their food. The White-browed Sparrow-weaver* (Plocepasser mahali)*, for example, has not been seen to drink in semi-desert areas of Botswana, but does drink in Mountain Zebra National Park, in South Africa.*

[*Sporopipes squamifrons*, Kgaligadi Transfrontier Park, South Africa. Photo: Nigel Dennis/ www.photolibrary.com]



Although a species of semi-arid habitats, the ***Red-billed Quelea*** *has to drink at least twice a day, and sometimes three times. At first light the birds often fly to water before going to feed, and they drink again on their return to the roost. When temperatures rise above 40°C, they form day roosts near water, and drink during the hottest hours. Queleas drink on the wing or from perches such as reeds, but the sheer weight of the birds causes some to be forced into the water, where they may drown or be taken by crocodiles. Waterlogged birds which get ashore are exposed to waiting predators such as Marabous* (Leptoptilos crumeniferus) *and kites* (Milvus).

[*Quelea quelea lathamii*, Etosha National Park, Namibia.
Photo: Michael & Patricia Fogden]

skin once the feathers have been parted; at this stage, it may even be possible to identify the seeds visually without removing them from the bird. Nestlings are generally fed on crushed and partly digested seed material, which is regurgitated by the parent.

Anting, referred to earlier in relation to plumage care (see General Habits), has been described also as being a technique for getting rid of the distasteful formic acid before eating the ants. Several weavers do eat ants, but in the case of the Cape Weaver, at least, they will swallow them without any prior preparation, or after no more than a brief wipe on the ground. Ants used for anting are sometimes consumed, but often simply discarded. So, the mystery remains, and it seems likely that this behaviour will not be amenable to any single "functional" explanation.

Many weavers will hawk flying insects, and at their breeding colonies Southern Red Bishops are able to catch dragonflies (Odonata) over the water, feeding these insects to young in the nest. Termite (Isoptera) alates, the winged reproductive individuals which emerge during rainy periods, are a favourite bird food throughout Africa and elsewhere, and are eaten by almost any species which is capable of catching them. Eagles (Accipitridae) will run about on the ground in pursuit of termites after they have landed, while tiny waxbills may need several bites at a flying termite in order to disable an insect with a wingspan as large as their own. Weavers generally take the termites in the air, returning to a perch to feed on them, but they may also pursue those insects which have landed on the ground to search for a new nesting site, or they will seek out the openings to the underground galleries from which the alates are emerging.

Insectivorous weavers use various feeding techniques when foraging in the trees. There are the so-called "nuthatch weavers", which probe bark crevices on the trunks and branches of the forest trees, working systematically upwards; their foraging methods are reminiscent of those of nuthatches (Sittidae). The foliage-gleaners focus their attention on the growing leaves in the canopy, while the dead-leaf specialists operate in the middle storey where wads of fallen leaves have become lodged in lianes and saplings. These are all agile birds, often hanging upside-down while inspecting the vegetation for concealed insects, insect eggs, and larvae such as caterpillars. In both forests and savanna woodland, weavers are able, with the strong bill, to tear off flakes of bark so as to expose the insects and other arthropods concealed beneath.

A common observation in many regions is that bird occurrence in forest and other woodlands is very patchy. There are long, quiet stretches where the observer encounters hardly any birds, and then, suddenly, a flurry of sightings of several individuals of different species, all actively feeding close to one another. In the older African literature, the term "bird parties" became established for these multi-species associations of insect-eating birds, whereas elsewhere the more formal term "mixed-species flocks" was current. At conferences there were jokes about the frivolous African birds attending parties, while the earnest foragers elsewhere joined mixed-species flocks. Nevertheless, closer examination has shown that, throughout the world, such associations have several common features. The participating birds belong to different families, and forage in different ways, some hawking insects, some gleaning from the leaves, some probing crevices in the bark and along branches, and some even scuffling through dead leaves at ground level. In addition, different categories of flock membership are apparent: core species seem to be invariably encountered in such flocks and may even initiate flock formation with their calls, which attract other birds to join them; regular members join flocks at every opportunity; and occasional members are species which generally forage independently, but which do sometimes associate with mixed flocks. The main postulated benefits of joining a flock relate to better security from predators, and to advantages in food-finding. In the case of mixed-species flocks of insectivores, the consensus view seems to be that improved foraging success brought about through the "beater effect" of the flock, its members disturbing many concealed insects, is the primary reason why these assemblages are formed.

Most weavers drink and bathe regularly. This can prove hazardous for queleas because when a huge flock approaches a water-hole, some individuals are inevitably forced down into the water, where they may drown or be taken by predators. Many members of the subfamily Plocepasserinae, however, inhabit relatively arid areas, and are unlikely to have regular access to water. Studies of captive individuals have shown that the Scaly-feathered Finch can survive for months without drinking, and this species has the capacity to produce metabolic water on a diet of dry seeds. In the Kalahari Desert of south-west Africa, Sociable Weavers drink irregularly, but for how long they can manage without access to water is not clear.



The displaying male Red-billed Buffalo-weaver (Bubalornis niger) *spreads his wings to show the white patches. This* ***White-headed Buffalo-weaver*** *may be doing something similar, though its display appears not to have been described. Unlike the two* Bubalornis *species, the White-headed Buffalo-weaver is monogamous, and the two sexes build the nest together, the construction perhaps forming part of their courtship. Unusually for weavers, the grassy inner section is built first, then surrounded by a shell of thorny twigs.*

[*Dinemellia dinemelli dinemelli*, Lake Bogoria National Reserve, Kenya. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

Breeding

A familiar image of weavers involves a bustling breeding colony, with brightly plumaged males displaying around the nests. Over half of the species in the genus *Ploceus* are colonial, mostly forming relatively small aggregations of about a dozen to a few hundred nests. The Village Weaver is a highly colonial species, and more than 200 of its nests may be found in a single tree, with some colonies boasting in excess of 1000 nests. It often breeds in mixed colonies with a variety of other species: in West and Central Africa it mixes most commonly with Vieillot's Black Weaver, which apparently uses similar nesting materials, prefers the same tree species, and nests at similar heights; in parts of South Africa it typically shares its colonies with the Cape Weaver. All *Quelea* species are colonial. The Red-headed Quelea breeds in colonies which can consist of hundreds or thousands of nests, but the Red-billed Quelea forms truly immense colonies: as many as 6000 nests have been recorded in a single large tree, and colonies in north-east Nigeria were noted to cover more than 110 ha, with estimates of a staggering 31,000,000 nests. At the other extreme, many species are normally solitary nesters, including the fodies, most of the bishops and widowbirds, and most of the malimbes.

Crook noted from his studies that there was a clear correlation between habitat, feeding biology and breeding dispersal in the family as a whole: savanna granivores were typically colonial and polygynous, whereas forest insectivores were solitary and monogamous. This broad picture holds true, and there seem to be good ecological explanations for the few exceptions. The Red-billed Quelea is the classic colonial granivore, yet it is monogamous. The explanation seems to be the rapid and highly synchronized breeding at each colony, which offers no opportunity for extended display and mate acquisition by the male, while both parents are needed for the task of brood-feeding. Individual queleas, however, may breed sequentially at several different colonies during a single season, and it is likely that they then have different partners. Thus, this species may actually practise sequential polygyny over a slightly longer time span and a different geographical range as compared with other weavers, which remain at a single colony for an extended breeding period, during the course of which they may acquire several mates, some of them in residence simultaneously.

The question of how polygyny, whereby a male is mated simultaneously with several females, evolved is an interesting one. Although recent genetic studies indicate that strict monogamy is not so universal among birds as had been thought, and that extra-pair copulations are responsible for up to 30% of the eggs produced by some species, the great majority of bird species must be considered socially monogamous. This implies that polygyny is a derived condition in evolutionary terms, and that the ancestors of the polygynous weavers were monogamous. This need



Fluffing out its body feathers until it resembles a giant bumble-bee, the ***Yellow-crowned Bishop****, like other short-tailed bishops, performs its "bumble-flights" at the approach of a female. This is followed by a perched display if the female lands. Male Yellow-crowned Bishops are polygynous, and hold territories bunched into small colonies. Reproductive success appears to depend on the number of nests built within a territory, rather than individual attractiveness or courtship behaviour.*

[*Euplectes afer taha*, Mpumalanga, South Africa. Photo: S. C. Hendriks]



When a female enters his territory, the male ***Long-tailed Widowbird*** *performs his flight display, with laboured wingbeats showing his red "epaulettes". Females visit several territories in succession, and experimental manipulation of tail length suggests that they choose the longest-tailed males. These are likely to be the oldest individuals, since the tail feathers increase in length over successive seasons. Male Fan-tailed Widowbirds* (Euplectes axillaris) *are similarly black with red shoulder patches. In field experiments which manipulated the size of the red patches, males with enlarged epaulettes defended larger territories and spent less time in boundary signalling, yet received fewer intrusions from other males. Most of those with reduced or blackened epaulettes failed to obtain territories.*

[*Euplectes progne progne*, Pretoria, South Africa. Photo: Kevin Ravno]

not, however, imply that the present-day monogamous forest species are older than, or ancestral to, their polygynous relatives in the savanna. A number of these species, such as the Spectacled Weaver, share such characters as sexual plumage dimorphism and the male's dominant role in nest-building with the polygynous species. They could equally well be descendants of savanna-dwelling populations which have colonized a new habitat, and subsequently changed their mating system.

One could hypothesize that the two key elements in the origin of polygyny among ploceids are the territorial system and the fact that the male is the main nest-builder. In savanna, food supplies are widespread in the grassland, but secure nesting sites which are within easy reach of food are much more restricted in their distribution. This would enable a limited number of males to occupy and dominate all the available nesting sites, and nesting attempts elsewhere would be unsuccessful. Females leaving surviving offspring would, therefore, be those mated to the territorial males in prime habitat, and this may compel them to mate with a male already mated with one or more other females. With the majority of monogamous species, both sexes participate in nest construction. From this point, the successful male remaining on and defending his territory may come to play the major role in nest-building and, with the opportunity to acquire additional mates, to adopt a lesser role in parental care. Experiments with normally monogamous passerine species such as the House Sparrow (*Passer domesticus*) and the Common Starling have revealed that a change in hormone levels, in this case an increase in testosterone, will cause the males to switch from parental care to renewed courtship, leading to the acquisition of extra mates. In several polygynous species, the fact that young males do not come into breeding condition in their first year, whereas females do, results in the sex ratio of breeders becoming skewed, which will reinforce polygyny. Yet in the adult population, males are often the more common of the two sexes overall, perhaps because females suffer higher mortality as a result of their single-parent role.

Visual displays are closely linked to the distinctive plumages of the Ploceinae, and the striking spectacle of a weaver breeding colony will be a lasting image of Africa for many visitors. In his review of the courtship behaviour of the members of the Ploceinae, embracing the genera *Malimbus*, *Ploceus*, *Amblyospiza*, *Notiospiza*, *Anaplectes*, *Pachyphantes*, *Brachycope*, *Quelea*, *Foudia* and *Euplectes*, Crook distinguished three primary pair-formation types. In the first, "type 1", the male chases and approaches the female, often far from the nest; this initial courtship is then followed by nest-invitation displays. In "type 2", the female is attracted to male displays centred on the nest; further courtship and nest invitation ensue. The third, "type 3", is characterized by aerial displays performed by the male over his territory to attract the female; perched courtship within the territory then follows.

If one extends this survey to the social-weavers and sparrow-weavers in the subfamily Plocepasserinae and the buffalo-weavers of the Bubalornithinae, these could best be treated as a subset of type 2, since the nest is a central element in the social organization of all of these species. At the foundation of a new colony, nest construction by the future breeding pair will form an initial part of their courtship. In the case of the social-weavers, the available descriptions suggest some parallels to the waxbills, in which ritualized movements while holding nest material in the bill form an important element in courtship. Such displays have not been recorded for any of the Ploceinae.

For many of the monogamous weavers, which may have long-term pair-bonds, observations of breeding birds could reflect the behaviour of established pairs, those elements specific to initial pair formation being omitted. In contrast, the courtship behaviour of polygynous species is likely to represent the full sequence of displays to a new partner each time. Thus, it is likely that the current understanding of pair-formation types 2 and 3 is much more complete than is that of type 1. In many cases, knowledge of the courtship behaviour of individual species, particularly that of forest weavers, has advanced little since Crook's field studies, which were made in the 1960s.





Nest-building male Ploceus *weavers like this* ***Holub's Golden Weaver*** *tear thin strips from grasses, reeds and palms. They perch on the stalk or base of the leaf and bite through one edge, beginning the tear while still perched, then tearing off the rest of the strip by flying in the direction of the leaf's tip. This technique requires practice. A study of captive Village Weavers* (P. cucullatus) *found that while experienced males tore off the strip in one smooth action, young males made mistakes such as starting the tear too close to the tip, tearing in the wrong direction, or tearing strips that were too short to be woven. Female* Ploceus *weavers normally choose fresh green nests, and males tear down rejected nests as they turn brown. Sparrow-weavers* (Plocepasser), *in contrast, normally use dry grasses and other stiff materials which they push together without interweaving them. In the same subfamily, the* ***Black-capped Social-weaver*** *tends to build its nest out of thin grass stems. Its nest ends up as a roughly conical, rather prickly-looking but quite neat aglomeration, with a mass of thin, dry grasses sticking out in all directions. Material may be added throughout the year by both sexes. At times, several neighbouring nests may be merged into what appears as a single structure.*

[Above: *Ploceus xanthops*, Nyika National Park, Malawi. Photo: Johannes Ferdinand.

Below: *Pseudonigrita cabanisi*, Samburu National Park, Kenya. Photo: Jürgen & Christine Sohns/FLPA]

Regarding pair-formation type 1, observations by Craig appear to support Crook's proposal that, in monogamous, solitary-nesting species such as the Dark-backed Weaver and Spectacled Weaver, the male's initial courtship approaches to the female involve "song bows" or "song stretches", which take place far from the nest-site. Once the birds are together at the nest, the pair-bond is probably already well established. Nest-invitation displays, in which the male leads the female to the nest and vocalizes, are designed to induce her to enter the nest and accept it as a breeding site.

In type 2, for open-country, polygynous species such as the Village Weaver, the Southern Masked Weaver and the Cape Weaver, the sequence of events is much easier to observe. Males establish breeding territories, which they defend aggressively by threat postures and, if necessary, overt fighting. Within these territories, they begin nest construction, at which stage females begin regular visits to the breeding sites. Every approach by a female, or, indeed, by any female-plumaged individuals, which may include subadult males and even other weaver species, elicits bursts of song and display at the newly completed or even incomplete nest. Such displays often involve wing-beating by the male while he hangs below the nest. Apart from the plumage details of the displaying males, species differ in various facets of these displays, such as the frequency of wing-beating, the angle of the body, and similar details. In mixed colonies, it is assumed that females make their initial mate selection on the basis of such species-specific cues. From the nest, the male may fly towards the female, even pursuing her well beyond his territory, before returning to the nest until she is induced to enter it, whereupon perched courtship and copulation follow.

Type 3 pair formation is typical of species which conceal their nests in low vegetation, such as the members of the genus *Euplectes*. This group has been studied extensively in recent years. Again, males establish territories which they defend against conspecifics and also, sometimes, against related species. For the Southern Red Bishop and similar short-tailed species, the arrival of putative females is greeted with calling, and often with an aerial display-flight during which the body plumage is fluffed out so that the bird resembles a fuzzy bumble bee (*Bombus*), these displays often being referred to as "bumble-flights". This provides a marked visual contrast to the sleeked body plumage and more rapid approach of an aggressive male aiming to displace an intruder; the species-specific colours and pattern are enhanced in this display. If the female lands within the territory, the male initiates perched displays, again quite different from the threat postures directed at trespassers. The sequence of perched displays will progress towards the nest-site, culminating in the female entering and ultimately accepting the nest prior to copulation.

Within this genus, there is a striking development in the form of the visual signals. The short-tailed bishops differ in their plumage colours, which are black, with red, orange or yellow, and in the distribution of the coloured patches on the body. A second group, represented by the Fan-tailed Widowbird and the White-winged Widowbird, has black plumage except for coloured epaulets, and a longer black tail, which is fanned in display. In this case, the flight style over the territory enhances the visibility of the epaulets, whereas there is no obvious fluffing of the body plumage. In the most sexually dimorphic members of the genus, the tail is greatly extended, most dramatically so in the Long-tailed Widowbird, on which it can be half a metre long; during display over the territory, it is held curved in a "keeled" posture, while the flight appears slow and laboured and the red-and-white epaulets are highly conspicuous. Once again, females tarrying in the territory will then be approached by the male in perched courtship near the nest frames, where the final acceptance of the male will be consummated.

Jackson's Widowbird has evolved a unique variation on the aerial display, and has also taken the polygynous mating system to its ultimate development, namely a lek, where the males display but provide neither a territory nor a nest for the female. In their open-grassland habitat, these all-black, long-tailed weavers establish dance courts, rings of trodden grass with a carefully trimmed tuft in the centre, where single males display by making vertical leaps which take them briefly above the level of the surrounding grass. Females landing within a court are then treated to a ground-based display. Since the male directs much of his display towards the central tuft, and as females no longer visit courts from which the tuft had been removed, even though the attendant male may continue to dance there, it would appear that this piece of avian topiary can be regarded as a symbolic nest-site.

The nests of the typical weavers, those in the subfamily Ploceinae, are characterized by the fact that the interwoven ma-



*The male **Crested Malimbe** initiates the construction of the nest, which is crudely woven from fibres such as strips of palm leaf, leaf petioles and vine fragments. The female then joins in, and the nest can be completed in a single day. In some malimbes, nest-building is co-operative. For example, in the Red-crowned Malimbe* (Malimbus coronatus), *a group of 3–6 individuals may participate, although at the end a single pair will be left alone to breed. In Cassin's Malimbe* (M. cassini), *nest-building regularly involves one female and several males. The dominant male subsequently displaces the others.*

[*Malimbus malimbicus crassirostris*, Budongo Forest Reserve, Uganda. Photo: Pete Morris]



*Nests of the **African Golden Weaver** are often attached to a single reed stem on one side, but sometimes they are supported by a reed on each side. Nest construction in* Ploceus *species usually starts with the male building a cross-bridge by knotting each end of a piece of material to two supports. With a single support, the male ties the leaf strip or grass stalk into a ring. In the completed nest, the cross-bridge will form the lower lip of the entrance, and the ring the full entrance. The bird uses the bridge or ring as a scaffold on which to perch while shaping and stitching the nest. Shape and dimensions of the nest are therefore determined by the distances to which the bird can reach up, out and around from its perch. The African Golden Weaver weaves its nest very neatly from grass blades or strips torn from reeds. The finished structure is oval to spherical, with the entrance on the underside. Nests are usually placed 1–2 m above water or the ground, but on Zanzibar, they can be as much as 9 m up in tall tamarinds or coconut palms.*

[*Ploceus subaureus subaureus*, Mkuze, South Africa. Photos: Pete Morris]



*The male **Red-headed Weaver** builds its retort-shaped nest from flexible twigs, which are meshed together rather than tightly woven. The twigs are sometimes tied to one another and to the supporting branch with tags of green bark, deliberately torn by the bird; these tighten as they dry out. The finished nest looks rough and untidy, and often has leaves and acacia pods incorporated into the roof. The male may build several nests in close proximity. This species is usually polygynous and colonial, although sometimes solitary monogamous pairs are found.*

[*Anaplectes rubriceps rubriceps*, Modimolle, South Africa. Photo: Warwick Tarboton]

terial forms a completely enclosed chamber, either with the entrance at the side and the nest orientated vertically along its longest axis, or with the entrance below and pointing downwards to the ground surface. Nests with a side entrance are attached to two or more vertical supports, such as grass stems or reeds; those with the entrance below may be attached to one or more bits of vertical vegetation, but are often suspended from the tip of a branch or a hanging creeper. Exotic vegetation is often used for nesting, this including eucalypt trees (*Eucalyptus*) in Africa, which are otherwise not frequented by many indigenous birds. Suspended nests may have the entrance extended into a tunnel, the length of which can vary considerably, even within a single species. Predation was probably the major force leading to the evolution of such a nest structure. Most designs of weaver nest appear to shed water well, so that the inside remains dry, which is certainly an advantage for birds the breeding seasons of which often coincide with the rainy season.

Nest construction usually starts with the male building a cross-bridge between two supports and knotting the material on to the vegetation. This bridge will form the lower lip of the entrance in the completed nest, and it provides a platform on which the male perches during the later work. In most species, the male builds the basic structure, the female contributing lining material once a nest has been accepted for breeding. In some cases, the female is involved from a much earlier stage, and in the case of Jackson's Widowbird all building is done by the female, the male producing no nest structure at all. This is related to this species' "exploded lek" mating system, whereby the males set up individual display grounds to which the females come for mating; in a classic lek, the males gather at a communal display arena. After selecting their partners, the female Jackson's Widowbirds leave the male territories and nest elsewhere, so that the males serve merely as sperm-donors.

Material used in the construction of the nest varies, often according to what is available. For example, one pair of Spectacled Weavers on a farm constructed an entire nest from the mane and tail hairs of the resident horses, instead of the usual fine strips from palm leaves or grass leaf blades. In forest, slender pliable twigs or bits of creeper may be used whole. A few forest or woodland weavers construct their nests almost entirely from lichens of the old-man's beard (*Usnea*) type. In many other situations, the birds collect strips of material from grass or the leaves of reeds and palms. The usual technique is that the weaver perches, pierces the leaf blade near its base and then, still holding the blade in its bill, flies off, tearing a long, narrow strip of green material from the living plant. There is some evidence that females favour fresh, green nests, and the males, or sometimes the females, of several species will systematically demolish nests which have not been occupied by a female. Males on their territory often carry out "leaf-stripping", when they systematically detach leaves from the area around the nest and then drop them. The movement used resembles the initial movement of collecting building material, and, although there have been suggestions that this activity denudes the branches and thus makes it more difficult for arboreal predators to reach the nests, it may be merely a displacement activity. The behaviour appears to be much more frequent when the males are unsettled by the presence of a human observer in full view than it is when the observer is concealed in a hide. The lining material consists most commonly of the soft seedheads of grasses and other plants, while feathers are rarely used by most species of Ploceinae, in contrast to other bird groups, such as the waxbills, and to some of the Plocepasserinae.

The addition of mud, or wet dung, to the nest structure is widespread among some Asian weavers, and has been reported also for one African species, the Compact Weaver. It is not clear whether there is any good functional reason for this behaviour; in other bird groups, such as starlings and the thrushes of the genus *Turdus*, it is also found in some species yet not in others which are thought to be close relatives and occupy similar habitats. In southern Asia, there is a persistent legend that the Baya Weaver deliberately embeds fireflies (Lampyridae) in the mud in order to provide a nightlight for the nest occupants, or perhaps to deter predators. R. Mail claimed that the original observations were made by a French sea captain, M. Briard, and the story was repeated in several compilations, including the works of the ornithologist A. E. Brehm. Apart from parasites such as mites and lice, weaver nests do provide shelter for a number of other arthropod species, and it is quite feasible that fireflies may enter the nests and become stuck in fresh mud. Alternatively, a weaver could accidentally pick up a firefly along with a load of mud.





*The bulky, kidney-shaped nest built by **Holub's Golden Weaver** is generally slung by the roof from a branch or tall reeds, although it may sometimes be suspended between two uprights. The nest is built by the male, using broad-bladed grass, with the female contributing the lining of softer grasses, and sometimes a pad of plant down or a few feathers. In most finished nests, the entrance faces downwards. Several nests may be built before one is occupied. The site is often over water, and two or three territorial males may form a loose colony. Like many other* Ploceus *species, Holub's Golden Weaver strips the leaves from the vegetation immediately around the nest. Various explanations have been suggested for this behaviour, but in Holub's Golden Weaver it has been observed as part of an apparent courtship display: the male slowly climbed an adjacent vertical vine, pulling off and dropping each leaf, all the while quivering his tail. In the normal display, the male perches beside the female, leaning forward, with his head and throat feathers ruffled, and sings. He also uses this "song stretch" display when he meets the female after a separation.*

[*Ploceus xanthops*, Karen, Nairobi, Kenya. Photos: Dave Richards]



*The nest of the **Red-vented Malimbe** is in the shape of an inverted sock. It has a round egg chamber and a tunnel below, which is up to 60 cm long with a flared entrance. The male and female both work on the nest, possibly with the help of other adults. The structure begins with a "trellis", shown here, which is gradually filled in. The nest is very neatly woven from palm fibres or vine tendrils, and the tunnel is semi-transparent. The nests are built in palms, sometimes as low as 6 m up, but often in the canopy. In Nigeria, this species often shares raffia palms with nesting Blue-billed Malimbes* (Malimbus nitens)*, but always occupies the higher sites in the trees.*

[*Malimbus scutatus scutopartitus*, Lekki Peninsula, Lagos State, SW Nigeria. Photo: A. P. Leventis]

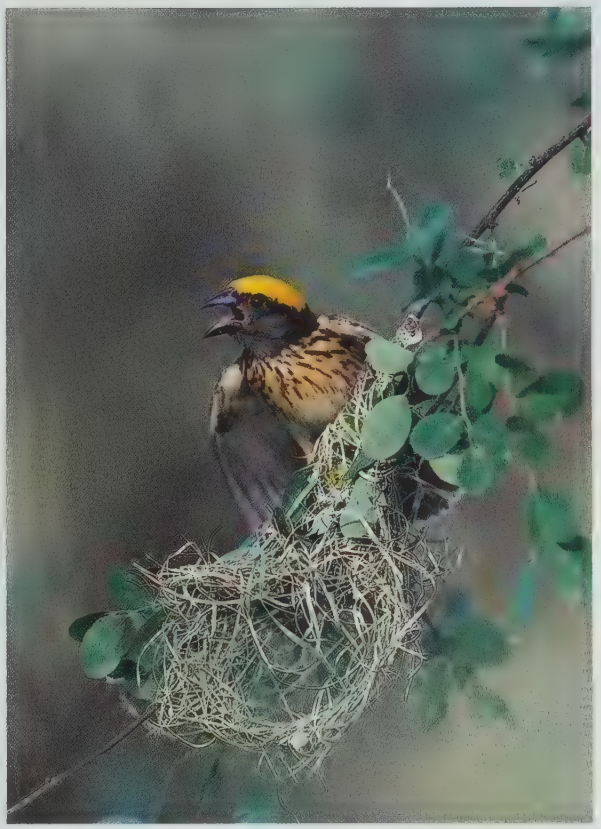
Recent observers, however, have failed to find a single instance of the accidental or deliberate miring of insects in these blobs of mud. There is no evidence that Baya Weavers include "interior lighting" in the construction plan for their nests.

Many polygynous weavers build numerous nests during a single breeding season. On entering a territory, the female often appears to show more interest in the nest than in the male himself, and she will enter it, clamber around on the outside, and tug at the material. Females must have some measure of quality control, although this has proved difficult for human observers to quantify. Fresh, green nests are much more likely to be accepted than are older models with dry, brown material. The males of some species, such as the Southern Masked Weaver, regularly demolish unoccupied nests, the most obvious explanation for which seems to be that this makes sites free for new construction. One such male in a Zimbabwe garden built 52 nests over a



According to a pioneering analysis by J. H. Crook in the 1960's, open-country weavers have simple, globular or kidney-shaped nests because their breeding season is too short for the elaborate architecture and fine weaving possible to forest species like the Red-vented Malimbe (Malimbus scutatus)*, which have longer seasons. Breeding in any month when rain falls, **Rüppell's Weaver** often nests in colonies. Males will breed with up to three females, and build up to eight flattened, globular nests, woven from grass or long strips torn from palm fronds. Initially the nest lacks an entrance tunnel, but sometimes one is added later, the new green material contrasting with the dried brown egg-chamber.*

[*Ploceus galbula*, Salalah, Oman. Photo: Hanne & Jens Eriksen]



*This male **Streaked Weaver** is displaying at a partially completed nest, woven over the leaves of the supporting branch. In another Asian species, the Baya Weaver* (Ploceus philippinus)*, the male begins displaying when the nest has reached the "helmet" stage, with the wall of the egg chamber (the face-opening of the helmet) still open, and a second aperture where the vertical entrance tube (the neck of the helmet) will be built. The visiting female perches on the "chinstrap" between the openings to inspect the nest, and the pair may mate. If the nest is successful in attracting a female, the male completes the egg chamber and builds the entrance tube.*

[*Ploceus manyar flaviceps*, Keoladeo Ghana National Park, India. Photo: Manfred Pfefferle]

period of 250 days, in some cases five successive nests on the same branch. Of these nests, twelve were occupied by females, but, as the birds were not ringed, it is possible that some of these, at least, may have been used by females for two broods. At some point the male demolished most of the nests, of which some had been occupied by females, whereas others had never been utilized. Observations of the time budgets of Southern Red Bishops, which evidently never demolish nests, revealed that males spent about as much of their time on the territory in nest-building as in active courtship of female visitors. The ontogenetic development of nest-building behaviour has not been adequately studied. Captive Village Weavers appeared to need practice in manipulating nesting material during their first year in order to build normal nests as adults, but this is hitherto the only member of the family for which the acquisition of nest-building skills has been recorded in sufficient detail.

Within the genus *Euplectes*, male nest-building appears to decline in relation to increasing tail length and more elaborate aerial displays. Whereas male Southern Red Bishops may construct up to 17 nests within a tiny territory of about 8 m², male Long-tailed Widowbirds do little more than twist a few grass blades together while perched in the territory between display-flights. The sites used by the males are not necessarily selected by females, which are responsible for nest construction. The most interesting situation is found on the dancing arenas of Jackson's Widowbird, where, as already noted, there is a central tuft in the male's display court. The male trims this, and moulds it by pushing against it, but does not weave it in any way. The female nests away from the male display areas, and constructs and lines the nest unaided; in structure, the nest closely resembles those of other members of the genus. From field experiments in which the tail length of males of several species has been artificially altered, it appears that the act of increasing the tail length does make the male more attractive to females. This provides support for the theory that such ornaments could evolve through a process of sexual selection, whereby the sole advantage to the male is that of increased reproductive success. A phylogenetic reconstruction of the *Euplectes* species supports the idea that long tails have evolved through directional sexual selection.

Increasingly extravagant ornaments may be held in check by natural selection once they handicap the individual to the point that his chances of survival are reduced. Old travellers' tales tell of Long-tailed Widowbirds being unable to fly after heavy rains, so that they could be caught by hand. An English aviculturist who had kept this species in an outdoor aviary was sceptical, however, and reported that his birds seemed to fly perfectly well in the worst of the English summer weather. The natural habitat of this species is highland grasslands with little cover, and heavy rainfall usually occurs in the form of thunderstorms during the summer breeding season.

In contrast to the typical weavers in the subfamily Ploceinae, the sparrow-weavers and the buffalo-weavers use straight, rigid nesting material, which they push together and do not interweave. Both sexes and often several group-members participate in nest construction, which starts with the laying of building material on or across a horizontal branch. Either twigs or dry grass stems are utilized, and several species have the habit of amalgamating the nests into a single bulky structure. A number of studies of the White-browed Sparrow-weaver have shown that, on single trees, the nests are arranged so that most lie on the side away from the prevailing winds. This building style is most highly developed in the Sociable Weaver, where a single roof covers numerous individual nest-chambers, some of which may even house other species. These nests persist at the same site for many years, in some cases until the tree supporting them ultimately collapses under their weight, on occasion as much as a tonne.

Plain white eggs are laid by all five Asian weavers. In the rest of the family's range, however, unmarked white eggs are unusual, and have been reported for only twelve other species, whereas plain blue or blue-green eggs are typical of more than 30 species. Other plain colours, such as grey and brown, are rare, each having been recorded for fewer than five species. White eggs with markings have been reported for some 30 species, and blue or greenish eggs with markings for about 50. There is often a great diversity of pattern and coloration within a single species. For 16 of the currently recognized ploceids, the eggs remain undescribed. Since the weavers are mainly a tropical group, clutch sizes tend to be small, with two eggs typical of many species and clutches containing more than three eggs quite unusual. The largest clutches attributed to a single female appear to be of five eggs, recorded for the Cape Weaver and the Baya Weaver, both of which



*The nest of the **Speckle-fronted Weaver** is a large untidy ball of dried grasses, loosely assembled rather than woven, as is typical for a member of the Plocepasserinae. This subfamily includes the highly colonial social weavers, but Speckle-fronted Weavers nest singly or in very small colonies. The thorns apparent in this tree provide some protection against predators, and this species also nests occasionally near colonies of the wasp* Ropalidia cincta*. Indeed, there are many examples of nesting ploceids seeking the protection of more formidable species, from drongos (Dicruridae) to crocodiles.*

[*Sporopipes frontalis emini*, Lake Manyara National Park, Tanzania. Photo: Anabel Harries]





Using grasses and strips of palm leaves, ***Vieillot's Black Weaver*** *takes around nine hours to complete a nest. This species is polygynous, and there may be several nests in the territory of one male, which in turn may be part of a colony of dozens or hundreds of nesting weavers. The black nominate and chestnut-and-black race* castaneofuscus *interbreed, where their ranges meet in southern Nigeria. Vieillot's Black Weaver is often found in mixed colonies with the closely-related Village Weaver* (Ploceus cucullatus)*, with which it shares much of its sub-Saharan range. These colonies are truly mixed, without the separation by height which occurs in some other mixed colonies of closely related species, such as malimbes* (Malimbus)*. The two species also use the same nest materials. In his nest-advertisement display, the male Vieillot's Black Weaver hangs below his nest entrance, quivering his wings. The male Village Weaver has a similar display, but he beats his wings rather than quivering them, showing off the yellow wing-linings, which Vieillot's Black Weaver lacks. The two species occasionally hybridize.*

[Above: *Ploceus nigerrimus nigerrimus*, Entebbe, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com.

Below: *Ploceus nigerrimus castaneofuscus*, Cape Coast, Ghana. Photo: Dick Forsman]

have a distributional range extending into temperate regions, and of five or six eggs, laid by the Scaly-feathered Finch, the Red-billed Quelea and the Sociable Weaver, all birds of arid and semi-arid regions exposed to highly variable conditions. In the case of the wide-ranging Village Weaver, clutch sizes in South Africa are reported as being of 2–4 eggs, whereas clutches in Central Africa usually consist of two eggs. Any study of latitudinal variation in clutch size within this family would require large samples, since the differences are likely to be small.

Among the Ploceidae, the incubation period is typically no more than 14 days, with 12–14 days apparently the standard for most of the species which have been studied at the nest. Accurate information in this regard, however, is lacking for more than half of the ploceid species. Periods as short as 10 days have been reported for the Scaly-feathered Finch and the Fire-fronted Bishop (*Euplectes diadematus*), both of which are small-sized species weighing no more than 10–15 g. The Red-billed Quelea is also characterized by its very short incubation period of 10–12 days, which appears to be one of the adaptations for the rapid breeding cycle of this species; breeding at a colony is closely synchronized, and the area may be occupied for fewer than 40 days in total.

With polygynous species, such as the Cape Weaver, the female undertakes all of the incubation duties, and thus has to leave the nest for periods in order to feed. Records of nest temperature indicate that the nest itself has no special insulative properties, and during the female's absence the eggs are at much the same temperature as their surroundings. In the region where the Cape Weaver occurs, however, both sexes of the monogamous Spectacled Weaver incubate, so that the eggs are seldom left untended. Nevertheless, the two species have the same clutch sizes and similar egg sizes, and their incubation periods are virtually identical. Perhaps, in the case of the Spectacled Weaver, the partners share incubation for social reasons, rather than physiological ones.

The males of many polygynous weavers do not feed their young at all. Males of some species may occasionally feed nestlings, or they will feed fledglings which have left the nest. There appears, however, to be individual variation in this respect, and in captivity, when only a single pair is present, the male may play a more active role than usual. One surprising observation concerned a male Northern Red Bishop, a species in which the male normally makes no contribution to the rearing of the young. A captive male of this bishop enthusiastically fed the young of some domestic canaries held in the same aviary, provisioning them both in the nest and after they had fledged. This suggests that such behaviour may not have been lost by these species, although it will normally take second place to such activities as nest-building and courtship. Experimental studies indicate that, for many birds, hormone levels are critical in determining whether, during



*The elaborate retort-shaped nest of the **Spectacled Weaver** takes up to three weeks to complete. This species is monogamous, with a long-term pair-bond and, unusually among weavers, the female occasionally helps with the outer fabric of the nest as well as the lining. Fine strips of plant fibre are used, and the birds may nibble the strips to make them pliable before knotting or threading them into place. The tunnel is often wide enough for the birds to pass one another on the way to and from the brood chamber, where both sexes will incubate the eggs.*

[*Ploceus ocularis*, St Lucia, South Africa. Photo: Kevin Ravno]



*Using thorny twigs up to 75 cm long, groups of **Red-billed Buffalo-weavers** build massive compound nests, which contain multiple brood chambers. They continue to add material throughout the breeding season, and the structure may be used for several years. In the non-breeding season, the birds roost in it. The Red-billed Buffalo-weaver is usually polygynous, one male breeding with a number of females, but it is sometimes co-operatively polygynandrous, two or more males sharing a group of females, and the females copulating with more than one male. The phalloid organ is longer in males resident at a nest, and longest in those with a harem of females.*

[*Bubalornis niger intermedius*, Yabello, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



*Small groups of **White-browed Sparrow-weavers** occupy their territories throughout the year. They build horizontal, cylindrical nests of grass, open at both ends, which they use for roosting. The grasses are bent to shape, not woven. Only the dominant pair will breed, and the breeding nest is closed off at one end. All the birds in a colony, whether or not related to the dominant pair, participate in defence of the territory. Most, if not all, work together on new nests. However, only the offspring of the dominant pair help feed the young, and the dominant female alone incubates. As a result of relatively low breeding success and high adult survival, group size is fairly stable.*

[*Plocepasser mahali*, Tsavo West National Park, Kenya.
Photo: James Warwick/ NHPA]

the breeding cycle, a male will switch to "fathering" or will carry on courting and try to acquire more mates, testosterone promoting courtship and progesterone prompting parental care.

Co-operative breeding, whereby birds other than the parents assist in raising the young, has been reported for many families of African and Asian birds. Among the ploceine weavers, however, it is apparently rare. In the case of some of the forest-dwelling *Malimbus* species, nest construction initially involves a group of individuals, but the helpers apparently leave on completion of the structure. Co-operative nest-building of this kind has been confirmed for Cassin's Malimbe (*Malimbus cassini*), Rachel's Malimbe (*Malimbus racheliae*), the Red-crowned Malimbe (*Malimbus coronatus*) and the Gola Malimbe (*Malimbus ballmanni*), and it may be a feature also of the Red-vented Malimbe (*Malimbus scutatus*). There are no records of helpers assisting with incubation of the eggs, but at nests of the Gola



Like its congener the Grey-headed Social-weaver (Pseudonigrita arnaudi), *the **Black-capped Social-weaver** is thought to be monogamous, and a co-operative breeder. Colonies may consist of up to 60 bulky nests, which sometimes merge into an apparent compound nest. All nests initially have two entrance holes at the bottom, but in those used for breeding, one hole is closed. In the Grey-headed Social-weaver, both parents incubate. Whether or not the Black-capped Social-weaver follows the same pattern is not yet known, but both parents, together with helpers, feed the young. In captivity, a pair of breeding Black-capped Social-weavers and a single adult helper all roosted in the nest with the young.*

[*Pseudonigrita cabanisi*, Arero, Ethiopia.
Photo: Ketil Knudsen]





*The compound nest of the **Sociable Weaver** is built cumulatively over the years, and may reach a tonne in weight and 4 m in depth. The nest is built around a supporting branch, with a rounded roof above it, and the nest chambers below. The chambers are not interconnected, although they may be packed so closely that the downward facing entrance holes are just 10 cm apart. A ridge next to the entrance tube stops eggs rolling out of the brood chamber. The nesting material is mostly dry grass and plant stems, although twigs may also be used in the roof. The birds thrust new straws into the existing mass with repeated movements of their bills, and they may bite the ends off. More than two birds are usually involved in the construction of a nest chamber: the dominant pair, and a number of helpers, which are thought to be previous offspring. Males do more building work than females, and females may concentrate on the interior of the chamber. Both sexes incubate the eggs, the female putting in more time than the male. In parts of their range, breeding is not seasonal, but depends on irregular rainfall, and can continue for up to nine months, with four successive broods. This species can be serially monogamous, the birds changing partners within the same season to raise new broods.*

[*Philetairus socius.*

Above: Kalahari Gemsbok National Park, South Africa. Photo: Andy & Gill Swash/ WorldWildlifeImages.com.

Below: Namibia. Photo: Ignacio Yúfera]



*Beginning with a knotted bridge between two adjacent uprights, the male **Thick-billed Weaver** builds a cup below the bridge, and then roofs it over. The material consists of very thin strips torn from reeds or grasses, the bird continuing to tear these strips until his beak is bristling with them. The side-entrance hole is made smaller with a descending "curtain" when the nest is occupied. The female contributes the lining. Thick-billed Weavers often nest over water, in small colonies, and are usually polygynous, each male having up to three females nesting in his territory simultaneously.*

[*Amblyospiza albifrons albifrons*,
Kruger National Park,
South Africa.
Photo: S. C. Hendriks]

Malimbe individuals other than the parents have been observed to feed the young occasionally. There is no suggestion of co-operative breeding by any other members of the subfamily Ploceinae, but it is regular for at least some of the Plocepasserinae. At the communal nests of the social-weavers, both those of the Sociable Weaver first studied by G. L. Maclean and those of the two East African *Pseudonigrita* species studied by L. A. Bennun, young from earlier broods may help their parents to feed younger siblings, but this phenomenon seems to be less frequent than one might expect from species in which most of the young do not disperse from the natal colony. The White-browed Sparrow-weaver has a "conventional" co-operative breeding system in which a dominant male and female are accompanied by subordinate helpers, at least some of which are the pair's offspring. The subordinate individuals help to defend the territory and also to feed the young, both in the nest and after they have fledged. The three other *Plocepasser* species have not been studied at the nest, but they, too, seem to be organized in resident flocks and may prove to have a similar social system.

A more complex arrangement, termed "co-operative polygynandry", has been found at some colonies of the Red-billed Buffalo-weaver (*Bubalornis niger*). This species is usually polygynous, a single male defending nests which may be occupied by several females. In some cases, however, two males form a coalition to defend a group of nests. The two may father young in the same brood, and also assist the females in feeding the offspring. Thus, each male may mate with more than one female, a situation of polygyny, while each female may mate with more than one male, in polyandry. For the White-billed Buffalo-weaver only polygyny has been recorded to date, but this species would certainly be worth reinvestigating, since the last detailed study of its biology was completed more than 50 years ago. In captivity, three White-headed Buffalo-weavers fed the nestlings at a single nest, and a field study may reveal some form of co-operative breeding.

Nestling periods are often difficult to determine accurately. One reason for this is that the young of many species, such as those of the Southern Red Bishop, may leave the nest prematurely if disturbed by a human observer during a nest inspection by the latter. The available data from field and aviary studies suggest that a period of 14–21 days is typical of the family, chicks of the smaller species leaving the nest earlier than those of larger-bodied birds. Here, too, the Red-billed Quelea is exceptional. The chicks of this species leave the nest after only 11 days, well before they are able to fly. They then perch in the nesting trees, where they continue to be fed by the adults until they attain final independence, at about 21 days. This presumably helps the youngsters to avoid the various nest predators which may be attracted to a quelea colony, and which may find nestlings easier prey than chicks clambering about among the thorny branches.

Although weaver nests are often placed in relatively inaccessible sites, they are conspicuous to any predators which use sight when hunting. Indeed, for most species in this family, nest predation seems to be the principal factor reducing breeding success. The huge concentrations of nests, and the close synchrony of breeding, in colonies of Red-billed Queleas are probably related to the defensive effect of "swamping" predators, so that the overall percentage of losses is reduced. A great diversity of mammalian, reptilian and avian predators may be attracted to such colonies. These range in size from leopards (*Panthera pardus*), monitor lizards (*Varanus*) and pythons (Pythonidae), storks (Ciconiidae) and eagles to rodents, egg-eating snakes and small hawks (*Accipiter*). Small quelea colonies can be totally destroyed by local concentrations of predators. Weaver eggs sampled by a human tasting panel varied in palatability; on a scale of 2·0 ("inedible") to 10 ("ideal"), they ranged from those of the Southern Red Bishop, rated at 7·1, to eggs of the Cape Weaver, which scored 4·1. Apart from the fact that the eggs in this test were not raw, but were cooked scrambled before tasting, this exercise provides little indication of how acceptable they are to egg predators in their natural habitat.

For forest-dwelling weavers, various primates, African palm civets (*Nandinia binotata*), genets (*Genetta*) and tree-snakes can reach most nests. Throughout Africa, an agile tree-snake, the boomslang (*Dispholidus typus*), is a major predator of both eggs and nestlings, and many other snakes in Africa and Asia are opportunistic predators of nests, whether in trees or in grassland and wetlands. The flexible joints of the African Harrier-hawk (*Polyboroides typus*) enable it to hang from a weaver nest with one foot while extracting the nestlings with the other, and many African birds will mob this raptor on sight. It is most surprising, therefore, that a mixed colony of Village Weavers and Vieillot's Black Weavers in Sierra Leone surrounded the active nest of an



*Colonies of **Southern Red Bishops** may consist of several hundred males, packed so densely into reedbeds that territories are as small as 3 m². In open grassland, colonies tend to be smaller and territories much larger. This species is highly polygynous, with individual males siring broods with up to 18 females in a season, as many as seven of them simultaneously. Individual success depends on the number of nests a male builds within his territory. He provides no paternal care, and the territories do not contain food or any other resources. One-year-old males sometimes build nests, but never succeed in attracting females. Two-year-olds build fewer nests and are thus less successful than older birds.*

[*Euplectes orix*,
KwaZulu-Natal, South Africa.
Photo: Nigel J. Dennis/
NHPA]



*The kidney-shaped nest of the **Lesser Masked Weaver** may be built among reeds, or suspended from the branch of a tree, a telephone line, or even the roof of a house. Males can have up to three females nesting in their territories, in colonies that may include up to 60 nests. In the south of its range, and possibly also in East Africa, Lesser Masked Weaver nests are occasionally parasitized by the Diederik Cuckoo* (Chrysococcyx caprius). *There is a record of a female Diederik Cuckoo becoming trapped in the tubular entrance of a Lesser Masked Weaver nest, and being pecked to death. Intraspecific nest parasitism is also suspected to be rife among colonially-nesting* Ploceus *weavers. There is often a degree of variation between the patterns of eggs within a single clutch, but less variability than between eggs laid by different females. In the Northern Masked Weaver* (Ploceus taeniopterus), *for example, eggs may be sage-green to brown, plain, or spotted with red-brown. A study of the Northern Masked Weaver which counted odd-looking eggs in clutches, and also looked for odd laying patterns, such as the appearance of two eggs on the same day, estimated the rate of conspecific nest parasitism in this species to be 22·8–34·7%, among the highest rates reported for a passerine.*

[*Ploceus intermedius cabanisii*, Hluhluwe, St Lucia, South Africa. Photo: Hugh Chittenden]



*The entrance tunnels of the nests of the **Baya Weaver** can reach 40–65 cm long, and in one instance, more than 90 cm. Adults feeding young birds may avoid using the tunnels by using an opening directly into the nest chamber. The nests are woven from grass, palm fibres or rice-plant leaves, and suspended by a pendulous supporting section from the end of a branch. Many males may build in the same tree, forming a colony in which each defends a three-dimensional territory. Each builds several nests, attracting up to five females in a season. In an experiment to find the relative importance of the quality of the nest and its location, nests that had reached the "helmet" stage, at which the bird begins to display for mates, were exchanged between males. The researcher found that neatly woven helmets with few fibres protruding from the surface were more likely to be chosen than poorly woven helmets. But helmets high up in the colony trees were most likely to be chosen, especially those on thin branches. Location thus appeared to be more important than the neatness of the weaving, although after helmets were exchanged, there was a suggestion of an increase in the number of female visits to formerly unpopular males, and a decrease in visits to formerly popular males.*

[*Ploceus philippinus*, Murai Farmway, Choa Chu Kang, Singapore. Photo: Jimmy Chew]



*Male **Dark-backed Weavers** sometimes sing while hanging from the nest tunnel, but courtship singing has more often been observed away from the nest. The pair-bond in this species lasts for several years, and probably until the death of one partner. Pair members build the nest together, although one bird (probably the male—sexes are alike) does most of the work, while the probable female perches nearby. The materials tend to be stiff, dry, old vine and creeper tendrils rather than the flexible materials used by other* Ploceus *weavers. Both partners also strip the leaves from branches near the nest, which may be another courtship or pair-bonding ritual.*

[*Ploceus bicolor stictifrons*, KwaZulu-Natal, South Africa. Photo: S. C. Hendriks]

African Harrier-hawk. One could speculate that the hawks, in order to avoid constant mobbing, did not hunt "on their own doorstep", or perhaps the weaver colony had been established before the raptors arrived, and would in due course, with a predator now in residence, be abandoned. A closely allied raptor, the Madagascar Harrier-hawk (*Polyboroides radiatus*), destroys fody and weaver nests on that island. Other birds of prey, such as small *Accipiter* hawks, may rip nests open from above, and even hornbills (Bucerotidae) will investigate any nests that they can reach. The permanent nest structures of the Sociable Weaver sometimes even harbour resident predators, such as Cape cobras (*Naja nivea*), which check the nest-chambers periodically, as well as foraging farther afield. The African Pygmy-falcon (*Polihierax semitorquatus*) is usually an inoffensive lodger in Sociable Weaver nests, but it does occasionally feed on chicks or young birds.

In reedbeds in southern Africa, the aquatic Nile monitor (*Varanus niloticus*) seems to use its forked tongue to check for the scent of chicks, and then rips the nest open from below, a crude but effective method for a predator the head of which is too big to pass through the nest entrance. Snakes and rodents, particularly the universal human camp-followers the rats (*Rattus*), swim out to nests and use the normal entrance, often leaving the nest undamaged. The rodents, however, sometimes depart through the back, leaving a characteristic neat hole. Grassland-nesting ploceids sometimes lose nests inadvertently through the trampling or grazing of large herbivores, while rodents, snakes and small ground-based carnivores such as mongooses (Herpestidae) may find the nests in the course of their foraging in the area.

There is little that a weaver can do to defend its nest against any of these predators, most of which are large enough to pose a threat to the adult bird, too. Occasionally, mobbing will persuade a raptor to move on, and dive-bombing attacks by several birds in unison can succeed in dislodging a tree-snake before it reaches the nest. The placing of nests close to, or even attaching them to the structure of, a large raptor's nest, such as that of the Crowned Hawk-eagle (*Stephanoaetus coronatus*), may provide passive protection against many of the likely predators, particularly forest-living primates. This choice of nest-site has been reported for two forest species, Maxwell's Black Weaver and the Red-bellied Malimbe (*Malimbus erythrogaster*). Other examples of weaver–raptor nesting associations include, in Africa, Red-headed Malimbes (*Malimbus rubricollis*), Village Weavers, Yellow-capped Weavers (*Ploceus dorsomaculatus*) and Yellow-mantled Weavers nesting near Palm-nut Vulture (*Gypohierax angolensis*) nests, Heuglin's Masked Weavers (*Ploceus heuglini*) with African White-backed Vultures (*Gyps africanus*), Village Weavers with Bateleurs (*Terathopius ecaudatus*), Red-headed and Heuglin's Masked Weavers with Red-necked Buzzards (*Buteo auguralis*), Red-headed and Village Weavers with Black Kites (*Milvus migrans*) of the yellow-billed form *aegyptius*, and Southern Masked Weavers and Village Weavers with Wahlberg's Eagle (*Aquila wahlbergi*). In Madagascar, the Sakalava Weaver may nest close to the (Yellow-billed) Black Kite, the Madagascar Buzzard (*Buteo brachypterus*) or the Madagascar Fish-eagle (*Haliaeetus vociferoides*). The most unusual association with a predator, however, was noted in Ghana, where Blue-billed Malimbes (*Malimbus nitens*) often nested above pools containing the dens of dwarf crocodiles (*Osteolamis tetraspis*). The possibility that this could be a deliberate choice was apparently strengthened when a pair of these malimbes nested above a pen temporarily housing crocodiles on a university campus in Nigeria. Drongos (Dicruridae) are well known for the habit of attacking animals that are potential threats to their nest, including the launching of assaults on birds of prey many times the drongos' own size. Weavers have apparently taken advantage of this trait by nesting near drongos both in Asia, where colonies of Finn's Weavers (*Ploceus megarhynchus*) are sometimes found in trees with nesting Black Drongos (*Dicrurus macrocercus*), and in Africa, where Red-headed, Red-bellied and Ibadan Malimbes (*Malimbus ibadanensis*) will likewise associate with drongos.

Gaining protection by nesting in association with biting or stinging insects, represented by bees (Apoidea), wasps and hornets (Vespidae) and ants (Formicidae), is another option, and in Asia this has been reported for the Asian Golden Weaver (*Ploceus hypoxanthus*), Finn's Weaver and the Baya Weaver. Among African weavers, at least ten species have been noted as nesting near wasps; these are the Chestnut-crowned Sparrow-weaver (*Plocepasser superciliosus*), the Red-headed Weaver, the Ibadan and Red-headed Malimbes, the Little Weaver, the Spectacled Weaver, and the Lufira Masked (*Ploceus ruweti*), Lesser Masked (*Ploceus intermedius*), Southern Masked and Heuglin's Masked

Weavers. For both the Sociable Weaver and the Red-billed Buffalo-weaver, it is evidently the wasps that take advantage of the structure provided by the birds as a site in which to suspend their nests, presumably some subsequent benefit accruing to the resident owners of these colonies. There is one report from Madagascar of a Red Fody nest near a wasp nest, while for two widespread African species, the Dark-backed Weaver and the Black-necked Weaver, this habit has been reported from the Gulf of Guinea island of Bioko, but not from the continental mainland. Similarly, an association with wasps has been described for Village Weavers nesting in the West Indies, where this species has been introduced, but such behaviour has not been recorded in Africa. Perhaps, in an era of egg-collectors, people were more likely to be made painfully aware of the proximity of aggressive insects.

For both the raptor–weaver and the insect–weaver associations, it would be interesting to examine the occurrence of the phenomenon over the geographical range of the weaver species concerned, and to have data on relative nest success with and without the purported guardians. In some cases, both animals may simply be responding independently to appropriate environmental conditions which meet their specific requirements for a nest-site.

In Africa, the Diederik Cuckoo (*Chrysococcyx caprius*) is a regular brood parasite of the Ploceinae. Confirmed hosts of this cuckoo include a true forest species, the Crested Malimbe (*Malimbus malimbicus*), the solitary-nesting and primarily insectivorous Spectacled Weaver, the colonial insectivorous Slender-billed and Red-headed Weavers, the co-operatively breeding White-browed Sparrow-weaver, and twelve other colonial species, mostly with a largely granivorous diet. These twelve are the Cape, Southern Masked and Village Weavers, the African Golden Weaver (*Ploceus subaureus*), Holub's Golden Weaver, Bocage's Weaver (*Ploceus temporalis*), the Lesser Masked Weaver, the Northern Brown-throated Weaver, Vieillot's Black Weaver, the Black-headed Weaver, the Yellow-mantled Weaver and the Cardinal Quelea (*Quelea cardinalis*). The young cuckoos must be able to flourish on a range of different diets and provisioning styles. The Southern Brown-throated Weaver (*Ploceus xanthopterus*) is a further probable host of the Diederik Cuckoo, which has been seen to remove eggs from the nests also of Thick-billed Weavers and Red-headed Queleas, although no cuckoo eggs have yet been found in the nests of these species. On the island of São Tomé, in the Gulf of Guinea, the endemic Sao Tome Weaver is a regular host of the African Emerald Cuckoo (*Chrysococcyx cupreus*), and there is one apparently reliable report from Kenya of a Baglafecht Weaver nest parasitized by this cuckoo. Eggs ascribed to the Long-tailed Paradise-whydah (*Vidua paradisaea*) were found in the nest of a Cardinal Quelea in Kenya, but this probably represented a case of "egg-dumping" by a parasite unable to find a nest of its normal waxbill hosts.

Since the young Diederik Cuckoo ejects the host's nest contents to ensure that it is the sole occupant of the nest, brood parasitism represents a total loss of breeding effort for the weavers. It is postulated that this has led to the development of varied egg patterns within some of the host species, and the evolution in the cuckoo of "gentes", such that individual cuckoos parasitizing the red bishops lay plain blue eggs, whereas those parasitizing *Ploceus* species lay spotted eggs of various patterns. In the case of the Village Weaver, females appear to discriminate against eggs which do not match their own. This behaviour had apparently been lost in the introduced population of Village Weavers in the Caribbean after about 200 years without exposure to cuckoos, but female discrimination against non-matching eggs seemed then to reappear in this population as parasitism by the Shiny Cowbird (*Molothrus bonariensis*) reached high levels. Recent experiments, however, have cast doubt on this interpretation, and it seems that differences in experimental method may be largely responsible for the conclusion that the weavers had lost their original ability to recognize foreign eggs. There is a marked difference in the way in which the weavers react to model eggs, used in the initial tests, and real eggs which have been coloured in different ways. An additional factor in the introduced Village Weaver populations, both in the Caribbean and on the Indian Ocean island of Mauritius, is that there has been some reduction in the variation in egg



*The male **African Golden Weaver** performs his fluttering display both from an upright position, as here, and while hanging upside-down from the entrance to the nest. This species is colonial and probably polygynous. It was previously considered to form a superspecies with Holub's Golden Weaver* (Ploceus xanthops)*, but Holub's is monogamous, and performs a quite different "song stretch" display, which is characteristic of weavers with a strong bond between two partners.*

[*Ploceus subaureus aureoflavus*, Zanzibar, Tanzania. Photo: Ketil Knudsen]



*When a female enters the colony, the male **Village Weaver** hangs below his nest entrance, calling and flapping his wings to reveal their yellow wing-linings. If he succeeds in attracting a female, she may enter the nest to inspect it while he continues to display. Male Village Weavers can have up to five active nests in their territories. If more than one is unoccupied, they tend to advertise from the newest and greenest. Females prefer fresh green nests, and ignore old nests that have faded to a dull brown. When they inspect them more closely, the closeness and neatness of the weave and external appearance does not seem to be as important as the strength of materials. Males destroy unsuccessful nests after a couple of weeks. Some females choose the same male and territory repeatedly for consecutive clutches or broods. A study of Village Weavers in captivity suggests that males have active days, particularly when building, during which they expend more energy than they have time to replenish by feeding, and rest days, when the birds may be inactive for hours at a time. One male completed a nest during a 12-hour day in which he spent around seven hours gathering materials and building, and just 17 minutes resting. He engaged in nest advertisement five to eight times more frequently on his active than his inactive days.*

[*Ploceus cucullatus spilonotus*, Bonamanzi Game Park, South Africa. Photo: Ian Merrill]



Although occasionally breeding in isolated pairs, ***Speke's Weaver*** *is normally colonial. In Kenya, it tends to form large colonies, numbering anything from about 20 to over 200 nests, all of them habitually situated in the same tree. Nests are suspended from the tips of branches, making them less easily accessible to terrestrial predators. Most colonies of this species are sited in a thorny tree, such as an acacia* (Acacia), *and this presumably acts as an additional deterrent to unwanted visitors, although it is of course no great problem for predatory birds, such as the African Harrier-hawk* (Polyboroides typus). *Research on the Village Weaver* (Ploceus cucullatus) *shows that, at least for that species, large colonies appear to be more successful in attracting females, and large trees generally tend to have larger colonies than small trees, but the success of a colony in attracting females is correlated much more with the number of males and nests than with the size of the trees.*

[*Ploceus spekei*, Laikipia District, Kenya. Photo: James Warwick/ NHPA]

appearance among individual females and, at the same time, an increase in the variability in egg appearance within a clutch. This has reduced the effectiveness of egg recognition, and hence reduced the rejection rate of foreign eggs. In the field, both Southern Red Bishops and Village Weavers always react aggressively towards Diederik Cuckoos, and groups of males will attack any cuckoo which enters the colony. In the case of the red bishops, at least, this results in lower rates of parasitism in larger colonies, where it is less likely that all the territory-holders will be away foraging at the same time.

An alternative explanation for the evolution of diversity in the egg patterns of individual females would be intraspecific brood parasitism, this and cuckoo parasitism not necessarily being mutually exclusive. For a number of ploceid species, there is evidence from both egg collections and egg-collectors that clutches of up to double the normal size occur in wild populations, and that the eggs are then not all of the same type in terms of colour and markings. It could be expected, however, that collectors would pay special attention to unusual clutches, and this provides no evidence that the phenomenon occurs sufficiently often to provide real selective pressure on the species concerned. W. M. Jackson's 1998 study of the Northern Masked Weaver is hitherto the only critical examination of the frequency of intraspecific parasitism in the field. Her work does suggest that, at least for some colonial ploceids, such parasitism could be as important as interspecific brood parasitism in certain populations.

Weaver nests, which often remain intact for months after the breeding season, can in turn provide accommodation for other animals. In temperate climates, nests surviving beyond the end of the summer may provide overwintering sites for spiders (Araneae) and other arthropods, and occasionally wasps construct their nests inside abandoned weaver nests. Bats (Chiroptera) use the nests as temporary roosts, both in Asia, where they roost in Baya Weaver nests at the helmet stage, and in Africa, where they use Village Weaver nests, while climbing mice are regular occupants of old nests on both continents, using Baya and Black-breasted Weaver (*Ploceus benghalensis*) nests in Asia and nests of Red Bishops, Thick-billed Weavers, Southern Masked Weavers and Village Weavers in Africa. Most often, however, it is other birds that take advantage of the weavers' construction work.

While there are a few records of species which merely roost opportunistically in the empty nests, such as the Willow Warbler (*Phylloscopus trochilus*) found in a Speke's Weaver (*Ploceus spekei*) nest in Kenya, most birds recorded as roosting in weaver nests have used these also as breeding sites. For example, Superb Starlings (*Lamprotornis superbus*), also found roosting in nests of Speke's Weaver, will line and lay eggs in the empty nests of Rufous-tailed Weavers (*Histurgops ruficauda*) and Red-billed Buffalo-weavers. Most such records involve species from two other bird families, the waxbills and the sparrows, the members of which construct closed nests at similar locations to those chosen by the weavers. Two other avian groups, the Old World flycatchers (Muscicapidae) and the prinias (Cisticolidae), contribute several records from different geographical areas. All of the African prinias build closed nests with a side entrance, quite reminiscent of those made by the *Euplectes* bishops, and it is perhaps not surprising, therefore, that three prinia species have been found to occupy unused nests of these ploceids: in different parts of South Africa, Yellow Bishop nests have been used by Karoo Prinias (*Prinia maculosa*) and Southern Red Bishop nests by Tawny-flanked (*Prinia subflava*) and Black-chested Prinias (*Prinia flavicans*). There are few records of African Dusky Flycatchers (*Muscicapa adusta*) using Cape Weaver nests or of Southern Black-flycatchers (*Melaenornis pammelaina*) making use of nests of the Red-headed Weaver, but in the Central African forests the Dusky-blue Flycatcher (*Muscicapa comitata*) has been noted as using the nests of three weaver species, namely the Slender-billed, Black-billed (*Ploceus melanogaster*) and Black-necked Weavers, apparently on a regular basis.

The bulky compound nests of Sociable Weavers and the two buffalo-weavers represent a rather special case. These provide a large platform-like structure, with internal chambers, some of which are always vacant, even in an active colony. Large raptors such as the Bateleur, Tawny Eagle (*Aquila rapax*) and African White-backed Vulture have nested on top of the stick nests of Red-billed Buffalo-weavers, and in the Kalahari region Verreaux's



*Artificial structures such as electricity pylons and telephone poles have enabled the **Sociable Weaver** to extend its range into areas that lack suitable trees for nesting. The African Pygmy-falcon* (Polihierax semitorquatus), *which in South Africa is apparently entirely dependent for roosting and breeding on the huge communal nests of the Sociable Weaver, has similarly extended its range. Sociable Weavers have indirectly benefited from the presence of these falcons in their nests, since breeding raptors cannot be disturbed without a licence. Telephone companies in South Africa fit baskets below the cross-arms of telephone poles, in an attempt to stop the weavers nesting around the conductors and risking "flash-overs", service outages and fires.*

[*Philetairus socius*, Northern Cape, South Africa. Photo: Geoff McIlleron]



This picture is rather atypical, since most weaver copulations occur in or on the nest. The male ***Southern Masked Weaver*** *commonly sets up alone, but as many as nine males may form a colony, which increases the potential for extra-pair copulations. In a study of the Baya Weaver* (Ploceus philippinus)*, another polygynous, colonial species, there was evidence of males attempting to guard their mates. However, the female Baya Weaver's fertile period coincides with the male frantically completing the nest she has chosen, so she has plenty of opportunity to play the field. Despite this, the incidence of nestlings with extra-pair paternity was found to be low for a colonially nesting passerine.*

[*Ploceus velatus*, Etosha National Park, Namibia.
Photo: Tony Heald/ naturepl.com]

Eagle-owls (*Bubo lacteus*) regularly use the "thatch roof" of Sociable Weaver nests as their nest-site, with Bateleur and African White-backed Vultures as occasional residents. There is a single record of a Martial Eagle (*Polemaetus bellicosus*) nesting on a Sociable Weaver nest mass. There appears to be little conflict with such external tenants. In contrast, the African Pygmy-falcon roosts and breeds in the chambers of Sociable Weaver and Red-billed Buffalo-weaver nests, and may actively take over nests from White-headed Buffalo-weavers and White-browed Sparrow-weavers. In South Africa, typically, about 25% of occupied Sociable Weaver colonies hold a pair of African Pygmy-falcons, and, although the falcons are only occasional predators of weaver chicks, the colony-members treat them as a potential threat, to be greeted with regular alarm calls.

Other breeding tenants in active Sociable Weaver nests are Rosy-faced Lovebirds (*Agapornis roseicollis*) and Red-headed Finches (*Amadina erythrocephala*), whereas Ashy Tits (*Parus cinerascens*), Familiar Chats (*Cercomela familiaris*) and Acacia



The chicks of the ***Southern Masked Weaver****, like those of most polygynous species, are usually fed by the female only, although the male may help occasionally, especially with second broods. Individual males of such species may vary in the amount of help they give, and in captivity, when only a single pair is present, the male may play a more active role. At the opposite extreme is the polygynous male Rüppell's Weaver* (Ploceus galbula)*, which feeds the chicks alone for the first few days, while the female broods them.*

[*Ploceus velatus*, Mpumalanga, South Africa.
Photo: S. C. Hendriks]

Pied Barbets (*Tricholaema leucomelas*) do no more than roost in the chambers. Familiar Chats will apparently nest in abandoned Sociable Weaver colonies, and Pearl-spotted Owlets (*Glaucidium perlatum*), the calls of which elicit intense mobbing responses from many southern African birds, are further possible roosting visitors. Rosy-faced Lovebirds in Namibia also occasionally utilize White-browed Sparrow-weaver nests for breeding, while Ashy Tits and Black-faced Waxbills (*Estrilda erythronotos*) use these nests as roost-sites. For all these arid-country species, sites offering protection against extreme environmental conditions must be at a premium.

Four sparrows make use of weaver nests on occasion. There is a record of House Sparrows using Baya Weaver nests in India. In South Africa, the Cape Sparrow (*Passer melanurus*) may exploit old nests of Cape and Southern Masked Weavers, while in East Africa the Common Grey-headed Sparrow (*Passer griseus*) will actively take over nests from Speke's Weavers. Most reports, however, concern the Chestnut Sparrow (*Passer eminibey*), which will usurp nests of the smaller Grey-headed Social-weaver (*Pseudonigrita arnaudi*), as well as occupying old Chestnut Weaver and Speke's Weaver nests in East Africa.

As the nests that waxbills build are closed, weaver nests are highly suitable substitutes. In fact, some estrildid species seem to use ready-made nest structures more often than they build their own nests, and some genera show a clear trend towards reliance on weaver nests. Thus, in the African genus *Lagonosticta*, the Red-billed (*Lagonosticta senegala*), Bar-breasted (*Lagonosticta rufopicta*) and Black-faced Firefinches (*Lagonosticta larvata*) are said to use old weaver nests occasionally, whereas there are a number of records for the Brown Firefinch (*Lagonosticta nitidula*) involving different weaver species, namely the Thick-billed, Red-headed, Village, Spectacled, Southern Brown-throated and Holub's Golden Weavers. Similarly, in the genus *Estrilda*, two species, the Black-headed (*Estrilda atricapilla*) and Black-faced Waxbills, have been reported roosting in weaver nests, while the Lavender Waxbill (*Estrilda caerulescens*) has been recorded nesting in an old *Ploceus* nest, and the Black-tailed Waxbill (*Estrilda perreini*) will use old nests of the Dark-backed, Spectacled and Village Weavers.

In Madagascar, the single indigenous waxbill, the Madagascar Bibfinch (*Lepidopygia nana*), roosts in Red Fody nests and breeds in Sakalava Weaver nests. In Asia, the Scaly-breasted Munia (*Lonchura punctulata*) uses old Baya Weaver nests for breeding, while the Indian Silverbill (*Euodice malabarica*) uses those of Baya Weavers, Black-breasted Weavers and Streaked Weavers (*Ploceus manyar*). In all cases, however, these waxbills appear usually to construct their own nests.

The nests of solitary, insectivorous weavers are also exploited by three African forest waxbills. Green Twinspots (*Mandingoa nitidula*) will breed in the nests of Dark-backed Weavers, Shelley's Oliveback (*Nesocharis shelleyi*) uses Black-billed Weaver nests, and White-collared Olivebacks (*Nesocharis ansorgei*) will breed in the nests of Strange Weavers (*Ploceus alienus*) and Spectacled Weavers. In addition, the White-collared Oliveback sometimes uses weaver nests found in clusters or colonies, such as those of Holub's Golden Weaver, the Baglafecht Weaver and the Village Weaver, but it apparently selects solitary nests more often.

In more open African savannas, waxbills take advantage of colonial weavers, the nesting habits of which mean that unoccupied nest-chambers are always available. Here, the Blue Waxbill (*Uraeginthus angolensis*) exploits old nests of the Southern Masked Weaver, and the Blue-capped Cordon-bleu (*Uraeginthus cyanocephalus*) nests in both *Ploceus* and buffalo-weaver nests. The Red-cheeked Cordon-bleu (*Uraeginthus bengalus*) has been found breeding in old nests of Speke's Weaver, but it will also usurp active nests of Speckle-fronted Weavers (*Sporopipes frontalis*), Heuglin's Masked Weavers, Little Weavers and Vitelline Masked Weavers (*Ploceus vitellinus*). The widespread Bronze Mannikin (*Spermestes cucullata*) usually makes its own nests, but it may also use old nests of Vieillot's Black Weavers, Village Weavers, Southern Masked Weavers, Southern Brown-throated Weavers, Black-necked Weavers, Red-headed Weavers and Southern Red Bishops.

Four African waxbills appear to be largely dependent on weaver nests, rarely building their own, and in some cases usurping active nests to the extent that breeding in the weaver colony may be disrupted. Cut-throat Finches (*Amadina fasciata*) usually insert their own ball of grass into a disused nest when appropriating those of White-headed and Red-billed Buffalo-weavers, Red-headed Weavers, Red-billed Queleas, Village, Chestnut and Speke's Weavers and Heuglin's Masked Weavers, but they will also usurp nests of Grey-headed Social-weavers and Vitelline Masked Weavers. Similarly, the related Red-headed Finch has been found breeding in the nests of Red-billed Buffalo-weavers and Southern Masked Weavers, while in Chestnut Weaver colo-



Many weaver species which are primarily seed-eaters, like the ***African Golden Weaver****, feed their young on insects, especially for the first days. Queleas* (Quelea) *and bishops and widowbirds* (Euplectes)*, however, include a substantial quantity of seeds in their nestlings' diet. The seeds are crushed, partly digested and regurgitated. The nestling period varies according to the size of the species, from 14 to 21 days. Red-billed Queleas* (Q. quelea) *leave the nest after only eleven days, before they are able to fly, reducing their exposure to nest predators.*

[*Ploceus subaureus subaureus*, Chinteche, Malawi. Photo: Niels Poul Dreyer]



The African Harrier-hawk (Polyboroides typus), *seen here attacking a* ***Village Weaver*** *colony, is a nest predator of many colonial weaver species. It hangs by one foot from the nests, flapping its wings to maintain its balance, and pulls out the nestlings with its other foot, or catches the adults as they emerge. Its counterpart on Madagascar, the Madagascar Harrier-hawk* (Polyboroides radiatus), *preys upon fody and weaver nests in the same manner. Other avian predators of weaver nests include the Gabar Goshawk* (Micronisus gabar), *which will tear a hole in the roof to get at the nestlings. The nests of species which breed near water, like the African Golden* (Ploceus subaureus) *and Lesser Masked Weavers* (P. intermedius) *are raided by the African Fish-eagle* (Haliaeetus vocifer). *Female Village Weavers quickly produce a new clutch after a nest is robbed. Like a number of other weaver species, Village Weavers appear to choose sites which take advantage of the protection provided by the proximity of dangerous animals, and even form colonies near the nests of birds which are predators on weavers, including the Black Kite* (Milvus migrans), *and in one recorded case, the African Harrier-hawk.*

[*Ploceus cucullatus spilonotus*,
South Africa.
Photo: Chris Tilde Stuart/
FLPA]



The tree-dwelling boomslang (Dispholidus typus) *is a major predator of the eggs and nestlings of many weaver species. Nests of the* ***Southern Masked Weaver*** *are also preyed upon by the common egg-eating snake* (Dasypeltis scabra). *But despite heavy predation by reptilian, mammalian and avian predators attracted to their colonies, fledging success in Southern Masked Weavers is over 50%. Adults also have an annual survival rate in excess of 50%, with some ringed individuals recaptured after as long as eleven years.*

[*Ploceus velatus*, South Africa. Photo: Roland Symons/ www.photolibrary.com]

nies it actively usurps nests, an action which led to many female weavers deserting one colony in Namibia.

Most Zebra Waxbill (*Amandava subflava*) nests are reconditioned weaver nests, about 70% being those of the Southern Red Bishop. In a study in Zimbabwe, 318 of 440 old Southern Red Bishop nests were occupied by Zebra Waxbills, and only 45 nests were built by the waxbills themselves. Here, breeding by the Zebra Waxbills usually reaches a peak after the bishops have left their breeding colonies, and these tiny waxbills could hardly displace other species. They occasionally use the nests of Southern Masked Weavers, Holub's Golden Weavers, Thick-billed Weavers, Red-billed Queleas, Black-winged Bishops, Yellow Bishops, and Red-collared, Yellow-mantled and White-winged Widowbirds. Finally, in both East and West Africa, the African Silverbill (*Euodice cantans*) also occupies deserted weaver nests, using those of the Village, Speke's and Chestnut Weavers and Heuglin's Masked, Lesser Masked and Vitelline Masked Weavers; in Oman, the silverbills use Rüppell's Weaver nests.



The duration of post-fledging care varies greatly among weaver species. No precise details are available for the ***Thick-billed Weaver*** *in the wild but in captivity, after spending about 18–20 days in the nest, the young birds remained dependent on their parents until they were about six weeks old. A more extreme case is that of the Seychelles Fody* (Foudia sechellarum), *where the parents continue to attend their young for an average of twelve weeks. It has been suggested that the Seychelles Fody has no fixed breeding season, and this extended care may indicate a more relaxed breeding regime than is possible for other species that are constrained by a short period of optimum conditions.*

[*Amblyospiza albifrons albifrons*, South Africa. Photo: Wil Leurs/AGAMI]



The twin-island nation of São Tomé and Príncipe is home to three endemic weavers, the ***Giant Weaver****, the Sao Tome Weaver* (Ploceus sanctithomae) *and the Principe Golden Weaver* (Ploceus princeps). *All three are common, and seem to thrive in degraded and altered habitats. Although very much larger, the Giant Weaver may form a superspecies with the Village Weaver* (Ploceus cucullatus)*; its ancestor would have been an open-country bird which was able to adapt to the forests which formerly blanketed São Tomé.*

[*Ploceus grandis*, Ponta Figo, São Tomé. Photo: Fabio Olmos]

Movements

Members of the Ploceidae are essentially resident species. Breeding colonies of weavers fall silent at the end of the season, and are deserted throughout the day. Moreover, the loss of colourful breeding plumage makes the birds less conspicuous, so that they are more likely to be overlooked by the casual observer. Nevertheless, ringing studies of the Southern Red Bishop in South Africa show that many individuals remain in the same area throughout the year and may continue to roost nightly at the breeding sites, but there is also a cohort of individuals that returns for the new breeding season after an absence of several months. It is particularly intriguing that male bishops return to the same colony, and even the same territory, for several years, whereas the return rate for females is much lower, even though there is no indication of a difference in mortality rate between the sexes. The available information on the recovery of ringed individuals suggests that few move more than 100 km from the ringing site, and such local movements, probably related to food availability, may be typical of many weavers. For the Cape Weaver and the Southern Masked Weaver in South Africa, the greater dispersal distances of the Southern Masked Weaver show an apparent correlation with its lower annual mortality rate. Ultimately, direct tracking of individuals will provide clear answers, although at present this remains an expensive and technically difficult procedure for birds of this size, and thus difficult to justify when they are neither economically important pests nor endangered species.



The little-known ***Juba Weaver*** *is found in the Jubba and Shabeelle Valleys Endemic Bird Area of Ethiopia, Somalia and Kenya. It is found in riverine bush and grassland and marshland, but in Ethiopia also in semi-arid savanna and thornbush. It forms small breeding colonies in trees or reeds. There are no records of it breeding in Kenya or Somalia, where it is uncommon, but it is assumed to be resident. It is locally common in Ethiopia. Increased grazing and an influx of human refugees threaten parts of its habitat, but its population is thought to be stable.*

[*Ploceus dicrocephalus*, Dawa River, Ethiopia. Photo: Jacques Erard]

Long-term studies of Sociable Weavers and White-browed Sparrow-weavers have confirmed that these are even more sedentary. There is some dispersal from the home colonies, sometimes forced by the collapse of the nesting tree, but the great majority of the birds will not move more than 10 km from their natal site. This is likely to apply also to other sparrow-weavers and to the buffalo-weavers, which occupy the nesting trees throughout the year.

Field studies during the 1960s in West Africa suggested that regular migratory movements of several hundred kilometres between the Sahel zone and the more humid regions to the south were taking place. Northern Red Bishops, Yellow-crowned Bishops and Village Weavers were among the ploceids thought to be involved, a conclusion based on their seasonal occurrence in different regions and on the fat reserves of individuals handled at certain seasons. In similar seasonally arid habitats in Namibia and in northern Kenya, the Chestnut Weaver also appears to have regular migrations. The most extensive movements of any African weaver, however, are those of the Red-billed Quelea. There have been numerous recoveries of ringed birds which have moved more than 1000 km, and they have also been studied in the most detail because of the economic importance of this species (see



Still locally common over much of its relatively small range in the highlands of west and central Kenya and north-east Tanzania, the Near-threatened ***Jackson's Widowbird*** *depends on open grassland for breeding, but montane grassland is becoming fragmented by agriculture. In addition, fires started by pastoralists to control ticks in the dry season temporarily destroy the most suitable habitat. Ironically, some populations in protected areas, such as Nairobi National Park in Kenya, may disappear because of grazing pressures from the large numbers of game animals. In a survey of the Mau Narok–Molo grasslands Important Bird Area in Kenya, Jackson's Widowbird was encountered feeding in fields of green wheat, in flocks of 10–30 birds. In one encounter, the birds alternated between feeding in a wheat field and courting in tussock grassland, a habitat that survives as remnants, particularly along the sloping sides of valleys, which are inaccessible to machinery. Jackson's Widowbirds are unique among weavers in displaying at a communal lek. Each male makes one or more circles of trampled grass, where they perform the dancing display shown here, leaping up as much as one metre into the air. Having mated, the males play no further part in breeding. The female alone builds the nest, a domed ball of grass with a side entrance, placed within 10 cm of the ground, and with living grass bent over it to form a bower.*

[*Euplectes jacksoni*, Masai Mara National Park, Kenya. Photo: Ferrero-Labat/ardea.com]



*Following a sustained increase in the Cousin Island population, and successful reintroductions to Aride and Denis Islands, in 2006 the **Seychelles Fody** was downlisted from Vulnerable to Near-threatened. The new island populations rapidly became self-sustaining; this species may breed several times in a year. The Seychelles Fody is still absent from some islands in its former range. However, the Seychelles have a long list of threatened bird species, and future reintroductions will have to take account of the fody's habit of predating other birds' eggs.*

[*Foudia sechellarum*, Cousin Island, Seychelles. Photo: Martin Harvey/DRK]

Relationship with Man). P. Ward originally matched the movements of queleas in different regions of Africa with the rainfall regimes, and postulated that there were three migratory populations, one in western Africa, another in eastern Africa and a third in southern Africa. Recent studies by P. J. Jones in southern Africa have confirmed the local patterns of movement in relation to rainfall, and experiments with caged captives revealed clear directional tendencies in "migratory restlessness", although the trials failed to reveal any differences in directional choices between birds from different populations. It seems likely, however, that most queleas follow an opportunistic "strategy" and are not obligatory long-range migrants. Some populations may be relatively sedentary, or move only short distances.

Relationship with Man

Weavers often make use of tall trees, including planted alien species such as eucalypts, as nest-sites in man-modified habitats. Perhaps the presence of people also deters other predators and ensures better breeding success on average. This can apply both to colonial species such as the Village Weaver, which is closely associated with villages, especially in the forested zone of Central Africa, and the Baya Weaver in India, and to solitary-nesting species such as the Spectacled Weaver in gardens in southern and eastern Africa. In Madagascar, the Sakalava Weaver is seldom molested by people. Colonies are often found within villages, and nests may even be suspended from thatched roofs. At one site, 18 nests were found under the roof of a veranda. In many Malagasy villages, such colonies, especially those close to a house, are considered a sign of good fortune.

Naturally, the long-standing proximity of weavers and people in Africa and Asia has led to the incorporation of the birds in cultural traditions. Among the Zulu people of South Africa, for example, the long tail feathers of the Long-tailed Widowbird were used to adorn the warriors, and similarly the distinctive helmets of the Lotuka tribe in southern Sudan were crowned with plumes from the tail of the Red-collared Widowbird. Some African folk tales did not, however, cast the weavers in an honourable role. The Nuer people in Sudan blamed the hyena (Hyaenidae) and the weaverbird for severing the link between our world and the heavens, which meant that humans could no longer climb into the sky and return rejuvenated. In Nigeria, the Yoruba tell of a time when the Earth and Heaven had quarrelled. No rain fell, to the despair of all on Earth, and it was decided that a burning sacrifice should be offered to Heaven. A bird was the obvious intermediary, but the weaver, when he was approached, declined, fearing that his plumage would be marred. In any case, he said that he was far too busy in building and demolishing nests. In the end, a Hooded Vulture (*Necrosyrtes monachus*) took the flaming offering, which explains why he has a bald head today. In a folk tale from northern India, however, the valiant weaverbird, with the aid of a cat, a rope, a club, some ants and a river, successfully



*Known from scattered areas in Malawi, Mozambique, Zambia and Tanzania, the **Olive-headed Weaver** is associated with mature miombo* (Brachystegia) *woodland with* Usnea *lichen. Living strands of* Usnea*, still attached to the tree, are incorporated into the nest, which hangs from the underside of a thick branch, rather than from terminal twigs, as in other weavers. Slash-and-burn agriculture is destroying miombo woodland throughout much of its range, even in nominally protected areas in Malawi. Listed as Near-threatened, this species could qualify for a higher threat category if the decline in its population continues.*

[*Ploceus olivaceiceps*, Panda, S Mozambique. Photo: Johann Grobbelaar]

With a declining overall population of less than 20,000 individuals, the ***Asian Golden Weaver*** *is listed as Near-threatened. In Sumatra and Java it has become uncommon to rare, and in Java, in particular, it is captured for the bird trade. But both in these Indonesian islands and across its South-east Asian range, the greatest threat comes from the conversion of wetlands. Vast areas in the poorer countries in the region have been the target of a "land-grab" by international investors, producing rice for export. Some of this habitat is being protected for more charismatic species like the Sarus Crane* (Grus antigone) *and the Bengal Florican* (Houbaropsis bengalensis).

[*Ploceus hypoxanthus hymenaicus*, Thung Bang Jack, Petchburi, Thailand. Photo: Alex Vargas]

freed his wife, who had been caught and caged by a king. On a more humorous level, in a tale from the Bakweri people in Cameroon, enmity between the woodpecker and the weaverbird was attributed to an occasion when the two were travelling together and were obliged to stop overnight along the way. The weaver built a woven nest suspended from a palm, but this was destroyed by a violent storm. When he asked for shelter in the nest-hole which the woodpecker had excavated, this was refused, and the two have never been friends since.

Two modern poets in Africa have used weavers to evoke very different images. In his poem *The Weaverbird*, the Ghanaian writer Kofi Awoonor describes how a tree is stripped of its foliage, and the shrine below defiled by the bird's droppings, using the intrusive weaver as a symbol of the impact of the colonial forces on the indigenous culture. There is a conservation theme, rather than a political one, to *Finches* (derived from the generic Afrikaans term for weaverbirds, *vinke*), in which C. Mann recalls with disquiet the callous boyhood slaughter of weavers, for which it was always open season on many South African farms.

In the arid northern parts of South Africa, suitable supporting structures for the bulky nests of the Sociable Weaver are lacking over wide areas. The appearance of telephone poles on the treeless plains provided new nesting opportunities, and the Sociable Weavers were quick to take advantage of this. As their nests built up around the cross-bars and insulators in the upper section of the pole, however, the mass of grass accumulated moisture and led to malfunctions of the telephone system, causing technicians to drive long distances in order to destroy the nests and restore communication. The weavers would then stubbornly rebuild the structure. Fortunately, a solution satisfactory to both parties was found: a wire basket, attached to the pole well below the level of the wires and "seeded" with a pile of appropriate grass, was quickly accepted as a suitable building site, and the birds could expand their breeding range without disrupting the telephone system. New advances in communication are rapidly making such land-lines obsolete, and it is hoped that poles with occupied nests will be left to the birds even after they no longer support any wires.

Many African seed-eating birds are nomadic opportunists, often forming flocks which concentrate at patches of foodplants. Thus, the weavers can cause devastating damage to the fields of subsistence farmers planting small-seeded cereals such as millet,



and may also cause significant losses on large-scale commercial farms. M. Adanson, a French botanist who spent five years in Senegal in the mid-eighteenth century, described a number of ingenious scaring devices which farmers used as a means of keeping the birds away from their crops. These included long strings festooned with bones and other dangling objects. The main culprits were evidently black-and yellow-weavers, probably the Village Weaver. Several species, including the Village and Chestnut Weavers and the Southern Red and Northern Red Bishops, are today regarded as pests in particular regions of Africa, while the Red Fody in Madagascar and the Baya Weaver in India are also locally important in this respect. The construction of dams in farming areas has resulted in the creation of additional wetlands and reedbeds, thereby providing new breeding sites for many ploceid species, such as the Southern Red Bishop in South Africa, which have then been well positioned to exploit the adjoining planted fields. The most notorious agricultural pest in the family is certainly the Red-billed Quelea, which is often touted as the most abundant bird species in the world. This intensely social species is always found in huge flocks, which can total millions of individuals, and it has a high reproductive rate adapted to semi-arid country, where environmental conditions can fluctuate between feast and famine. Every year, tens of millions of queleas are killed by aerial spraying and fire-bombing at roosts, but this has no significant impact on the total population. The "quelea problem" has economic, political and social aspects, which have been the focus of many publications, listed most recently in a bibliography by H. D. Oschadleus. To biologists, the Red-billed Quelea represents a wonderfully successful species, and a vast flock of queleas "roller-feeding", a process whereby the individuals at the rear repeatedly fly to the front, must rank as one of the great spectacles of the African savanna.

For some rural communities, weaver colonies can form an important source of protein when the chicks can be "harvested" conveniently. Many nests, however, are not easily accessible, even though weavers often nest close to buildings. In West Africa, adult queleas are harvested by traditional bird-catchers and sold in the markets as food, and some weaver species also appear on the stalls of dealers in traditional medicines in this part of Africa.

In Africa, a wide variety of animal species contributes to the ingredients of traditional medicines, employed both in the treatment of diagnosable ailments and in potions intended to influence outside events. For some globally threatened species, such

The destruction of native forest, competition with the introduced Red Fody (Foudia madagascariensis), *cyclones and severe drought caused the near-extinction of the* ***Rodrigues Fody****, which was once abundant on the island of Rodrigues. By 1968, just five or six pairs were left. The population recovered with the expansion of woodland on the island, and by 1999 had reached over 900 individuals. Numbers continue to increase, but the Rodrigues Fody is still confined to just 5 km² of mostly exotic forest habitat, and is consequently at great risk from disease, extreme weather or invasive species. It is classed as Vulnerable.*

[*Foudia flavicans*, Rodrigues Island. Photo: Walter Mankel]





Along with the Endangered Bannerman's Turaco (Tauraco bannermani), ***Bannerman's Weaver*** *is restricted to the Cameroon Mountains Endemic Bird Area. This weaver has benefited from community-based projects to protect and restore montane forest in Cameroon's Bamenda Highlands. It also occurs in protected areas in Nigeria, including part of the Gashaka-Gumti National Park. But although surveys have found it to be commoner than previously thought, its numbers are declining as its already fragmented forest edge habitat is further eroded by subsistence agriculture and firewood collection. It is listed as Vulnerable.*

[*Ploceus bannermani*, Obudu Plateau, Cross-River State, SE Nigeria. Photo: A. P. Leventis]

as vultures, the collecting of birds for sale at markets supplying this trade constitutes a significant additional threat to declining populations. In the case of weavers, however, those best represented on the market stalls seem to be the commonest species, and the family as a whole is not an important element in the traditional pharmacopeia in either western or southern Africa. Ornithologists surveying the markets in West Africa noted that sales of traditional remedies fluctuated with the economic climate: when pharmaceuticals were very expensive, many people turned to the old animal and plant products, but sales of these would decline again when the economy improved. A major problem for the traders was the "shelf-life" of their products, which might decay or be destroyed by insects before they could be sold. Some of the preservation methods described, such as that of dipping whole birds in petrol before drying them, would seem to negate any possible beneficial effects for the buyer, who would be expected to ingest some parts of the animal.

As they are common, attractive in breeding plumage, and relatively hardy, many weavers are caught for the cagebird trade and imported into countries well outside their natural range (see Status and Conservation). A South African-ringed Southern Masked Weaver reported as found near Schiphol Airport, in the Netherlands, had certainly travelled by aircraft, rather than under its own power. As shown by the many reports in the avicultural literature, it is quite feasible to breed weavers in captivity, although large aviaries may be required, and thus fewer successes are reported than is the case for smaller cagebirds such as waxbills. Once acclimatized in aviaries, weavers are hardy even in colder climates, and there are occasional reports of breeding attempts in the wild in many countries in Europe and elsewhere in the Northern Hemisphere. A side-effect of the Cold War period was a much lower frequency of exotic bird releases and escapes in Eastern Europe, but since 1992 several free-flying weaver species have been recorded in these countries, although none appears to be established in the wild.



First described from the coast of the Angolan enclave of Cabinda, the ***Loango Weaver*** *is also found along a narrow strip of the coast of Gabon and DRCongo, to which recent surveys have added two small coastal swamps in PRCongo. Little is known about this species. It occurs at low densities and appears to be rare, although recent surveys suggest its range may be more extensive and its numbers larger than previously known. Nevertheless, it is classed as Vulnerable. Habitat along the Cabinda coast is well protected, and is also well represented in Gabon's complex of protected areas. But onshore and offshore oil exploration and extraction are growing threats along this coast.*

[*Ploceus subpersonatus*, Sette Cama, Gabon. Photo: Ron Hoff]

Status and Conservation

The weavers include many widespread and abundant species which are flourishing in both natural and man-modified habitats. Yet others are habitat specialists with a very restricted range, and, as with other animal species, the major threat to them is large-scale habitat change. Events such as civil war and massive movements of displaced refugees, as has occurred recently in the Albertine Rift region of Central Africa, could rapidly modify a large proportion of their total distributional area. Island species are especially vulnerable in this regard. In the first assessment of the conservation status of the birds of Africa and associated islands, a total of 14 Ploceidae was listed under various threat cat-

egories. The most recent review by BirdLife International categorized seven species as Endangered, six as Vulnerable and five as Near-threatened, with a further species listed as Data-deficient.

One species, the Mauritius Fody (*Foudia rubra*), was formerly classed as Critically Endangered, but its conservation status has now been downgraded to that of Endangered. On the main island, this species has suffered both from habitat destruction and from the introduction of predators, such as the black rat (*Rattus rattus*) and the crab-eating macaque (*Macaca fascicularis*). Its population in 1975 was estimated at 247–260 pairs, but this had declined by more than 50% by 1993, when the species was confined to just three localities, the largest of which covered no more than 15 km². Since then, however, following control of those predators, this population has remained stable, and has even increased its range, probably a result of the setting-up of new territories by dispersing juveniles. The two other subpopulations total fewer than ten pairs and show no indication of expansion; the long-term viability of both is considered doubtful. A captive-breeding programme was started in the first years of the twenty-first century, and in 2005 a total of 45 hand-reared chicks was released on the offshore islet of Île aux Aigrettes, where two previously released pairs had raised chicks. In 2006, about 40 young Mauritius Fodies fledged on this tiny island, on which the total population at the end of 2008 stood at 140 individuals, including 47 pairs. Current studies suggest that the Mauritius Fody can coexist with the introduced Red Fody, and that competition between the two species will not be a serious threat if suitable habitat is available in predator-free areas.

The six other Endangered members of the family are Clarke's Weaver (*Ploceus golandi*), the Golden-naped Weaver, the Usambara Weaver (*Ploceus nicolli*), Bates's Weaver (*Ploceus batesi*), and the Gola and Ibadan Malimbes. The two malimbes and Bates's Weaver are restricted to forested areas in West Africa, where they have very small ranges, so that habitat destruction is the main threat to their continued survival. The three other species in this category are found in African forests farther to the east. The taxonomic status of the Golden-naped Weaver needs to be resolved (see Systematics). It is clearly very rare, and was formerly known only from a handful of specimens and a few sightings in a limited area of the Ituri Forest, in north-east DRCongo, but a recent sighting was reported from western Uganda in 2006. Clarke's Weaver has a small and fragmented range in coastal Kenya, where it is virtually restricted to the Arabuko-Sokoke forest, a distinctive habitat which contains other endemic animal species; it is the subject of an active conservation programme in which the local communities also are involved. The Usambara Weaver occurs only in another biodiversity hotspot, the Eastern Arc Mountains of Tanzania, where it is present at low densities in montane forests in the East and West Usambaras, the Ulugurus and the Udzungwas. The forest habitats in this region are already fragmented and are under constant threat of further degradation, and this species presumably has a very small and probably declining population.

Six ploceids are rated as Vulnerable. These are the Rodrigues Fody (*Foudia flavicans*), found only on the Indian Ocean island of that name; Bannerman's Weaver (*Ploceus bannermani*), an inhabitant of the montane forests of western Cameroon and adjacent eastern Nigeria; the Kilombero Weaver (*Ploceus burnieri*), known only from a limited area in central Tanzania; the Loango Weaver (*Ploceus subpersonatus*), restricted to a narrow coastal strip from Gabon south into extreme south-west DRCongo; and Finn's Weaver, localized in the mountain foothills of northern India. The taxonomic status of the sixth Vulnerable weaver remains questionable: the Yellow-legged Weaver, confined to the Ituri Forest, may yet, like its threatened congener the Golden-naped Weaver from the same area of DRCongo, prove to be a hybrid (see Systematics). All of these weavers have a small or very small global range within which they are threatened by loss and degradation of habitat, and most of them are already uncommon to rare and declining in numbers. The Loango Weaver, for example, is a little-known species with very specific habitat requirements; it lives in rank grassland in forest clearings and at edges of marshland, although it has apparently adapted to secondary habitats, such as vegetation around coastal villages. Following habitat clearance throughout its very small range, its population is almost certainly small and severely fragmented. Similarly, in Asia, Finn's Weaver has suffered loss and degradation of its terai-grassland habitat, primarily through overgrazing and conversion to agriculture; as a result, its population is now small, severely fragmented and rapidly declining.



*The **Kilombero Weaver** was not described until 1990. It is patchily distributed within less than 1500 km² of seasonally flooded grassland, and although still abundant in suitable habitat, its shrinking range and continuing decline have led to it being listed as Vulnerable. Grazing and commercial sugar-cane and rice growing are all expanding, and bringing increased use of fertilizers and pesticides. Kilombero Valley has been declared a Ramsar site, with funding from Tanzania's Wildlife Department, but its protection status is uncertain. If two new cisticola* (Cisticola) *taxa found here prove to be full species, Kilombero will qualify as an Endemic Bird Area.*

[*Ploceus burnieri*, Kilombero, Tanzania. Photo: Samuel Hansson]

Five members of the family are currently considered Near-threatened. These are Fox's Weaver (*Ploceus spekeoides*) from central Uganda, the Asian Golden Weaver from South-east Asia, the Seychelles Fody from the Indian Ocean islands, the Olive-headed Weaver (*Ploceus olivaceiceps*) from eastern Africa, and Jackson's Widowbird from the Kenyan Highlands. Although none of these appears to be at immediate risk, any one could become threatened if its circumstances change even slightly for the worse. Fox's Weaver is very poorly known, and has been recorded from only one area, in central Uganda, where it inhabits seasonally flooded wetlands. Its global population is assumed to be fairly small and perhaps declining, and it may possibly become threatened by drainage and grazing within its small known range.

Finally,one ploceid species is listed as Data-deficient. This is the Lufira Masked Weaver, formerly known only from Lake Tshangalele, where it was said to be common in 1960 when the type specimen was collected. No further information was forthcoming until February 2009, when breeding birds were located on the lake in fair numbers. They were found nesting at the same sites in January 2010, and also at a new locality below Kiubo Falls, some 120 km downstream on the Lufira River. This suggests that the species may have a more extensive distribution along this river system.

A fody from the Indian Ocean island of Reunion, and known only from an eighteenth-century illustration, was described in 1776 as *Foudia bruante*. The bird depicted, however, appears to be the introduced Red Fody, the only species on the island today. On the other hand, visitors to the island in the seventeenth century mentioned a small seed-eating bird which was a pest of crops, and their descriptions do not match the Red Fody. It is possible, therefore, that there was an endemic fody on Reunion which is now extinct, but, in the absence of any specimens or contemporary illustrations, this must be consigned to a category of "hypothetical extinct taxa". So far as is known, no ploceid species has become extinct in the last four centuries.

Direct persecution of ploceids is restricted to some of the common species which are pests of cultivated grain or other crops, such as fruit. These species seem well able to recoup their numbers, as demonstrated most dramatically by the Red-billed Quelea. In the initial hope of reducing the total population of this species, teams of people with flame-throwers were sent to breeding colonies, flocks were sprayed with poison from the air, roost-sites were subjected to aerial spraying, or ground-based teams placed drums of petroleum at the base of the roosting trees, which would then be engulfed in flames when an explosive charge was detonated from a safe distance. After several years, a critical stock-taking by international agencies such as the Food and Agriculture Organization of the United Nations revealed that, despite hundreds of millions of queleas killed annually, there was no net reduction in the species' population, and the enormous cost of the control operations made no economic sense. The current opinion is that lethal control should be used only when large numbers of queleas pose a direct threat to crops at a vulnerable stage, provided that the birds can be destroyed without damaging local ecosystems. Fenthion, the chemical most commonly used in aerial spraying of quelea roosts, is highly toxic to all birds, and secondary poisoning can result for both birds and mammals which ingest dead or dying queleas. When sprayed over wetland roosts, fenthion is toxic to aquatic invertebrates, too. Fine control over both local dosage and targeting of the exact roost-site is seldom possible, but careful planning can significantly reduce the danger of other species being killed because of their association with quelea roosts.

The trade in wild animals remains a potential threat to many species, as shown by recent events in Uganda, where a proposed bill to allow the export of a wide range of birds and mammals, including some not native to Uganda, was withdrawn only after a public outcry and representations from many national and international organizations. In Africa, Senegal and Tanzania have traditionally been the main sources of wild-caught bird exports, and the survivors which are sold in Europe or North America typically represent a mere 10% of the birds originally captured. The impact on local populations of the species concerned has not been studied, and few accurate data are available for the numbers of weavers involved in this traffic, since they are generally common species which are not of special conservation concern. One shipment at Dar-es-Salaam, however, included what was at first taken to be a new species of *Euplectes* and was featured, with a photograph, in the 22nd February 1992 issue of *New Scientist*; all of these birds died, and on examination they proved to be an unusual colour morph of the Black Bishop, an uncommon and little-known species in Tanzania. In Asia, a survey in northern India found that all four *Ploceus* species in the region were captured for aviculture, and the three common ones were caught



*In 2005, 45 hand-reared **Mauritius Fody** chicks were released on the offshore islet of Île aux Aigrettes. They were a mixture of captive-bred birds and chicks taken from wild nests considered to be at risk from the non-native mammalian predators which have contributed to the decline of this species. By late 2008, this population had reached 140 birds. The main breeding population on Mauritius is also expanding its range, following control of rats and macaques and rehabilitation of native forest remnants. In 2009 the Mauritius Fody was downlisted from Critically Endangered to Endangered, with the possibility of downlisting to Vulnerable if the improvement continues.*

[*Foudia rubra*, Mauritius. Photo: Clifford & Dawn Frith]

also for eating or to be released on "auspicious days". Although the last-mentioned category seems innocuous, it leads to high mortality, since the birds are ordered by quantity, and are seldom fed between capture and release, which is often set for several days later. The rarest species in this region, Finn's Weaver, which was then on the IUCN Red Data list and legally protected in India, cost three times as much as the other weavers, and was captured primarily for the zoo trade. Over an eight-year period, an average total of 2500 Baya Weavers was exported legally each year via Delhi Airport, and this official figure clearly represents only a small proportion of the true volume of the trade. One positive side-effect of international concern over the threat of avian influenza has been a dramatic reduction in legal intercontinental transport of wild birds.

Escapes from captivity and deliberate releases have led to the establishment of wild populations of Northern Red Bishops in California, in the south-west USA, and also, more recently, in Portugal and the West Indies, while Yellow-crowned Bishops are also established in California, the West Indies, Spain and Portugal. Southern Red Bishops and White-winged Widowbirds formerly occurred as breeding species in south-eastern Australia, the former near Adelaide and the latter in the Sydney area, but both populations were extinct by 1976. Village Weavers have been in the Caribbean for more than 200 years, and were introduced also on the Indian Ocean islands of Mauritius and Reunion. The Southern Masked Weaver is now listed as a wild-breeding bird in Israel, and the Streaked Weaver, from Asia, has established itself in the Nile Delta; this latter, north-east African population is thought to have originated from individuals which had escaped from the zoo in the north Egyptian city of Alexandria, on the western edge of the delta. In the 1950s, an agricultural officer stationed on St Helena, in the south-central Atlantic Ocean, released at least four species of South African ploceids, among other aliens, but none of these became established. The earlier release of Red Fodies was highly successful on this island, and also on Reunion, Mauritius and Rodrigues, as well as the Seychelles, Amirantes and Chagos Islands, all in the Indian Ocean. So far, weavers have not achieved the success of the sparrows or the starlings outside their natural range. Moreover, and fortunately, there appear not to have been any attempts to introduce the Red-billed Quelea in other regions, where its raids on grain crops would certainly not be appreciated.

*In the early 1980s, the total population of **Clarke's Weaver** was estimated at 1000–2000 pairs. It has not been assessed since. Most records are from the Arabuko-Sokoke Forest Reserve, which is the subject of a long-term community-based conservation project, but the species may not breed there. It is found in all forest types in Arabuko-Sokoke, but elsewhere in its very limited range in south-eastern Kenya, it is confined to lowland miombo* (Brachystegia) *woodland. Because of accelerating habitat loss, it is presumed to be declining, and is listed as Endangered.*

[*Ploceus golandi*, Arabuko-Sokoke Forest Reserve, Kenya. Photo: Steve Garvie]



*Successive surveys have found the **Ibadan Malimbe** to be disappearing from its historical range, but its distribution is something of a mystery. It can persist in forest patches as small as 0·2 km², and in degraded habitats, but its numbers decline as habitat remnants become more isolated. The causes may include short dispersal distances, or competition with other malimbes and weavers better adapted to altered habitats. Further studies are desperately needed if this already Endangered species is not to slide towards extinction.*

[*Malimbus ibadanensis*, Ibadan, Oyo State, SW Nigeria. Photo: A. P. Leventis]



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PLATE 1

PLATE 1

Subfamily BUBALORNITHINAE

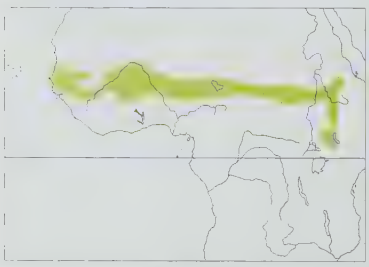
Genus *BUBALORNIS* A. Smith, 1836

1. White-billed Buffalo-weaver

Bubalornis albirostris

French: Alecto à bec blanc **German**: Alektoweber **Spanish**: Bufalero Piquiblanco
Other common names: Black/Common Buffalo-weaver

Taxonomy. *Coccothraustes albirostris* Vieillot, 1817, Senegal.
Forms a superspecies with *B. niger*, and previously the two were normally considered conspecific. In the past, race *intermedius* of *B. niger* was on occasion erroneously placed within present species. Monotypic.
Distribution. S Mauritania, Senegal, Gambia, NE Guinea-Bissau and Guinea E in a narrow band S of desert to C Chad and on to C Sudan, SW Eritrea and W Ethiopia, S to NE Uganda and NW Kenya.



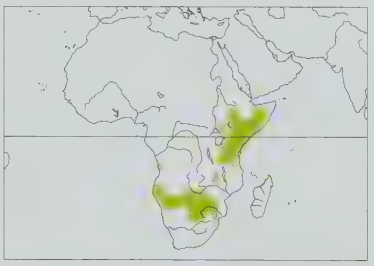
Descriptive notes. 23 cm; male c. 70 g. Large blackish buffalo-weaver with dark or whitish bill; distinctive unperforated feathered rod anterior to cloaca projecting from abdomen ("phalloid organ"). Male plumage is black (white feather bases sometimes visible), except for white edges of primaries; often shows some white spots of variable size on scapulars or anywhere in region from side of neck down to flanks, generally having white markings on scapulars more frequently than in *B. niger*; phalloid organ c. 15 mm long; iris dark brown; bill in breeding condition mostly whitish and ridged, with prominent hump above nostrils, on non-breeding bird black and smooth on surface with yellowish-white base; legs dark brownish to dark grey. Female resembles male in plumage, but bill always black and smooth, phalloid organ shorter than 5 mm. Juvenile is very different from adults, dusky brown above, mottled with white below, throat white, has buffy edges to wing feathers; iris grey-brown, bill brown. VOICE. Male song starts with a rattling "tschutchutchutchu", followed by a strident "skwee-skwee-skwee-kereekerilli-kerilli-keree" phrase (variable in form); colony-members may sing in chorus at dawn. In courtship, male delivers a distinctive 2-note call, to which female typically responds with hissing "shiir shiir". Contact call "chek", and aggressive chatter a repeated series of "chek" notes; alarm call described as "ourg ourg".
Habitat. Dry savanna and open farmland, provided that large trees present. In Kenya, mainly below 1200 m.
Food and Feeding. Seeds, including crops such as millet; also fruit of *Boscia senegalensis*; also grasshoppers (Orthoptera), termites (Isoptera), beetles and their larvae (Coleoptera); also small animals such as frogs. Only insects found in stomachs of chicks. Forages on ground, searches for insects in cowpats; removes ectoparasites such as ticks (Acarina) from cattle. Large feeding flocks may include individuals from several colonies; also associates with starlings (Sturnidae), shrikes (Laniidae) and *Dinemellia dinemelli*.
Breeding. Season Jul–Sept throughout range; also Oct–Nov in some W African countries, and Feb–Mar in Ethiopia and Eritrea; nest-building activity apparently stimulated by rainfall. Polygynous; colonial. Nest more than 1 m in diameter, a mass of dry thorn twigs and branches, with up to ten individual nest-chambers lined with grass, green leaves, rootlets and wool, placed in thorn trees up to 10 m above ground; main structure built primarily by male, often stealing sticks from neighbouring nests, both sexes may add lining material, entrance may be surrounded by protruding thorny twigs; rarely, single nest. Clutch 2–4 eggs, whitish or pale green to bluish, heavily blotched and spotted with grey and grey-brown (Nigeria), or plain to sparsely spotted with brown (Kenya), average for nine eggs in Nigeria 26·7 × 19·6 mm; incubation of eggs and feeding of chicks by female only, no information on duration of incubation and nestling periods; fledged young fed by both sexes. Average of 2·5 young survive from each nest; size differences in nestlings suggest that brood reduction occurs.
Movements. Appears to be resident at colonies.
Status and Conservation. Not globally threatened. Very wide distribution, and common in many parts of its range.
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2. Red-billed Buffalo-weaver

Bubalornis niger

French: Alecto à bec rouge **German**: Büffelweber **Spanish**: Bufalero Piquirrojo
Other common names: Southern Red-billed Buffalo-weaver (*niger*); Northern Red-billed Buffalo-weaver, Kenya Buffalo-weaver (*intermedius*)

Taxonomy. *Bubalornis niger* A. Smith, 1836, Kurrichane, South Africa.
Forms a superspecies with *B. albirostris*, and previously the two were normally considered conspecific. Proposed race *militaris* (described from Luangwa Valley of N Zambia) is more appropriately lumped within nominate. In the past, race *intermedius* was on occasion erroneously placed within *B. albirostris*. Two subspecies currently recognized.
Subspecies and Distribution.
B. n. niger A. Smith, 1836 – W & SW Angola (including isolated population on Luanda–Bego coastal plain), SW & E Zambia, N half of Namibia, Botswana, SW Zimbabwe and SW Mozambique S to N provinces of South Africa and N Swaziland.
B. n. intermedius (Cabanis, 1868) – S Ethiopia, extreme SE Sudan, NE Uganda (Karamoja), W & S Somalia and Kenya S to C Tanzania.



Descriptive notes. 22 cm; male 65–98 g, female 59–90 g. Large blackish buffalo-weaver with brownish or red bill; distinctive unperforated feathered rod anterior to cloaca projecting from abdomen ("phalloid organ"). Male nominate race has uniformly dark chocolate-brown plumage (appears black in field), all feathers with white bases; primaries have narrow white outer margin and broad white central band (forming patch on extended wing); often shows some white spots of variable size on scapulars or anywhere in region from side of neck down to flanks, most typically with fairly large white patch on side of lower neck, but with white markings on scapulars appearing less frequently than in *B. albirostris*; phalloid organ c. 16 mm long (largest on males with harem, and larger on resident than on non-resident floaters); iris dark brown; bill and legs red. Female has head and upperparts dark brown (not looking black in field), is mainly dark brown below, feathers of chin and throat with broad white margins, breast feathers with white centres, brown surrounds and white fringes; white patch in primaries;

phalloid organ smaller than male's, average length 6 mm; iris dark brown, bill horn-brown, legs light brown. Juvenile is pale brown, underparts spotted and barred with white, bill yellow-orange or pinkish. Race *intermedius* is like nominate, but white bases on primaries narrower (wing patch smaller). Voice. Male song an extended series of chattering or squealing phrases, "cheek cha cheekla-cheekla-chu", "cherja wooklyu-wooklyu-wooklyu"; female responds with single more musical note, "chwee".

Habitat. Dry thornveld, including mopane (*Colophospermum mopane*) and mixed acacia–baobab (*Acacia–Adansonia*) woodland, generally below 1500 m. Most common in habitats where grass has been trampled by large mammals, including domestic livestock. Large trees required for nesting colonies.

Food and Feeding. Diet consists largely of insects, including c. 50% beetles (Coleoptera, particularly of weevil family Curculionidae), also grasshoppers (Orthoptera), caterpillars (Lepidoptera), bugs (Hemiptera), ants and wasps (Hymenoptera), and flies (Diptera); other arthropods, including spiders (Araneae) and scorpions (Scorpionidae), sometimes taken; also seeds and fruit. Nestling diet comprises only insects. Forages primarily on the ground, both running and hopping, in flocks of up to c. 50 individuals. Associates with other species, including starlings (Sturnidae), drongos (Dicruridae), sparrows (Passeridae) and shrikes (Laniidae); in Serengeti (Tanzania), especially with Superb Starling (*Lamprotornis superbus*) and *Histurgops ruficauda*. At Tsavo, in Kenya, foraging flocks accompanied by Long-tailed Fiscals (*Lanius cabanisi*) which caught grasshoppers flushed by the flock; this appeared to be a regular association, as present species responded to the fiscal's alarm calls.

Breeding. Season mainly Mar–Jun in E Africa, Sept–Apr in S Africa; scattered records in other months; may be double-brooded. Mating system polygyny, sometimes co-operative polygynandry whereby more than one male shares a group of females and may father young in same brood. Colonial; dominant male at each nest mass controls most of the chambers and defends site against other males; sometimes two males form a coalition, both individuals building and defending nest. Courting male postures with wings and tail spread, showing white patch in primaries; this followed by mounting lasting longer than 20 minutes. Nest built by male, a mass of thorny twigs each 15–75 cm long, contains up to 13 nest-chambers lined by both sexes with fresh green vegetation, placed 3–12 m above ground in tall tree such as baobab, leadwood (*Combretum imberbe*), acacia, marula (*Sclerocarya birrea*) or mopane, even in base of nest of Yellow-billed Stork (*Mycteria ibis*) in Zambia; sometimes near homestead, or on man-made structure such as windmill or pylon; material added throughout breeding season, and compound nest may last for several years. Aggressive wasp *Belonogaster rufipennis* often builds nest under nests of present species in Namibia, and *Ploceus intermedius* may suspend nests from such sites; nest in Zimbabwe used by Southern Grey-headed Sparrow (*Passer diffusus*), and chambers may be occupied by African Pygmy-falcon (*Polihierax semitorquatus*), Superb Starling, Red-headed Finch (*Amadina erythrocephala*) and Blue-capped Cordon-bleu (*Uraeginthus cyanocephalus*). Clutch 2–4 eggs, white, heavily spotted with sepia and grey, or blue-green with olive-green and ashy markings, average size 28·3 × 19·9 mm (South Africa); incubation from first egg (in captivity), by female alone, period 11–14 days; chicks fed by female, very rarely by male, nestling period 20–23 days. Variation in egg pattern within clutch suggests intraspecific brood parasitism in colony. Nests can be heavily infested by mites and insects; colony abandoned following attacks on nests by Wahlberg's Eagle (*Aquila wahlbergi*); raptors such as Bateleur (*Terathopius ecaudatus*), Tawny Eagle (*Aquila rapax*) and African White-backed Vulture (*Gyps africanus*) sometimes nest on top of nest mass.

Movements. Mainly resident at breeding colonies. In Kenya and South Africa, some evidence for dispersal from breeding areas during dry season; in Zimbabwe, visits high plateau only in wet years.

Status and Conservation. Not globally threatened. Generally common and widely distributed, with large numbers occurring in areas thinly populated by humans, including major reserves. Estimated population in Kruger National Park, in NE South Africa, greater than 8000 individuals, and perhaps 1000 in adjoining S Mozambique. Rather local in several parts of range, e.g. Uganda and W Kenya.

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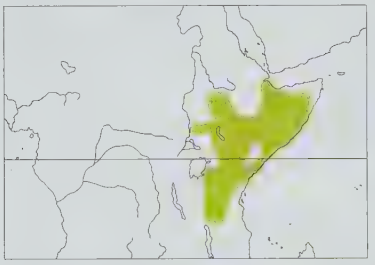
Genus *DINEMELLIA* Reichenbach, 1863

3. White-headed Buffalo-weaver

Dinemellia dinemelli

French: Alecto à tête blanche **German**: Starweber **Spanish**: Bufalero Cabeciblanco
Other common names: White-faced Buffalo-weaver

Taxonomy. *Textor dinemelli* Rüppell, 1845, Shoa, Ethiopia.
Races intergrade in S Kenya and NE Tanzania. Two subspecies recognized.
Subspecies and Distribution.
D. d. dinemelli (Rüppell, 1845) – SE Sudan, SW, S & E Ethiopia, Somalia (except NE), NE Uganda, Kenya (except SE) and NE Tanzania.
D. d. boehmi (Reichenow, 1885) – SE Kenya S to SC Tanzania.



Descriptive notes. 18 cm; 57–85 g. Large, mainly white buffalo-weaver. Nominate has white forehead, crown and nape, bare black skin around eye and between eye and base of bill; mantle and back dark brown, rump and uppertail-coverts orange-red; upperwing and tail dark brown, blacker on primaries, with narrow white margin on outer webs of greater coverts, secondaries, tertials and outermost pair of rectrices, rest of tail with just narrow whitish fringe at tip, small orange epaulet often concealed, white band c. 20 mm wide across base of primaries; throat and underparts white, dark brown thighs and orange-red undertail-coverts; iris brown; bill black (may change seasonally between horn/brown and black); legs dark grey. Sexes alike. Juvenile has conspicuous gape wattle, and tail-coverts initially pale orange, rather than reddish. Race *boehmi* has mantle, back, wing and tail mainly black with reduced white fringes. Voice. Song slow, drawn out, with piercing nasal calls and trills, phrases such as "tsu-weely-weely-wair", "tsu-weely-weely-tsair-tsu". Strident calls "skwieeeer", "errrrrrh" or "kiiyerr"; also a ringing "tew", repeated at intervals.

Habitat. Dry bush and savanna thornveld, mainly below 1400 m; rarely grassland or riverine vegetation.

Food and Feeding. Feeds mainly on insects, also seeds and fruit; beetles (Coleoptera) and caterpillars (Lepidoptera) found in stomach contents. Forages primarily on ground, usually in groups of 3–6 individuals. Often associates with other species, e.g. *Plocepasser* and starlings (Sturnidae); in Somalia, associated particularly with Superb Starling (*Lamprotornis superbus*) and White-crowned Starling (*Lamprotornis albicapillus*). In Kenya, regularly joins mixed-species flocks in open woodland.

Breeding. Season probably dependent on local rainfall: Aug–Sept and Dec in Sudan, Apr–Aug in Ethiopia, Feb–Jun and Sept in Somalia, May in Uganda, Feb–Mar, May, Jul and Nov in Kenya, and Dec in Tanzania. Monogamous. Observations of three adults feeding young in captivity, perhaps suggesting occasional co-operative breeding. Nest built by both sexes, a large oval structure c. 0·5 m long, outer shell of thorny sticks with short entrance tube opening downwards, interior a dome of dry grass stems lined with grass, leaves and feathers (inner grassy section built first, then thorny twigs added), usually 2–4 m above ground and resting on branch or suspended from end or underside of branch; several nests in same tree may belong to same pair; old reports of old nests of *Plocepasser mahali* being used; nests sometimes usurped by African Pygmy-falcons (*Polihierax semitorquatus*), and also used by Cut-throat Finches (*Amadina fasciata*). Clutch 3–4 eggs, greyish or pale blue, thickly blotched with olive-brown and grey-brown, markings sometimes forming cap at thick end, average 24·6 × 18 mm (Kenya); no data on incubation; chicks fed by both sexes, nestling period in captivity at least 14 days.

Movements. Apparently resident. Variations in numbers in Tsavo National Park, in S Kenya, suggest some local movements or dispersal.

Status and Conservation. Not globally threatened. Common in most of range. Occurs primarily in arid regions with sparse human population, and present in protected areas throughout its range.

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inches 3
cm 8
PLATE 2
ssp pectoralis
4
5
6
7
p mahali
10
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8
11
12
ssp arnaudi
ssp dorsalis
13
♂
♂
ssp montana
ssp albifrons
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♂
ssp capitalba
14
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ssp quelea
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variants
ssp aethiopica
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16
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Subfamily PLOCEPASSERINAE

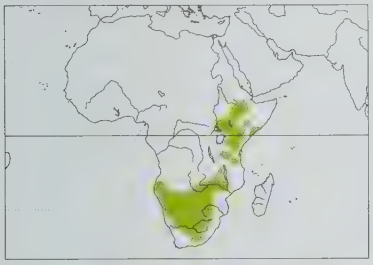
Genus *PLOCEPASSER* A. Smith, 1836

4. White-browed Sparrow-weaver

Plocepasser mahali

French: Mahali à sourcils blancs **Spanish**: Tejedor-gorrión Cejiblanco
German: Weißbrauenweber
Other common names: Stripe-breasted (Sparrow-)Weaver

Taxonomy. *Plocepasser mahali* A. Smith, 1836, Modder River, Thabanchu, South Africa.
Genus sometimes placed in sparrow family (Passeridae). Proposed race *propinquatus* (described from Baardheere, on R Jubba, in S Somalia) is synonymized with *melanorhynchus*; *terricolor* (N Namibia) included in *ansorgei*; *stridens* (E Tanzania) included in *pectoralis*; and *stentor* (from Northern Cape, in W South Africa) is treated as a synonym of nominate. Four subspecies currently recognized.
Subspecies and Distribution.
P. m. melanorhynchus Rüppell, 1845 – SE Sudan, SC Ethiopia, SE Somalia, N Uganda and Kenya.
P. m. ansorgei E. J. O. Hartert, 1907 – SW Angola and N Namibia.
P. m. pectoralis (W. K. H. Peters, 1868) – N & C Tanzania, S & E Zambia, S Malawi, W Mozambique (W Zambezi Valley), N Zimbabwe and N Botswana.
P. m. mahali A. Smith, 1836 – S Namibia, S Botswana, SW Zimbabwe and N & C South Africa.



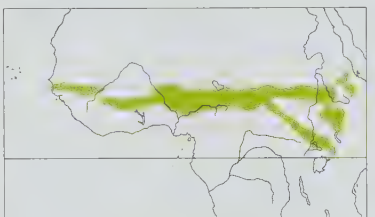
Descriptive notes. 17 cm; 31–59 g. Large sparrow-like weaver with broad white eyestripe and white rump. Nominate race has forehead and crown chocolate-brown, broad white eyebrow, brown cheek and ear-coverts, blackish malar stripe; nape to back mantle brown, paler than crown, rump and uppertail-coverts white; upperwing and tail brown, the feathers tipped white, on greater and median wing-coverts forming bold wingbars, narrow pale edges on remiges, broader ones on tertials and inner secondaries; white below, some buffy wash on flanks; iris rich chestnut-brown to dark brown; bill pale brown or black (possibly changing seasonally); legs brown. Sexes alike in plumage; in some populations, only male has black bill. Juvenile has dark bill, dull brown eye, plumage like adult. Race *pectoralis* has mantle and back reddish-brown, breast feathers marked with dark triangular centres; *ansorgei* has broad white tips on tail feathers; *melanorhynchus* has earthen-brown upperparts, and black marks at side of breast continuous with malar stripe. Voice. Solo song of dominant male in group is highly individual, with complex chattering and squealing notes in unbroken sequence lasting for 6–20 minutes. Duets, performed primarily by breeding pair, are short (c. 5 seconds) series of matching syllables; territorial chorus song by group-members short and stereotyped. Both song types heard throughout year. Captive young first sang within a week of fledging. Alarm and vigilance call a short "chuk"; a shriller chirp in flight; in Kenya, utters alarm calls in response to people, vervet monkeys (*Cercopithecus aethiops*), Pearl-spotted Owlet (*Glaucidium perlatum*) and Fan-tailed Raven (*Corvus rhipidurus*).
Habitat. Inhabits open mopane (*Colophospermum mopane*) and acacia (*Acacia*) savanna in areas with annual rainfall exceeding 600 mm; generally occurs below 1400 m, but ranging locally up to 1900 m.
Food and Feeding. Diet insects and seeds, proportion of arthropod food varying both regionally and seasonally. In South Africa, up to 50% of diet insects, e.g. termites (Isoptera), especially harvester termites (Hodotermitidae), beetles including weevils (Curculionidae) and tenebrionids (Tenebrionidae), caterpillars and adult moths (Lepidoptera) and ants (Formicidae); readily takes bread and other scraps at camp-sites. Seeds taken include those of wild grasses, e.g. *Urochloa*, *Stipagrostis*, *Simeam fenestratum*, *Digitaria velutina*, *Eragrostis papposa*, *Cenchrus ciliaris*, *Dactyloctenium aegyptium*; cereal crops such as sorghum (*Sorghum*), millet, wheat (*Triticum*) and maize (*Zea mays*) important at times. Forages primarily on ground, running or hopping in pursuit of prey; rolls over stones or dung pats, digs in soil, searches underside of vegetation. Hawks insects, especially termite alates. Occasionally joins mixed-species flocks of insectivorous birds in acacia woodland in South Africa. Not seen to drink in semi-desert areas of Botswana, but noted as drinking and bathing in Mountain Zebra National Park, in South Africa.
Breeding. Breeds throughout year in Kenya and South Africa, depending on local conditions in areas of irregular rainfall; mostly Mar–May in E Africa, but Jul–Aug on Laikipia Plateau (Kenya); Nov–Dec in Angola, peak Dec–Mar in Zambia, Oct–Feb in Malawi, May–Jun in Botswana, and Sept–Nov in Zimbabwe; mostly Nov–Feb in South Africa. Monogamous; dominant breeding pair in small territorial group of 5–9 (occasionally up to 20) individuals, and co-operative breeding system with helpers, which either offspring of breeders or unrelated birds; unrelated helpers participate only in group defence of territory, whereas related helpers also feed young. Competition for status apparently correlated with levels of luteinizing hormone, rather than testosterone; breeding male may be replaced by outsider or by a group-member; dominant individuals not physically larger than other group members of same sex. Nests built throughout year, but especially after rain, used for roosting by individual birds; a horizontal cylinder of dry grasses (983 grass stems in one nest) 30 cm long and 18 cm in diameter, resting on supporting branches with entrance at each end, grasses bent but not woven, construction taking 10–18 days; c. 60% of such nests converted to breeding nests by closing of lower entrance, then lined with feathers, particularly from guineafowl (*Numida*) (858 feathers in one nest), with pasque flowers (*Pulsatilla patens*) reported as lining in one nest; placed 2–8 m above ground in tree such as mopane, *Sclerocarya caffra*, or acacia (at least six species recorded), compass orientation apparently dependent on prevailing wind direction; in S Africa, nests used for roosting also by Ashy Tit (*Parus cinerascens*), Red-headed Finch (*Amadina erythrocephala*) and Black-cheeked Waxbill (*Estrilda erythronotos*), and in N Namibia used for breeding by Rosy-faced Lovebirds (*Agapornis roseicollis*). Clutch 2–3 eggs, salmon-pink or creamy white, either evenly speckled with red, brown and grey, or markings forming band at thick end, average 24·9 × 16·4 mm (South Africa); incubation by female alone, period 14–16 days; young fed by female alone for first 2–3 days, then also by male and helpers, chicks in nests with helpers grow faster; nestling period 17–18 days in Zambia, 21–23 days in South Africa, 25 days in captivity; young still fed occasionally for up to 3 months after leaving nest. Success from egg to fledging 38% in South African study, 46% in Zambia; predation main source of nest losses, with vervet monkey, Shikra (*Accipiter badius*) and African Harrier-hawk (*Polyboroides typus*) recorded as predators. Ringed adult at least 10 years old in South Africa; estimated annual survival of adults at colonies in Zambia and Kenya more than 70%, with improved survival in larger groups.
Movements. Mainly resident. Some local movements away from breeding sites; birds dispersing from natal group often leave as a cohort, initial movement seldom more than 1 km, but after several successive moves may settle more than 5 km away.
Status and Conservation. Not globally threatened. Generally common; abundant in many semi-arid areas, and population in Zambezi Valley, in WC Mozambique, estimated at more than 1,000,000 individuals. Less common in protected areas in South Africa, with c. 500 birds in Kgalagadi Transfrontier Park, and at least 60 colonies in Mountain Zebra National Park, close to S limit of range; this region colonized over past 40 years.
Bibliography. Ash & Miskell (1998), Belcher (1924), Benson & Benson (1977), Benson *et al.* (1964), Brooke *et al.* (1972), Burger & Gochfeld (1981), Carswell *et al.* (2005), Cave & Macdonald (1955), Clancey (1968), Collias, N.E. & Collias (1964, 1977, 1978a, 1978b, 1978c, 1981, 2004), Craig *et al.* (2005), Dean (2000), Dean & Milton (2005), Douthwaite (1992), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Earlé (1983a, 1983b), Farkas (1981), Ferguson (1985, 1987, 1988a, 1988b, 1988c, 1989), Ferguson & Siegfried (1989), Ferguson *et al.* (2002), Friedmann & Northern (1975), Fry & Keith (2004), Gichuki (1984), Granvik (1934), Hartert (1907), Hockey *et al.* (2005), Hoesch (1936, 1940), Irwin (1956, 1981), Johnston (1985), Jones (1978), Kemp *et al.* (2001), Kothe (1911), Lack (1985), Leitner *et al.* (2009), Lendrum (1974), Levin & Wingfield (1992), Lewis, A.D. & Pomeroy (1989), Lewis, D.M. (1981, 1982a, 1982b), Lönnberg (1911), Macdonald (1983), Mendelsohn (1968), Milstein (1975), Mitchell, B.L. (1966), Nikolaus (1987), Oschadleus (2007), Parker (2005), Penry (1994), Short & Horne (2005), Skead, C.J. (1966, 1997), Skead, D.M. (1975), Skinner (1995), Smith (1974), van Someren (1916), Tarboton *et al.* (1987), Thomson & Ferguson (2007), Tomlinson (1947–1948), Traylor (1963a), Urban & Brown (1971), Vernon (1972, 1983), Vincent, J. (1936), Vincent, A.W. (1949a), Voigt & Eppel (2009), Voigt & Siebenrock (2001), Voigt *et al.* (2006, 2007), Wingfield & Lewis (1993), Wingfield *et al.* (1991, 1992), Zimmerman *et al.* (1996).

5. Chestnut-crowned Sparrow-weaver

Plocepasser superciliosus

French: Mahali à calotte marron **Spanish**: Tejedor-gorrión Coronicastaño
German: Kastanienscheitelweber
Other common names: Sparrow-Weaver

Taxonomy. *Ploceus superciliosus* Cretzschmar, 1827, Kordofan, Sudan.
Genus sometimes placed in sparrow family (Passeridae). Proposed race *brunnescens* (described from Bozoum, in NW Central African Republic) appears to be inseparable from individuals in rest of species' range. Monotypic.
Distribution. Gambia and S Senegal, SW Mali and N Guinea; and from S Burkina Faso and N parts of Ivory Coast, Ghana, Togo and Benin E in narrow band to WC Sudan and N Central African Republic, thence E to W Eritrea and W & N Ethiopia and, in S, to NE DRCongo, N Uganda and W Kenya.



Descriptive notes. 18 cm; 30–45 g. Large brown-and-white sparrow-like weaver with rufous crown. Has forehead and crown chestnut-brown, white superciliary stripe, pale chestnut lores and cheek; nape chestnut, passing into dull brown on upperparts; upperwing and tail brown, narrow buffy margins on remiges, white tips on greater and lesser wing-coverts (producing double wingbar); chin and throat white, black malar stripe broadening into hook-shape ventrally; breast white with grey wash, flanks greyish, belly, thighs and undertail-coverts white; iris brown; bill horn-brown; legs brown. Sexes alike. Juvenile is described as being duller and paler than adult. Voice. Song a short phrase of jumbled notes, often ending in trill. Soft, rapid ticking call reported.
Habitat. Woodland and tall bush areas, generally below 2000 m. In Ethiopia, occurs above *P. mahali* in areas where ranges overlap.
Food and Feeding. Few details. Seeds reported in diet. Forages mainly on ground, often in association with waxbills (Estrildidae), sparrows and *Sporopipes frontalis*. In Ghana, small groups regularly join mixed-species flocks of insectivorous birds in savanna woodland.
Breeding. Breeds Sept–Nov in Gambia, Jun in Burkina Faso, Apr–Aug in Nigeria, Feb and May–Jun in Sudan, May in Ethiopia, Mar–Apr and Aug–Sept in Uganda, and Jun, Aug and Oct in Kenya. No information on mating system; probably a co-operative breeder. Nest a horizontal tube of dry grass stems, placed up to 6 m above ground on branches, several nests in one tree; apparent association with polistine wasps (Vespidae) in Togo. Clutch 2 eggs, cream or reddish, heavily spotted with grey and lilac, average size 22·6 × 15·3 mm (Nigeria). No other information.
Movements. Presumed mostly resident. In Ghana described as partial migrant, with notable increase in numbers during breeding season; seasonal visitor to N Guinea.
Status and Conservation. Not globally threatened. Uncommon to rather scarce throughout range; generally local. Occurs in semi-arid regions, where human populations normally sparse.
Bibliography. Balança & de Visscher (1997), Bannerman (1949), Barlow *et al.* (1997), de Bie & Morgan (1989), Borrow & Demey (2001), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Chapin (1954), Cheesman & Sclater (1936), Cheke & Walsh (1996), Elgood *et al.* (1994), Fry (1971), Fry & Keith (2004), Giraudoux *et al.* (1988), Green & Carroll (1991), Greig-Smith (1978a), Grimes (1987), Holyoak & Seddon (1989), Lamarche (1981),

On following pages: 6. Donaldson-Smith's Sparrow-weaver (*Plocepasser donaldsoni*); 7. Chestnut-mantled Sparrow-weaver (*Plocepasser rufoscapulatus*); 8. Rufous-tailed Weaver (*Histurgops ruficauda*); 9. Scaly-feathered Finch (*Sporopipes squamifrons*); 10. Speckle-fronted Weaver (*Sporopipes frontalis*); 11. Black-capped Social-weaver (*Pseudonigrita cabanisi*); 12. Grey-headed Social-weaver (*Pseudonigrita arnaudi*); 13. Sociable Weaver (*Philetairus socius*); 14. Thick-billed Weaver (*Amblyospiza albifrons*); 15. Red-billed Quelea (*Quelea quelea*); 16. Cardinal Quelea (*Quelea cardinalis*); 17. Red-headed Quelea (*Quelea erythrops*).

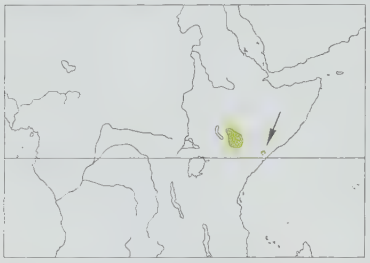
Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1924), Morel & Morel (1982), Nikolaus (1987, 2000), Sauvage & Rodwell (1998), Smith (1955), Urban & Brown (1971), Zimmerman *et al.* (1996).

6. Donaldson-Smith's Sparrow-weaver

Placepasser donaldsoni

French: Mahali de Donaldson **Spanish**: Tejedor-gorrión de Donaldson
German: Dornbuschweber

Taxonomy. *Placepasser donaldsoni* Sharpe, 1895, 'Eastern Africa' = Lasamis, Kenya.
Genus sometimes placed in sparrow family (Passeridae). This species sometimes treated within a separate genus, *Fullerellus*. Monotypic.
Distribution. S Ethiopia and N Kenya; also S Somalia (isolated records at Afmadow).



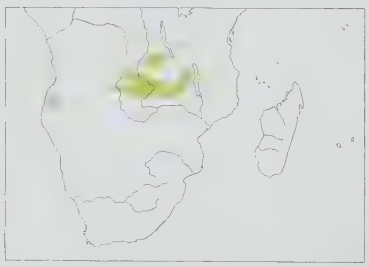
Descriptive notes. 17 cm; 35–45 g. Large sparrow-like weaver with scaly crown and white rump. Forehead and crown are dark brown with pale edges, producing scaly effect; nape and upperparts brown, rump white; upperwing and tail dark brown, wing-coverts with prominent white edges; chin and throat white, narrow black malar stripe extending to level of wing; breast white, light brown central streaks on feathers sometimes forming broad band on underparts, flanks light brown, belly, thighs and undertail-coverts white; iris reddish; bill black; legs light brown. Sexes alike. Juvenile lacks scalloping on crown, has malar stripe indistinct, breast less clearly marked, flanks pale buff, iris brown, bill horn-coloured, legs greyish. Voice. Song a rambling combination of varied notes, including harsh sounds, whistles and warbling, loudest at beginning and end of phrase; lower frequency than that of sympatric *P. mahali* in Kenya. Usually sings from nest. Contact calls a loud "chink-chink" and a soft "cluk cluk".
Habitat. Dry bushland, open woodland, grassland and rocky areas, including barren lava country; to 1500 m.
Food and Feeding. Grass seeds and insects noted in stomach contents. Forages on ground. Occurs in small flocks, sometimes in association with *Dinemellia dinemelli*.
Breeding. Breeds in Jan, Jun, Jul, Sept and Dec in Kenya. No information on mating system; probably a co-operative breeder. Nest a tube of dry grass stems, described as like that of other sparrow-weavers, placed 1·5–3 m above ground in low thorn tree or bush, up to 20 nests in single tree. Clutch size not recorded; eggs pinkish or greyish, with fine, diffuse speckles of mauve and reddish-brown. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Little known; apparently locally common. Occurs in regions very sparsely populated by humans.
Bibliography. Ash & Miskell (1998), Brown & Britton (1980), Collias & Collias (2004), Fry & Keith (2004), Lewis & Pomeroy (1989), Lönnberg (1911), Mackworth-Praed & Grant (1949b), Stevenson & Fanshawe (2002), Tomlinson (1947–1948), Urban & Brown (1971), Zimmerman *et al.* (1996).

7. Chestnut-mantled Sparrow-weaver

Placepasser rufoscapulatus

French: Mahali à dos roux **German**: Rotrückenweber **Spanish**: Tejedor-gorrión Dorsicastaño
Other common names: Chestnut-backed/Red-backed Sparrow-weaver

Taxonomy. *Placepasser rufoscapulatus* Büttikofer, 1888, Kasinga River, south Angola.
Genus sometimes placed in sparrow family (Passeridae). Monotypic.
Distribution. SW Angola, SE DRCongo, C & E Zambia, W Tanzania (near Mpanda) and WC Malawi.



Descriptive notes. 18 cm; 39–49 g. Large sparrow-like weaver with heavy black and white head stripes and rufous back. Has forehead black, broad white central crownstripe surrounded by black band, white supercilium from near bill to nape, black lores and cheek; upperparts rich chestnut-brown, rump grey, tail grey-brown; upperwing dark brown, buffy edges on tertials and wing-coverts, upperwing-coverts with white tips forming wingbars; chin and throat white, black malar stripe; breast, flanks, belly, thighs and undertail-coverts buffy grey; iris reddish-brown; bill whitish or black (both sexes may have black or white bill in different months, suggesting seasonal colour change); legs flesh-coloured. Sexes alike. Juvenile is patterned like adult, but paler chestnut on back, moustachial stripes indistinct, iris dark brown, bill blackish. Voice. Song described as a loud jumble of different elements (this perhaps only territorial song). Contact call a high-pitched "srp".
Habitat. Restricted to miombo (*Brachystegia*) woodland; below 1500 m.
Food and Feeding. Seeds reported as stomach contents; species presumably also takes insects. Forages primarily on ground; also joins mixed-species flocks moving through middle stratum of trees.
Breeding. Breeds Sept–Oct in Angola, Sept–Nov in Zambia and Oct–Mar in DRCongo. No information on mating system; likely to be a co-operative breeder with system like that of *P. mahali*. Nest a tube of dry grass with two entrances, one entrance closed off when breeding, placed up to 5 m above ground near end of branch in tree (*Julbernadia* or *Brachystegia*); small groups of nests in a single tree in Zambia, solitary nests reported in Angola. No information on clutch size; eggs whitish, heavily spotted with reddish-brown at thick end. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Locally common. Found mainly in areas of sparse human population. Present in some protected areas.
Bibliography. Aspinwall & Beel (1998), Benson (1959), Benson *et al.* (1964), Chapin (1954), Dean (2000), Dean *et al.* (1988), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Lippens & Wille (1976), Newman *et al.* (1992), Traylor (1963a), Verheyen (1953).

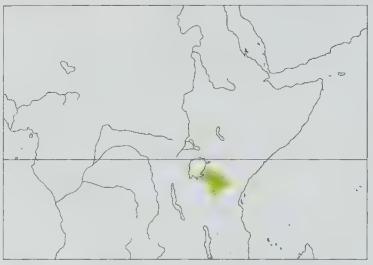
Genus *HISTURGOPS* Reichenow, 1887

8. Rufous-tailed Weaver

Histurgops ruficauda

French: Histurgopse à queue rouge **German**: Rotschwanzweber **Spanish**: Tejedor Colirrojo

Taxonomy. *Histurgops ruficauda* Reichenow, 1887, Wembaere, Tanzania.
Genus sometimes placed in sparrow family (Passeridae). Monotypic.
Distribution. NC Tanzania.



Descriptive notes. 21 cm; 60–70 g. Large, mottled weaver with pale iris and rufous outer tail feathers. Head, mantle and back are dark brown with pale feather edges, rump and uppertail-coverts rufous with dark central streaks; tail rufous, two central feathers dark brown; upperwing brown, flight-feathers with pinkish-buff to rufous outer margins and inner webs; whitish below, dark central streaks on chin, throat, belly, thighs and undertail-coverts, dark brown droplet pattern on breast and flank feathers; iris bluish-white; upper mandible blackish, lower mandible brown with pale base; legs slate-grey. Sexes alike. Juvenile is darker brown than adult, with scaly mottling on underparts, iris brown, bill yellowish. Voice. Song an extended string of nasal skirls and slurs, often sung from nest. Contact or alarm call a harsh "skweuk"; bleating call also reported.
Habitat. Inhabits thornveld and grassland, especially on black cotton soils, at altitude range of 1100–2000 m.
Food and Feeding. Diet includes seeds, insects and fruit; locusts (Orthoptera) in stomach contents, which generally contain more insects than seeds. Forages mostly on ground; makes short flights low above ground while feeding. Flocks of up to 25 individuals, often associated with Superb Starlings (*Lamprotornis superbus*) or *Bubalornis niger*.
Breeding. Breeding recorded in May–Jun, Aug and Oct–Feb. Monogamous; colonial, with up to 30 nests in one tree. Nest a cylindrical ball of grasses such as *Panicum*, *Pennisetum*, *Sporobolus*, *Themeda* and *Urochloa*, initially with two entrances, one closed when eggs laid, leaving wide spout c. 10 cm long, unlined or with some feathers as lining, placed 1·5–4 m above ground in gall acacia (e.g. *Acacia drepanolobium* or *Acacia tortilis*); unoccupied nests used for breeding by Superb Starling and for roosting by Fischer's Lovebird (*Agapornis fischeri*). Clutch 2–3 eggs, pale blue with grey and brown streaks and scrawls, markings sometimes forming wreath at thick end, average size 27·3 × 17·3 mm; no information on incubation and nestling periods. Nests robbed by African Harrier-hawk (*Polyboroides typus*).
Movements. Apparently resident, present at colonies throughout year.
Status and Conservation. Not globally threatened. Restricted-range species: present in Serengeti Plains EBA. Locally very common. Small global range, confined to NC Tanzania, but present in large protected areas such as Tarangire National Park, Maswa Game Reserve, Ngorongoro Conservation Area and Serengeti National Park. Recently reported from adjoining Masai Mara National Reserve, in S Kenya.
Bibliography. Bowen (1931a), Britton (1980), Brown & Britton (1980), Fishpool & Evans (2001), Fry & Keith (2004), Fuggles-Couchman & Elliott (1946), Mwangomo *et al.* (2007), Reichenow (1887a), Sclater & Moreau (1933), Stevenson & Fanshawe (2002), Turner & Pitman (1965), Zimmerman *et al.* (1996).

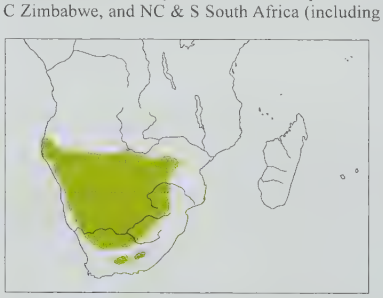
Genus *SPOROPIPES* Cabanis, 1847

9. Scaly-feathered Finch

Sporopipes squamifrons

French: Sporopipe squameux **German**: Schnurrbartweber **Spanish**: Tejedorcito Escamoso
Other common names: Scaly(-feathered)/Scaly-fronted Weaver

Taxonomy. *Estrelda squamifrons* A. Smith, 1836, Kuruman, Northern Cape, South Africa.
Forms a superspecies with *S. frontalis*. Proposed race *fuligescens* (described from R Modder N of Bloemfontein, in Free State, South Africa) regarded as inseparable from individuals elsewhere in species' range. Monotypic.
Distribution. SW Angola, Namibia (except for coastal desert), extreme S Zambia, Botswana, W & C Zimbabwe, and NC & S South Africa (including isolated populations in SE Karoo).



Descriptive notes. 11 cm; 10–14 g. Very small, pale finch-like weaver with pink bill and black malar stripes. Forehead and crown feathers are black with arrow-shaped white margins; side of head, nape and upperparts dull grey-brown; tail dark brown, feathers with white fringes; upperwing brown, but upperwing-coverts and tertials blackish-brown with broad white margins; chin black, throat white, two black malar streaks extending onto throat; underparts white, some light brown wash on breast; iris reddish-brown; bill pink (flesh-coloured to rosy), base of lower mandible pale bluish; legs horn-brown. Sexes alike. Juvenile resembles adult in pattern, but crown and forehead dull grey-brown, malar stripes indistinct, bill horn-coloured. Voice. Male song a repetitive 2-note "kreep krop, kreep krop". Female solicits copulation with high-pitched "zi-zi-zi". Contact call of both sexes a rolling "sirrip".
Habitat. Dry acacia (*Acacia*) savanna, scrub and bushes along dry watercourses, and bushy areas near houses; absent from barren coastal deserts in Namibia.

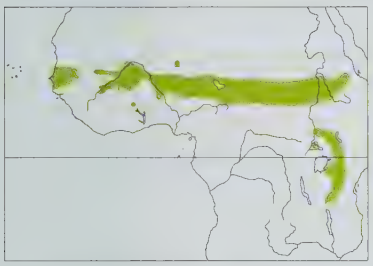
Food and Feeding. Diet primarily small seeds, such as those of grasses *Aristida* and *Schmidtia*; also insects, including termites (Isoptera). Forages mostly on ground, where it hops, seldom walks; insects, as well as seeds, collected on ground. Wild-caught individuals survived for up to 62 days without access to drinking water.
Breeding. Breeds at any time of year when conditions favourable; peak months Feb–Mar in Zambia, Dec–Apr in Botswana, Jan–Mar in Zimbabwe and Jan–Jun in South Africa. Monogamous, at least within a breeding season. Male defends a small territory. In captivity, female built nest while male brought material; nest an untidy oval mass of stiff grass stems and flowering heads of *Androgopon*, *Aristida*, *Digitaria*, *Eragrostis*, *Sporobolus* and *Urochloa*, sometimes also stems of aromatic *Pentzia*, lined with plant down, spikelets from *Rhynchelytrum* and feathers, placed in tree and usually 1–4 m above ground, up to 6 m in tall tree; sometimes roofs over old cup-nest of shrike (Laniidae) or flycatcher (Muscicapidae), or utilizes old nest of another weaver, e.g. *Ploceus velatus*; nests used throughout year also for roosting, occupied by up to twelve individuals; roof of sleeping nests thin and transparent. Clutch 3–5 eggs, greenish, bluish or pale cream, densely freckled with grey to brownish, average size 15·7 × 11·3 mm (106 eggs from South Africa); incubation by female only, period 10–12 days; chicks fed by both sexes, nestling period 14–18 days. Of 30 nests, nine failed through predation.
Movements. No regular pattern of movement detected; locally nomadic during periods of food shortage.
Status and Conservation. Not globally threatened. Common to abundant in many areas. Estimated population in Kgalagadi Transfrontier Park, on SW Botswana–South Africa border, more than 500,000 individuals; densities of up to 22 birds/km recorded on transects near Gaborone (Botswana). Has extended its range N in recent years, having become established in S Zambia. Attempted introduction on St Helena, in SC Atlantic Ocean, was unsuccessful. Deaths noted in Zimbabwe during unusually cold weather in early summer.
Bibliography. Cade (1965), Collett (1982), Collias, N.E. & Collias (1964), Dean (1973, 2000), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Farkas (1981), Fry & Keith (2004), Haydock (1954), Hockey *et al.* (2005), Irwin (1956, 1981), Kemp *et al.* (2001), Kunkel (1966b), Michaelis (1970), Penry (1994), Rowlands *et al.* (1998), Skead, D.M. (1975), Skinner (1995), Steyn & Brooke (1970), Tarboton (2001), Tarboton *et al.* (1987), Traylor (1965), Tyler (2001b), Vincent (1949a), Ziswiler (1968).

10. Speckle-fronted Weaver

Sporopipes frontalis

French: Sporopipe quadrillé **German**: Schuppenkopfweber **Spanish**: Tejedorcito Frontal
Other common names: Scaly-fronted Weaver

Taxonomy. *Loxia frontalis* Daudin, 1800, Senegal.
Forms a superspecies with *S. squamifrons*. Proposed race *pallidior* (described from Zinder, in S Niger) synonymized with nominate. Two subspecies currently recognized.
Subspecies and Distribution.
S. f. frontalis (Daudin, 1800) – SW & SE Mauritania, N & W Senegal, Gambia, Mali (mainly drainage area of R Niger), NW Burkina Faso, NW Ghana (Mole region), N Benin, WC & S Niger (including Aïr Massif) and N Nigeria E in Sahel region to NW Ethiopia and SW Eritrea.
S. f. emini Neumann, 1900 – S Sudan, NW & NE Uganda and WC Kenya S to C Tanzania.



Descriptive notes. 11 cm; 14–22 g. Small, pale finch-like weaver with distinctive head pattern. Nominate race has feathers of forehead and crown black with white tips (creating speckled effect), cheek and ear-coverts pale grey, nape chestnut-brown, this colour extending forwards in narrow crescent behind ear-coverts, black submoustachial stripe with white feather tips; upperparts pale grey-brown, upperwing and tail brown with paler margins; throat and underparts white, greyish wash on breast; iris brown; bill pale horn-grey; legs brown. Sexes alike. Juvenile is like adult but paler, especially on nape, which is tawny, rather than chestnut. Race *emini* is very like nominate, but has darker grey mantle. Voice. Song a high-pitched, rapid "tsitsitsi te-te-te-teetee-tee". Flight call "tsip-tsip-tsip".
Habitat. Dry thornveld, scrub and thickets; in Sahel region especially associated with acacia (*Acacia*), *Salvadora persica* or *Butyrispermum* trees. From 400 m up to 2000 m in E Africa, and often present around villages.
Food and Feeding. Mainly seeds; also small insects, including alate termites (Isoptera). Forages largely on ground, where it moves by hopping. Often on open gravel patches, associated with waxbills (Estrildidae).
Breeding. Season Sept–Dec over much of range, sometimes until Feb/Mar; breeding recorded also Apr–May in Ethiopia, May–Jul in Kenya and May–Aug in Tanzania; in W Africa breeding reported both in wet season and at height of dry season. Monogamous; unclear if long-term pair-bond. Nest a large, untidy ball of dry grass with entrance tunnel at side, lined with finer material and a few grass seedheads, rarely with feathers, placed 2–6 m above ground in shrub or tree; occasionally near colony of wasp *Ropalidia cincta* in Ghana; roost in old nests throughout year. Clutch 2–4 eggs, pale grey mottled with darker markings, giving impression of dark brown ground colour, size 17·5 × 12·5 mm (Sudan); in captivity, incubation by female only, period not recorded, chicks fed by both sexes (by regurgitation of crushed seeds). Nests in Kenya raided by Green Woodhoopoes (*Phoeniculus purpureus*), which ate several eggs; in Ghana, active nest taken over by Red-cheeked Cordon-bleu (*Uraeginthus bengalus*). Estimated annual survival of a small sample of adults in Nigeria 40%.
Movements. Generally resident. Local movements reported during rains in Mauritania; apparently present only during wet season in Sahel zone of Nigeria, but protracted wing moult (lasting nearly 6 months) in Nigeria suggests no long-distance movement after breeding.
Status and Conservation. Not globally threatened. Widespread and locally common; rather local in NW Uganda (West Nile region). Occurs primarily in regions not suited to agriculture or intensive human settlement; projected climate change is thought likely to increase its range, rather than restrict it. One record of a specimen for sale in Nigerian market of animal products for traditional medicine.
Bibliography. Balança & de Visscher (1997), Bannerman (1949), Barlow *et al.* (1997), Bates (1934), Beier & Tungbani (2006), de Bie & Morgan (1989), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Cheesman & Sclater (1936), Cheke & Walsh (1996), Claffey (1995), Cresswell *et al.* (2009), Elgood, Fry & Dowsett (1973), Elgood, Heigham *et al.* (1994), Fry (1971), Fry & Keith (2004), Giraudoux *et al.* (1988), Granvik (1934), Grimes (1987), Holyoak & Seddon (1989), Kaestner & Kaestner (1978), Kunkel (1966b), Lamarche (1981, 1993), Lewis & Pomeroy (1989), Louette (1981), Lynes (1924), McGregor *et al.* (2007), Morel & Morel (1982), Newby (1980), Nikolaus (1987, 2001), Paludan (1936), Reynolds (1968), Sauvage & Rodwell (1998), Schifter (1986), Stevenson & Fanshawe (2002), Thonnerieux (1988), Thonnerieux *et al.* (1989), Urban & Brown (1971), Weckes (1948), Zimmerman *et al.* (1996).

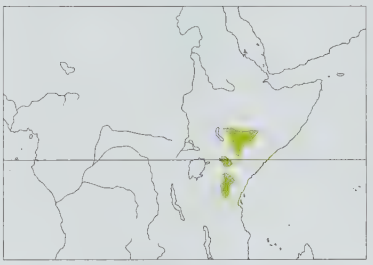
Genus *PSEUDONIGRITA* Reichenow, 1903

11. Black-capped Social-weaver

Pseudonigrita cabanisi

French: Républicain de Cabanis **Spanish**: Tejedor Social de Cabanis
German: Schwarzkappenweber

Taxonomy. *Nigrita cabanisi* G. A. Fischer and Reichenow, 1884, Tanzania.
Genus sometimes placed in sparrow family (Passeridae). This species sometimes treated within a separate genus, *Somalita*. Monotypic.
Distribution. S Ethiopia and N & C Kenya S to NC Tanzania.



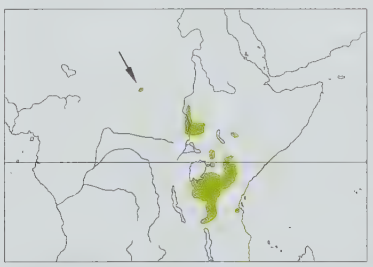
Descriptive notes. 13 cm; 18–24 g. Small finch-like weaver with black cap and white underparts. Forehead and crown are black, ending in sharp line below eye and across nape; nape, mantle, rump and upperwing light brown, tail dark brown; chin to undertail-coverts white, thin black streak in centre of belly, flanks light brown with black line bordering white belly; iris red; bill ivory-white; legs brown. Sexes alike. Juvenile has brown crown, lacks black borders on flanks and central black streak on belly, iris brown, bill horn-brown. Voice. Only vocalizations reported are a mix of chirps and skirls, sounding very like calls of a sparrow (*Passer*), and ceaseless chipping notes during foraging; squealing chatter from birds in colony.
Habitat. Dry thornveld, generally below 1300 m. Sometimes found alongside *P. arnaudi*, and also with *Sporopipes frontalis*.
Food and Feeding. Seeds and also a few insects recorded amongst stomach contents. Forages on ground.
Breeding. Breeds Feb–May; also Dec–Jan and Aug–Sept in Kenya. Monogamous; thought likely to be co-operative breeder. Colonial, up to 60 nests in adjoining trees. Nest a bulky, conical mass of thin, dry grass stems (which protrude from surface), unlined, placed c. 2 m above ground in tree such as *Delonix*, *Acacia mellifera*, *Acacia tortilis* or tree euphorbia (*Euphorbia*), often near end of pendant branch, adjacent nests sometimes merging into apparent compound structure; nests with two entrances used for roosting, second entrance closed during breeding; both sexes add material throughout year. Clutch 2–4 eggs, white or pinkish, with brown and violet markings, size 19 × 14 mm; in captivity, young fed by breeding pair and additional adult, and all roosted in nest together. No other information.
Movements. Non-breeding flocks described as being nomadic.
Status and Conservation. Not globally threatened. Fairly common, but very localized in distribution. Occurs primarily in regions sparsely populated by humans. Present in Yavello Wildlife Sanctuary, in S Ethiopia. Old records from SW Somalia–Kenya border.
Bibliography. Benson (1947a), Britton (1980), Brown & Britton (1980), Collias, N.E. (1984), Collias, N.E. & Collias (1964), Davies (2006), Fishpool & Evans (2001), Fry & Keith (2004), Lewis & Pomeroy (1989), Moreau (1944), Moreau & Moreau (1939), Serle (1943a), Stevenson & Fanshawe (2002), Tomlinson (1947–1948), Urban & Brown (1971), Zimmerman *et al.* (1996).

12. Grey-headed Social-weaver

Pseudonigrita arnaudi

French: Républicain d'Arnaud **German**: Marmorweber **Spanish**: Tejedor Social de Arnaud
Other common names: Grey-capped Social-weaver

Taxonomy. *Nigrita arnaudi* Bonaparte, 1850, White Nile, Sudan.
Genus sometimes placed in sparrow family (Passeridae). Proposed race *australoabyssinicus* (described from Yavello, in S Ethiopia) is treated as synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
P. a. arnaudi (Bonaparte, 1850) – W & S Sudan, extreme S Ethiopia, E Uganda, and W & C Kenya S to NW Tanzania.
P. a. dorsalis (Reichenow, 1887) – N, C & E Tanzania.



Descriptive notes. 12 cm; 15–26 g. Small, sandy finch-like weaver with pale cap. Nominate race has forehead to nape pale grey, ending in sharp line level with eye and across nape, ring of white feathers around eye; side of head, upperparts and underparts sandy brown; tail blackish-brown, broad dull white or pale sandy tips on outer rectrices, extending to entire inner web of central pair of rectrices; upperwing sandy brown, blackish-brown on primaries and their coverts and on inner webs of secondaries and tertials, small pale grey epaulet; iris red-brown to brown; bill black; legs pinkish to brown. Sexes alike. Juvenile lacks grey cap and white-feathered eyering, is paler and more buffy than adult, with dark brown patch on epaulet, buff margins on rectrices, bill light brown. Race *dorsalis* differs from nominate in having slate-grey mantle. Voice. Song a high-pitched series of 7–10 elements. Rolling and trilling flight calls and contact calls; loud "cheep" notes in territorial display, single "cheep" in alarm.

Habitat. Dry woodland, generally below 1400 m, sometimes to 1900 m.
Food and Feeding. Diet a mixture of grass seeds and insects, including grasshoppers (Orthoptera), beetles (Coleoptera), termites (Isoptera) and caterpillars (Lepidoptera). Nestlings fed with green grass seeds and insects. Forages mostly on ground. Drinks regularly.
Breeding. Breeding recorded in all months; peak Aug–Dec in Sudan and Mar–May in Ethiopia and E Africa. Monogamous; sometimes co-operative breeder, e.g. 25–30% of nests at a Kenyan colony had helpers. Colonial, with up to 157 nests, some in fused masses, in single tree; groups of 2–8 nests defended by family group; joint defence against predators and intruders from other colonies. Nest built by both sexes, a compact mass of straight grass stems, two openings in roost nests, one closed off when breeding, lined with feathers, attached to thin branches, often of ant-gall acacia (*Acacia drepanolobium*), sometimes in other acacias (*A. mellifera*, *A. senegala*, *A. tortilis*); old nests utilized by Cut-throat Finches (*Amadina fasciata*), and both latter species and Chestnut Sparrow (*Passer eminibey*) will take over newly built nests. Clutch 3–4 eggs, greenish or blue-white, often plain white with fine olive or black specks concentrated at thick end, sometimes heavily blotched olive-brown and ash-grey, average size of six eggs 19 × 14 mm (Kenya); incubation by both parents (in captivity, 70% of work by female), period 13–14 days; both parents and any helpers present may roost in nest, but only parents incubate; young fed by both parents and by helpers, latter predominantly males (which contribute most when food demand by chicks greatest), nestling period 20 days; fledglings fed by adults for 2–3 weeks after leaving nest. Pairs with helpers raised more young in study in Kenya. Nest predators include snakes, House Crow (*Corvus splendens*) and Gabar Goshawk (*Micronisus gabar*). Adult survival from one year to the next was up to 80% in Kenya.
Movements. Resident at colonies; juveniles disperse, females apparently leaving natal colony before males.
Status and Conservation. Not globally threatened. Locally common. Distribution fragmented, with isolated populations in W Sudan (S Darfur), S Ethiopia and E Uganda; also coastal E Tanzania near Dar-es-Salaam, where population established from escapees and individuals released by bird-traders. Old records from S Somalia. Present in many protected areas in E Africa.
Bibliography. Baker & Howell (1992), Bartsch (1991), Bennun (1994a, 1994b), Benson (1947a, 1948), Bowen (1931a), Britton (1980), Brown & Britton (1980), Carswell *et al.* (2005), Cave & Macdonald (1955), Collias, N.E. (1984), Collias, N.E. & Collias (1977, 1978c, 1980), Cunningham-van Someren (1971a), Fry & Keith (2004), Granvik (1934), Hemmer (1976a), Lewis & Pomeroy (1989), Moreau (1942, 1943), Nikolaus (1987), Payne (1969), Reynolds (1968), Stevenson & Fanshawe (2002), Urban & Brown (1971), Zimmerman *et al.* (1996).

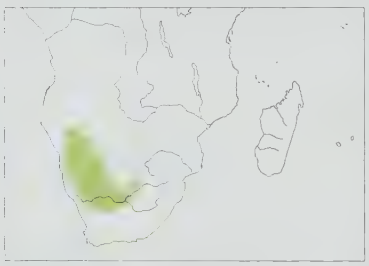
Genus *PHILETAIRUS* A. Smith, 1837

13. Sociable Weaver

Philetairus socius

French: Républicain social **German**: Siedelweber **Spanish**: Tejedor Republicano
Other common names: (Common) Social Weaver

Taxonomy. *Loxia socia* Latham, 1790, Warmbad, Great Namaqualand, south Namibia.
Genus sometimes placed in sparrow family (Passeridae). Several geographical races proposed, i.e. *geminus* (described from Okaukuejo, in N Namibia), *xericus* (from W Namibia), *lepidus* (from Kuruman region, in Northern Cape, South Africa) and *eremnus* (from Kransfontein, N of Prieska, in Northern Cape); examination of large samples of specimens, however, does not reveal any constant regional variations, and plumage coloration perhaps dependent more on colour of substrate. Treated as monotypic.
Distribution. NC Namibia S to SW Botswana and NW South Africa.



Descriptive notes. 14 cm; 24–32 g. Small, rather pale-plumaged finch-like weaver with scaly markings on upperparts and flanks. Cap sandy brown, hindneck to back dark brown with pale feather edges (producing scalloped effect), rump pale sandy brown; upperwing and tail dull brown, broad pale margins on wing-coverts; cheeks cream with brownish wash, black patch (with rounded lower border) from lores down to chin and throat; breast, belly, thighs and undertail-coverts cream with brownish wash, flanks with black patch of white-edged feathers; iris dark brown; bill blue-grey, darker base; legs dark brown. Sexes alike. Juvenile lacks black throat patch and scalloping on mantle and flanks, has some speckling on forehead and crown, bill pale horn. Voice. Song, given only by high-ranking males, a chatter of c. 10 initial notes followed by a few paired elements. Threat call a complex series of at least 15 rapid notes; nest-entry call a long phrase of more than 15 elements. In flight, 7–8 calls per second; contact call normally a single note; alarm a harsh single note.
Habitat. Open arid country (annual rainfall 80–600 mm) with scattered trees and bare ground. Dependent on trees (or man-made structures) for nest-sites.
Food and Feeding. Diet seeds and insects, proportions (by weight) varying seasonally from 16% insects and 84% seeds to 80% insects and 20% seeds; occasionally soft fruit, ovaries of flowers of *Rhigozum trichotomum*. Insect food includes grasshoppers (Orthoptera), beetle larvae (Coleoptera), caterpillars and moths (Lepidoptera), termites (Isoptera), especially harvester termites (Hodotermitidae) and termite alates. Nestling diet solely insects. Most food collected on ground, where this species hops, but also runs in darts after insect prey; also hawks flying insects. Forages usually within 2 km of nest-site. Seldom drinks, but will do so if water available.
Breeding. Breeds Dec–Aug in N Namibia and Nov–Jan in SE of range; elsewhere breeding not seasonal, dependent on irregular rainfall, continued over 9-month period (this associated with very slow, extended moult); up to four successive broods in a season. Monogamous, but successive nesting attempts often with different partners, even if former mate still present in colony. Often breeds co-operatively, with up to nine helpers (both adults and young), these most often related to young in nest at which they help; those still helping when older than 1 year are always males (artificial provision of extra food at a colony promoted earlier breeding, with more independent breeding pairs and fewer birds as helpers). Colonial breeder; up to several hundred individuals at a single nest. Nest a huge mass which can be 4 m deep and 7·2 m long, weighing as much as 1 tonne, of dry grass stems forming roof over separate nesting chambers (up to 95) with entrances on underside, material added throughout year, chambers lined with soft plant material, animal fur, sometimes feathers, and new chambers added especially after rain; placed 3·5–7 m above ground in tree such as *Acacia erioloba*, *Acacia haematoxylon*, *Acacia giraffae*, *Boscia albitrunca*, mopane (*Colophospermum mopane*) or *Aloe dichotoma*, occasionally exotic tree utilized, and once nest placed on small cliff; in treeless areas, telephone poles used since 1949 (baskets fitted on pole to avoid nest mass being built around insulators) and recently also electricity pylons (nest usually low, within 4 m of ground); nests of aggressive wasp *Belonogaster rufipennis* often suspended under nest mass, may provide some protection from diurnal predators; in S Africa, African Pygmy-falcon (*Polihierax semitorquatus*) apparently entirely dependent for roosting and breeding on nests of this weaver, which tolerates it, although directs alarm calls to resident falcons; other bird species that may roost or breed in nest-chambers include Rosy-faced Lovebird (*Agapornis roseicollis*), Acacia Pied Barbet (*Tricholaema leucomelas*), Ashy Tit (*Parus cinerascens*), Familiar Chat (*Cercomela familiaris*) and Red-headed Finch (*Amadina erythrocephala*); large birds of prey, such as Verreaux's Eagle-owl (*Bubo lacteus*), African White-backed Vulture (*Gyps africanus*) and Bateleur (*Terathopius ecaudatus*), may use nest mass as base for own nests. Clutch 2–6 eggs (mean of 32 clutches 3·6), dull white, densely spotted with different shades of grey, average size of 76 eggs 20·9 × 15·1 mm (South Africa); incubation by both sexes, period 13–14 days; chicks fed by both parents and by helpers, nestling period 21–24 days; fledglings fed for at least 16 days after leaving nest. At Kalahari colony, 42% of eggs hatched, but only 13% of eggs produced flying young; at one colony, pairs with helpers produced more male offspring than did pairs raising young unaided; experimentally enlarged broods were more successful when helpers present, and comparisons between years showed that helpers enhance breeding success (this effect usually detectable only in poor seasons); main nest predators snakes, e.g. Cape cobra (*Naja nivea*) and boomslang (*Dispholidus typus*), also honey badger (*Mellivora capensis*), sometimes also African Pygmy-falcon. Comparisons between colonies of different sizes suggest that birds in larger colonies invest less in reproduction than do those in smaller colonies; relative colony sizes were fairly stable over a ten-year period in one study population.
Movements. Resident; some dispersal and interchange between colonies up to 4 km apart, one individual moved more than 30 km.
Status and Conservation. Not globally threatened. Common to locally abundant. Population of Kgalagadi Transfrontier Park, on SW Botswana–South Africa border, estimated as greater than 16,000 birds.
Bibliography. Anderson (1995), Baron & Baron (1976), Bartholomew *et al.* (1976), Bologna *et al.* (2007), Brooke & Harrison (1992), Brown, C.J. & Lawson (1989), Brown, C.R. *et al.* (2003), Burger & Gochfeld (1981), Channing & Maclean (1976), Clancey (1950, 1989b), Collias, E.C. & Collias (1980), Collias, N.E. & Collias (1964, 1977, 1978, 2004), Courtenay-Latimer & Clancey (1960), Covas & du Plessis (2005), Covas, Brown *et al.* (2002, 2004), Covas, Dalecky *et al.* (2006), Covas, Doutrelant & du Plessis (2004), Covas, Huyser & Doutrelant (2004), Covas, du Plessis & Doutrelant (2008), Doutrelant & Covas (2006), Doutrelant *et al.* (2004), Ferguson (1988a), Friedmann & Northern (1975), Fry & Keith (2004), Gießelmann *et al.* (2008), Gimenez *et al.* (2006), Hassall (1983), Hoesch (1940, 1956), Kemp *et al.* (2001), Macdonald (1983), Maclean (1970, 1973a, 1973b, 1973c, 1973d, 1973e, 1987), Oschadleus (2004), Penry (1994), Rudebeck (1956), Skinner (1995), Spottiswoode (2007), Tarboton *et al.* (1987), White *et al.* (1975), Williams & du Plessis (1996).

Subfamily PLOCEINAE

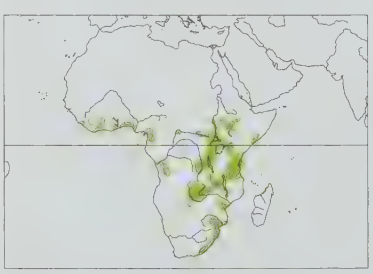
Genus *AMBLYOSPIZA* Sundevall, 1850

14. Thick-billed Weaver

Amblyospiza albifrons

French: Amblyospize à front blanc **German**: Weißstirnweber **Spanish**: Tejedor Picogordo
Other common names: Grosbeak Weaver, White-fronted Grosbeak

Taxonomy. *Pyrrhula albifrons* Vigors, 1831, Algoa Bay, South Africa.
Original spelling of genus name is "*Amblyospitza*", but this form has never been used and best regarded as obsolete. Proposed race *woltersi* (described from Manhica, in S Mozambique) is synonymized with nominate; *saturata* (from Bitye, on R Dja, in Cameroon) and *tandae* (from N Angola) with *capitalba*; and *kasaica* (from SE DRCongo) and *maxima* (from Chobe, in Botswana) with *montana*. Five subspecies currently recognized.
Subspecies and Distribution.
A. a. capitalba (Bonaparte, 1850) – S Sierra Leone, SE Guinea, Liberia, C & S Ivory Coast, S Ghana E to SW Nigeria, W & S Cameroon, Equatorial Guinea, N Gabon, S Central African Republic, NW DRCongo, and SW PRCongo S to NW Angola.
A. a. melanota (Heuglin, 1863) – S Sudan, SW Ethiopia, E DRCongo, Uganda, W Kenya, Rwanda, Burundi and NW Tanzania.
A. a. montana van Someren, 1921 – interior of Kenya and Tanzania, SE DRCongo, Zambia, Malawi, N Botswana (Okavango Basin) and NW Zimbabwe.
A. a. unicolor (G. A. Fischer & Reichenow, 1878) – S Somalia, coastal Kenya and Tanzania, Zanzibar and Pemba I.
A. a. albifrons (Vigors, 1831) – E Zimbabwe, C & S Mozambique, Swaziland and E South Africa.



Descriptive notes. 18 cm; male 35–57 g, female 34–53 g. Large, dark-plumaged weaver with very heavy bill. Male nominate race has forehead white (considerable individual variation in extent of white frontal band within any one population; white may be absent during moult), rest of head and upperparts uniformly dark chocolate-brown, upperwing and tail blackish-brown, white bases of primaries forming patch (visible on folded wing, conspicuous in flight); throat and underparts dark chocolate-brown, sometimes with paler feathers fringes from lower breast to vent; iris brown; bill blackish or dark grey; legs dark grey to black. Female is dark brown with buffy scaling above, indistinct grey supercilium, dark brown wing and tail, paler edges of wing-coverts; rarely, may have some remiges with male patterning; chin to belly and flanks dull white with heavy brown streaking in centre of feathers,

thighs brown, undertail-coverts with blackish-brown centres; iris brown, bill dull brown to orange-yellow, legs grey. Juvenile resembles female, but bill yellowish; young male takes at least 2 years to acquire adult plumage. Race *capitalba* male has white of forehead extending onto crown, light rufous-brown hindcrown, nape, and chin to chest contrasting with dark chocolate-brown of upperparts, wings and tail and with grey-brown belly; *melanota* male has small area of white on forehead, dark brown head contrasting with black upperparts; *montana* is very dark, virtually black on head, breast and upperparts; *unicolor* is similar to last but smaller, has some brown wash on head of male, but no obvious colour contrast. VOICE. Song a combination of trills and clicking notes, including such elements as "jee teee click-click-click clee-clee-clee wer-pee krrrr". Contact call a loud "chuck".

Habitat. Generally near water and well-wooded areas. Breeds in wetlands; in non-breeding season forages on edges of evergreen forest and in forest canopy, often far from water. Roosts communally in tall grass or reedbeds during non-breeding season. Found at up to 3000 m in Kenya and E DRCongo, at 1300 m on Mt Kilimanjaro (N Tanzania), and to 1500 m in SC Africa; below 850 m on Mt Kupe, in Cameroon.

Food and Feeding. Diet seeds, soft fruit, insects and occasionally other animal food. Seeds include those of *Acacia robusta*, *Albizia adianthifolia*, *Pennisetum*, Cyperaceae, conifer seeds in Malawi plantations, also seeds of sunflowers (*Helianthus annuus*) and *Manikot palmata* in gardens; takes green drupes of *Celtis africana*, removing skins and flesh to eat the hard seeds. Eats berries and fruits of *Sapium manianum*, *Trema guineensis*, sunflower, *Chaetachme aristata*, *Melia azedarach*, *Kiggelaria africana*, *Sizygium cordatum*, *Rhus succedeana*, *Lantana camara*, *Grewia*, *Ziziphus mucronata*, *Zanthoxylum davyi*, *Coix lachryma-jobi*, *Celtis mildbraedii*. Hawks alate termites (Isoptera); adult in Kenya ate small frog. Nestling stomachs contained ants (Formicidae), beetles (Coleoptera) and aquatic snails *Lymnaea natalensis*. Forages on ground and in forest canopy. In small flocks outside breeding season.

Breeding. Breeds May–Nov in Cameroon, Jul–Oct in Central African Republic, Nov in Sudan, and May–Jun and Aug–Sept in Ethiopia; in DRCongo, Jan–Mar in Katanga, Jun–Nov in Ituri and Jan in Itombwe; all months except Nov–Dec (peak Apr–Jun) in Uganda; in Kenya, Apr–Oct on coast and all months except Sept–Oct (peak Mar–Jun) inland; Mar–Apr in Rwanda, Dec–Feb and Apr–May in Tanzania, and Dec–Mar in Mozambique, Angola, Zambia and Malawi; Jan–Feb and Apr in Botswana, and Nov–Mar in Zimbabwe; in South Africa, Nov–Mar inland and Sept–Mar in coastal regions. Polygynous, male with up to six females, three nesting simultaneously on territory; also single nests and apparently monogamous pairs in areas of low density. Often in small colonies; more than 100 nests in one South African colony. Small territory defended around nest. Male displays near nest with slow, flapping flight; when female approaches, perched male rotates wings forwards, displaying white patches, jerks tail up and down, and sings. Nest ovoid, with large side entrance, built by male from finely shredded strips torn from grass, palms or bulrushes (*Typha*), starting with a bridge between vertical supports, then a cup formed below bridge, roofed over in last phase; once nest occupied, entrance closed to a small round opening, female lining cup with wad of grass; attached, 1–3 m above ground or water, to bulrushes, papyrus (*Cyperus papyrus*) or reeds (*Phragmites*) and sedges, usually over water, also in tall elephant grass (*Pennisetum purpureum*); may nest close to various *Ploceus* species, also near *Euplectes orix* in South Africa; old nests occupied by climbing mice (*Dendromus*), and utilized for breeding by Zebra Waxbill (*Amandava subflava*) and sometimes by Brown Firefinch (*Lagonosticta nitidula*). Mean clutch size 3 eggs (Malawi, South Africa), white to pink, spotted with red, purple and brown, average size of 165 in S Africa 23·6 × 16·2 mm; incubation by female, in mean spells of 33 minutes (mean 12·5 minutes off nest), period 14–16 days; chicks fed by female (by regurgitation), occasionally by male, nestling period 18–20 days; in captivity, young dependent on adults until 6 weeks old, first opened sunflower seeds at 12 weeks. Nests possibly parasitized by Diederik Cuckoo (*Chrysococcyx caprius*), one of which seen to remove eggs from nest; corroboration required. During two successive seasons at colony in KwaZulu-Natal, in NE South Africa, breeding success 60% (50 nests) and 72% (35 nests), respectively; nest predators include White-browed Coucal (*Centropus superciliosus*) and House Crow (*Corvus splendens*) in Kenya, and Nile monitor (*Varanus niloticus*) in Togo. In ringing studies, oldest individual recovered more than 8 years after ringing.

Movements. Resident. Short local movements in relation to foraging; only one ringed individual moved more than 50 km, having moved 130 km along coast in Eastern Cape (South Africa). High recapture rates at breeding and roosting localities in South Africa, but less site fidelity in Malawi over 16-year study.

Status and Conservation. Not globally threatened. Abundant in many parts of range. Estimated population in Swaziland 3000 individuals; 1000 in Kruger National Park, in South Africa, and 7000 in adjacent S & C Mozambique. In W of range, a single record (of race *capitalba*) from Senegal. Recent range expansion in Zimbabwe and South Africa (Mpumalanga and Gauteng), where now occurs in settled and even urban areas.

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Genus *QUELEA* Reichenbach, 1850

15. Red-billed Quelea

Quelea quelea

French: Travailleur à bec rouge **German**: Blutschnabelweber **Spanish**: Quelea Común
Other common names: Sudan/Pink-billed Quelea, Black-faced Quelea/Dioch

Taxonomy. *Emberiza quelea* Linnaeus, 1758, India; error = Senegal.

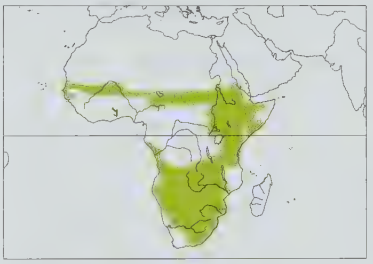
Has hybridized with *Q. erythrops* in captivity. Proposed race *spoliator* (described from KwaZulu-Natal, in South Africa) is inseparable both morphologically and genetically from *lathamii*. Distribution of races difficult to state with accuracy; species has been recorded from all mainland countries in sub-Saharan Africa, and ranges listed below reflect areas where birds always likely to be found, and where breeding may occur; separation of races based partly on postulated independent movements of the three populations. Three subspecies recognized.

Subspecies and Distribution.

Q. q. quelea (Linnaeus, 1758) – S Mauritania, W & N Senegal, Gambia, C Mali, N Burkina Faso, SW & S Niger, N Nigeria, N Cameroon, SC Chad and N Central African Republic.

Q. q. aethiopica (Sundevall, 1850) – W, C & E Sudan, Ethiopia and W Eritrea S to NE DRCongo, Uganda, Kenya, C & E Tanzania and NW & S Somalia.

Q. q. lathamii (A. Smith, 1836) – SW Gabon, S PRCongo, Angola (except NE and arid coastal SW), S DRCongo and R Congo mouth, Zambia, Malawi and W Mozambique S to Namibia (except coastal desert) and C, S & E South Africa.



Descriptive notes. 12 cm; 15–26 g. Small, short-tailed weaver. Male nominate race breeding shows considerable variation in extent of black and white on forehead and crown; most commonly has black face mask covering forehead, lores, cheek, ear-coverts, chin and throat (variable: mask sometimes pink to purplish, sometimes creamy white); areas adjacent to mask variably straw-coloured or pink, the pink sometimes extending onto underparts as far as belly; otherwise, crown and nape usually straw-coloured, upperparts light brown with heavy central streaks, rump with finer streaks, tail brown, upperwing brown, remiges with dull yellow margins; upper breast straw-coloured (or pink), lower breast and flanks light brown, flanks streaked, belly, thighs and undertail coverts white; iris brown, narrow bare red orbital ring; bill bright red; legs orange. Male in non-breeding plumage has forehead and crown grey-brown with faint streaks, chin and throat white, breast buff, rest of plumage much as for breeding male; iris brown, red orbital ring, bill red to pink, legs flesh-coloured. Female is like non-breeding male, but in breeding condition has dull yellow bill and eyering. Juvenile resembles non-breeding adult, but head plain grey, cheek whitish, broad buffy margins on rectrices and wing-coverts, iris brown with dull brown eyering, bill horn-brown. Races differ primarily in male breeding plumage: *aethiopica* lacks buffy wash on underparts and black band across forehead; *lathamii* has broad band on forehead, also mainly white on underparts. VOICE. Male song in short bursts, with preliminary chatter, a warbling section "tweedle toodle tweedle", and ending with long whistle. Contact call "chirt chirt"; flight call "tseep"; aggressive call a harsh "chak".

Habitat. Most abundant in semi-arid habitats, including dry thornveld and bushed grassland, visiting cultivated areas; also sporadically in very dry or wet areas. Generally absent from forested regions. Lowlands and hills, rarely to 3000 m; primarily at 500–1500 m in E Africa and mainly below 1000 m in S.

Food and Feeding. Diet primarily grass and cereal seeds, collected both when on the plant and from ground; also insects. Prefers seeds 2 × 1 mm in size; damages crops of wheat (*Triticum*), sorghum (*Sorghum*), manna, millet, oats (*Avena*), buckwheat (Polygonaceae) and rice (*Oryza*), also takes crushed maize (*Zea mays*) in feedlots for cattle and Ostriches (*Struthio camelus*); wild grasses exploited include *Dactyloctenium aegyptium*, *Echinochloa colonum*, *Echinochloa pyramidalis*, *Ischaemum brachyantherum*, *Oryza bartlii*, *Panicum laevigatum*, *Paspalum* (of three species), *Schoenfeldia gracilis*, *Setaria* (of five species), *Urochloa* and *Pennisetum*. Major crop damage usually occurs when natural food sources inadequate; in Kenya, wild grass seeds 80% of diet in Oct, but in Feb–Apr millet more than 40% of diet. Insects constitute less than 10% of diet, include beetles (Coleoptera), caterpillars and adult butterflies (Lepidoptera), grasshoppers and crickets (Orthoptera), bugs (Hemiptera), ants (Formicidae), harvester termites (Hodotermitidae), dragonflies (Odonata); spiders (Araneae) also taken. Insects account for 35–50% of nestling food by volume. Colony with more than 12,000 nests/ha estimated to consume 1845 kg/ha of seeds and 214 kg/ha of insects in a month. Females ingest snail shells, eggshell fragments and calcrete, presumably to boost calcium levels when nesting. Large flocks forage on ground in "roller-feeding" fashion, in which birds from the back constantly fly to the front. Field studies of co-ordinated movements of flocks, and experimental studies in aviaries, suggest that transfer of information on location of food sources could occur among individuals at roosts. Large temporary roosts formed in trees near feeding areas during the heat of the day. Drinks regularly.

Breeding. Season mainly Aug–Nov in W Africa, and Jun–Sept in Sudan, Ethiopia and Somalia; in DRCongo, Sept in E and Jan–May in S; two periods, around Dec–Feb and in May–Jul, in Kenya and Tanzania; Feb–Apr in Angola and Zambia, and Dec–Apr in Namibia, Botswana, Zimbabwe, Mozambique and South Africa; rainfall and availability of nesting material may be important in timing of breeding, which may also depend in part on an endogenous annual rhythm. Monogamous at each breeding attempt, but also itinerant breeding in which individuals may nest at up to three different locations within a season, thus likely that serial polygamy occurs with new partners at different times. Territory restricted to nest-site, where male sings with raised and fluttering wings. Typically, breeds in vast colonies with millions of nests, up to 6000 in a single large tree; occasional small colonies (five pairs) reported; breeding highly synchronized within colony, and all birds often leave area within 40 days of first nesting. Nest built by male, taking 2–3 days, roughly woven, a small oval ball of grass, with side entrance under small porch, of fresh green grass strips, placed 1–6 m (mostly 2 m) above ground in thorn tree, sometimes in reeds or sugar cane; old nests may be used for breeding by Cut-throat Finch (*Amadina fasciata*) and Zebra Waxbill (*Amandava subflava*). Clutch 1–5 eggs, typically 3, pale greenish or bluish, very rarely with some dark spotting, average size of 86 eggs 18·3 × 13·2 mm (South Africa); first egg sometimes laid while nest still incomplete; incubation period 10–12 days; chicks fed by both sexes, by regurgitation (even when insects delivered), at Senegal colony male fed 4·7 times per day, female 6 times, nestling period 10–11 days; young perch in branches until able to fly, independent at 21 days. At large colony in Nigeria 87% of eggs produced flying young, and average productivity in Senegal and Chad 2 young per nest; breeding colonies attract vast array of predators, from mammalian carnivores as large as lion (*Panthera leo*) and leopard (*Panthera pardus*) to armoured crickets, with major avian predators herons (Ardeidae), storks (Ciconiidae) and ibises (Threskiornithidae), raptors from small falcons (Falconidae) to eagles (Accipitridae), and hornbills (Bucerotidae), and reptiles including various snakes and lizards; in South Africa, colony of 3000 nests destroyed by Cattle Egrets (*Ardeola ibis*), but often impact of predators insignificant, e.g. predation destroyed no more than 13–14% of nests at two colonies in Kruger National Park. In ringing studies, maximum recorded longevity 7 years 10 months (South Africa); 1·3% of 970 juveniles survived for nearly 5 years and 2·6% of 228 juveniles survived for 3 years in Senegal.

Movements. Apparently resident in some areas, but large-scale movements occur throughout range. In W Africa (nominate race) regular migration follows rain fronts, with pre-migratory fattening directly correlated with distance moved. In E Africa (*aethiopica*), several short flights seem more likely than non-stop long-distance migration. In S Africa, some movements greater than 2000 km (confirmed by ringing studies); in contrast, of 420 birds only ten moved more than 1000 km, and 113 moved farther than 100 km. Zimbabwe individuals tested in orientation funnels showed two distinct directional preferences, suggesting migratory divide (but no morphological or genetic characters to distinguish two populations). Moult and breeding cycles of S African individuals suggest that some populations move little, and that short-range movements may be the norm for this region. Dry-season flocks may be segregated by sex.

Status and Conservation. Not globally threatened. Considered one of the most abundant wild bird species in world. Peak post-breeding population estimated at c. 1,500,000,000 individuals. Aerial surveys in N Cameroon and W Chad estimated 36 million birds, three months later 55 million; colonies in NE Nigeria covered more than 110 ha, and contained estimated 31 million nests. Population of Kruger National Park, in NE South Africa, estimated at 33 million (most abundant bird species there), and in adjacent S & C Mozambique estimated at 20 million individuals. Enormous roosts, sometimes holding millions of birds, form during dry season; often shared with other ploceids, and in S Africa also with Barn Swallows (*Hirundo rustica*). May be in process of expanding range in SW parts of South Africa. This species is a major pest of cereal crops, and huge efforts have been expended by national and international agencies on lethal control and attempts to reduce population numbers by use of explosives, petrol bombs and aerial spraying of avicides; in South Africa up to 21 million reported killed in a single month, with annual kill estimates of up to 180 million. Control operations, however, probably do no more than replace naturally occurring mortality, and there is a significant adverse impact on other species, which are poisoned directly or die after eating dead queleas; current crop-protection strategies include planting of new seed varieties and modified planting schedules. Nestling queleas are collected opportunistically for food in rural areas; adults also harvested regularly at roosts and sold in markets in W Africa. Sometimes, when drinking, lands in water, and is then eaten by crocodiles, Marabous (*Leptoptilos crumeniferus*) and pelomedusid turtles.

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16. Cardinal Quelea

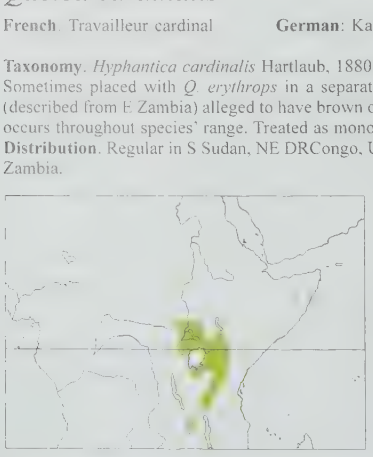
Quelea cardinalis

French: Travailleur cardinal **German**: Kardinalweber **Spanish**: Quelea Cardenal

Taxonomy. *Hyphantica cardinalis* Hartlaub, 1880, Lado, Sudan.

Sometimes placed with *Q. erythrops* in a separate genus, *Queleopsis*. Proposed race *rhodesiae* (described from E Zambia) alleged to have brown on nape more extensive, but individual variation occurs throughout species' range. Treated as monotypic.

Distribution. Regular in S Sudan, NE DRCongo, Uganda, W Kenya and NW & N Tanzania S to E Zambia.



Descriptive notes. 11 cm; 11–15 g. Small, short-tailed weaver. Male breeding has bright red head down to throat and to variable extent onto breast; nape and upperparts light brown with dark central feather streaks, rump light brown and less streaked; upperwing and tail dark brown, primaries with narrow yellow margins; belly and undertail-coverts white, flanks and thighs tawny; iris brown; bill black; legs brown. Non-breeding male has forehead, crown and nape light brown with dark central streaks, side of head tawny-brown, clear yellow supercilium, pale yellow chin and throat, this colour extending onto breast, some streaking on flanks; bill dark brown. Female is like non-breeding male. Juvenile has dark brown upperparts with broad buffy margins, buffy-yellow supercilium, white throat and underparts, washed with buff on breast, flanks and thighs, bill brown. Voice. Song a repetition of buzzes or sizzles introduced by sharp notes, terminating in nasal whistle, "tsap tsap tsap tsaptsaptsap zee-zee-zee-zee dzidzidzidzidzi nyeeeaaan". Contact call a soft "zeet".

Habitat. Rank grass and wooded grassland, generally in dry areas. Recorded at altitudes of 400–3000 m; in Kenya at 800–2000 m, and rarely up to 3000 m in mountains, but mostly below 900 m in Zambia.

Food and Feeding. Diet primarily seeds of grasses such as *Panicum* and *Setaria*; seen to take nectar from *Leonotis nepetifolia*. Insects, especially caterpillars, and regurgitated seeds fed to young. Forages on ground. Gregarious; flocks of up to 1000 individuals.

Breeding. Breeds Aug–Sept in DRCongo, Mar–Jul in Uganda and Kenya, Feb–May in Tanzania and Feb in Zambia. Polygynous. Colonial, in large colonies, also in smaller groups; sometimes solitary. Male gives short song, performs upright wing-beating display to female on territory. Nest built by male, may be completed in a single day, a tightly woven dome of grass with large side entrance, no porch over entrance, lined with finer grass, placed 30 cm to 1·5 m above ground between vertical stems of grass or other vegetation. Clutch 2–4 eggs, whitish with mauve spots and scrawls, or blue to greenish (rarely, pinkish) and finely mottled with reddish-brown, average size of seven eggs 17·3 × 12·5 mm (Uganda); incubation by female alone, period 12–14 days; chicks fed by female alone, nestling period 16–18 days. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*); reportedly also by Long-tailed Paradise-whydah (*Vidua paradisaea*), though this possibly a case of egg-dumping, rather than true brood parasitism.

Movements. Flocks appear in many areas after rain, but may move on without breeding; not clear if seasonal movements follow a regular pattern for particular populations. Wandering inferred from occasional records from S Ethiopia, Burundi, Malawi (two records, including breeding in Jan), NE Namibia (Caprivi region), and Zimbabwean side of R Zambezi.

Status and Conservation. Not globally threatened. Locally abundant. A pest of agricultural crops in some parts of E Africa.

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17. Red-headed Quelea

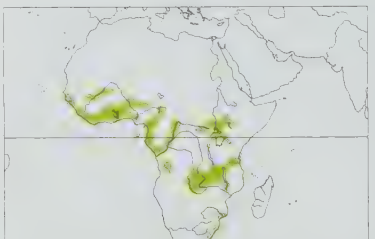
Quelea erythrops

French: Travailleur à tête rouge **German**: Rotkopfweber **Spanish**: Quelea Cabecirrojo

Taxonomy. *Ploceus erythrops* Hartlaub, 1848, São Tomé.

Sometimes placed with *Q. cardinalis* in a separate genus, *Queleopsis*. Has hybridized with *Q. quelea* in captivity. S populations described as race *viniceps*, but validity uncertain; although morphological criteria for recognition minimal, timing of moult and breeding suggests possible separation of N & S populations; further study required. Treated as monotypic.

Distribution. SW Senegal, Gambia, Guinea-Bissau, Guinea, W Mali (Niger floodplain), Sierra Leone, Liberia, Ivory Coast, SW Burkina Faso and Ghana E to SW Niger, SW & NW Nigeria, C & SW Cameroon, Equatorial Guinea, São Tomé, W Gabon, SW PRCongo and inland along R Congo and R Ubangi, S Central African Republic, W & NE DRCongo, S Sudan, SW Ethiopia, W Uganda, W Kenya, C Tanzania, W Rwanda, W Burundi and Malawi; NW Angola, Zambia, SE Mozambique and E coastal South Africa. Occasional in NE Namibia and N Botswana (Caprivi region) and on Zimbabwean side of R Zambezi.



Descriptive notes. 11 cm; male 18–26 g, female 15–22 g. Small, short-tailed weaver. Male breeding has dark red head with blackish barring on throat, red extending a little onto breast (extent of red on breast varies, as does intensity of red coloration); lower nape and upperparts light brown with dark central streaks, tail and upperwing brown with narrow yellowish feather fringes; breast and flanks dull brown, belly, thighs and undertail-coverts dull white; iris brown; bill black; legs brown. Non-breeding male has forehead, crown and nape light brown with dark central streaks, broad yellow supercilium; chin and throat white, tinged with yellow, breast buff and unstreaked, some streaking on flanks; upper mandible brown, lower mandible pale flesh-coloured. Female resembles non-breeding male. Juvenile resembles female and non-breeding male, but has broad buff edges on feathers, buff supercilium, and buffy wash on underparts, with only centre of belly and undertail-coverts white. Voice. Male song a repetitive churring. Chattering calls from flocks, and sharp "tyap" contact call. Vocal mimicry reported for captive birds.

Habitat. Tall grassland, often near water; found also in agricultural areas, including rice (*Oryza*) fields. In Kenya, below 1400 m in areas of higher rainfall; below 1500 m in Ethiopia; in S Africa, primarily coastal but occurs at up to 1600 m.

Food and Feeding. Diet mainly grass seeds of *Echinochloa*, *Rottboellia exaltata*, *Scleria verrucosa*, *Pennisetum americana*; also rice. Also insects, especially when feeding nestlings. Forages mostly on ground. Gregarious, in small or large flocks. Flocks may be segregated according to sex.

Breeding. Season mainly Jun–Oct in W Africa, Nov–Feb on São Tomé; Jul–Aug in Sudan and N Congo Basin, Jan–Mar in S DRCongo, Apr in Uganda and Apr–May in Tanzania; Jan–Apr in Angola, Zambia and Malawi; usually Dec–Jan in S Africa, but egg-laying recorded early Mar in Zimbabwe. Probably polygynous, males building up to three nests simultaneously. Highly colonial, with hundreds or thousands of nests per colony; breeding highly synchronized within colony, but colony seldom at same site in successive years. Male displays from prominent perch near nest. Nest built by male, a tightly woven dome with large side entrance and sometimes a porch above opening, made from strips of grass, suspended c. 1·5 m above ground or over water between grass or reed stems. Clutch 1–4 eggs, average 2 (South Africa), pale blue, average size for 38 eggs in South Africa 19·4 × 13·5 mm; incubation by female only, period, c. 13 days at Zimbabwe colony, in captivity 12–14 days; chicks fed generally by female only, at one colony males also seen to feed, nestling period 12–14 days; both sexes may feed fledglings, although males sometimes leave colony before young fledge. Nests probably parasitized by Diederik Cuckoo (*Chrysococcyx caprius*), which seen to remove eggs from nests in South Africa (KwaZulu-Natal). At colony in Ghana, hatching

success 76%, and overall 71% of 122 nests produced flying young; nests sometimes destroyed by storms. Recorded longevity in South Africa at least 7 years 9 months.

Movements. Migratory in some regions, with regular breeding areas and non-breeding zones; apparently non-breeding visitor to Kenya. Seasonal N–S movements recorded in both W Africa and E Africa; in S & C Africa primarily a breeding migrant. Recorded as a vagrant on Bioko I (Fernando Póo). Males often leave colony before breeding cycle complete.

Status and Conservation. Not globally threatened. Locally common to abundant. In Gulf of Guinea was formerly present on Príncipe I, but now extinct there. Considered a pest species in some parts of range.

Bibliography. Aspinwall & Beel (1998), Barlow *et al.* (1997), Barré *et al.* (1976), Basilio (1963), Benson (1947b), Benson & Benson (1977), Benson *et al.* (1971), Borrow & Demey (2001), Bretagnolle (1993), Brosset & Érard (1986), Brown & Symes (2004), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1932, 1954), Christy & Clarke (1994, 1998), Claffey (1995), Clancey (1986, 1987a), Collias, N.E. & Collias (1964), Craig, A.J.F.K. (1987), Cyrus (1986), Da Camara-Smeets (1988), Dean (2000), Demey (1995), Demey & Fishpool (1994), Din (1994), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Eisentraut (1963), Elgood *et al.* (1994), Fry & Keith (2004), Fuggles-Couchman (1983), Gatter (1997), Germain & Cornet (1994), Giraudoux *et al.* (1988), Grimes (1977, 1987), Halleux (1994), Hockey *et al.* (2005), Holyoak & Seddon (1989), Hustler & Pollard (1995), Hustler & Voss (1997), Jones & Tye (2006), Kunze (1961), Lamarche (1981), Lamm (1955), Lewis & Pomeroy (1989), Lippens & Wille (1976), Macdonald (1979), Marchant (1942), McLean & Taylor (1986), Nikolaus (1987), Park (1975), Parker (1999), Penry (1994), Rand *et al.* (1959), Ruwet (1965b), Serle (1950, 1951, 1957), Simmons (1961), Siroki (1974b), Skead (1965b, 1995), Smith (1991), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1985), Thonnerieux (1988), Tree (1965a, 1965b), Urban & Brown (1971), Verheyen (1953), Vincent (1936), Waltert & Mühlenberg (1999), Winch (2001, 2004), Zimmerman *et al.* (1996).



PLATE 3

inches 4

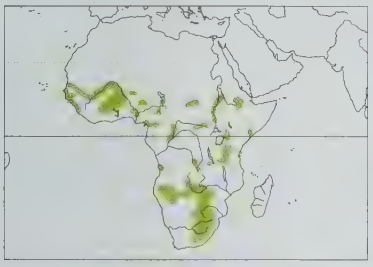
Genus *EUPLECTES* Swainson, 1830

18. Yellow-crowned Bishop

Euplectes afer

French: Euplecte vorabé **German**: Tahaweber **Spanish**: Obispo Coronigualdo
Other common names: Napoleon/Golden Bishop; Black-winged(!)/Taha Golden Bishop (*taha*)

Taxonomy. *Loxia afra* J. F. Gmelin, 1789, Africa = Senegal.
This species and *E. diadematus* have sometimes been placed in a separate genus, *Taha*, and considered to form a superspecies, but molecular data suggest that present species occupies a basal position within current genus, without close relatives. Has hybridized with *E. franciscanus* in captivity. Proposed race *ladoensis* (described from S Sudan) subsumed in *taha*; validity of *niassensis*, description of which based on a single female (from Mitomoni, in S Tanzania), uncertain, as specimen not now available. Three subspecies currently recognized.
Subspecies and Distribution.
E. a. afer (J. F. Gmelin, 1789) – S Mauritania, Gambia, coastal regions of Senegal, Guinea-Bissau, Guinea and Sierra Leone, NE Ivory Coast, riverine areas of Mali, Burkina Faso, N parts of Ghana, Togo and Benin, SW Niger, N & C Nigeria, N, C & W Cameroon, N Central African Republic, W Sudan and Nile Valley, S to PRCongo along rivers, N DRCongo, and W Angola (Luanda region); sporadic records from Liberia, Chad, Gabon and Uganda.
E. a. strictus Hartlaub, 1857 – highland plateau of C Ethiopia.
E. a. taha A. Smith, 1836 – S Sudan, S Somalia, W Kenya, C Tanzania, SE DRCongo, S Angola, SW & N Zambia, N Namibia, N & E Botswana, W Zimbabwe, E South Africa and Lesotho lowlands; occasional records from Swaziland and Mozambique.
Introduced populations (escaped cagebirds) established in USA and West Indies, possibly also in parts of Iberian Peninsula.



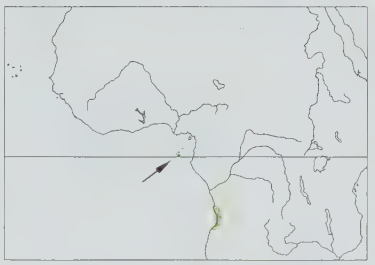
Descriptive notes. 10 cm; 11–20 g. Small bishop with very short tail. Male nominate race breeding has forehead, crown and nape golden-yellow, hindneck feathers narrowly fringed black at tips; mantle dark brown, feathers tipped yellow, back and rump yellow, some uppertail-coverts fringed black; upperwing and tail brown, wing-coverts with paler edges; side of head, chin, throat and belly black, broad yellow breastband tinged chestnut-brown in centre, flanks, vent and undertail-coverts yellow, thighs whitish; iris dark brown; bill black; legs brown. Female and non-breeding male have forehead, crown, nape and upperparts, including uppertail-coverts, brown, with darker central streaks on feathers; wing and tail brown; chin, throat, breast and belly whitish, dark shaft streaks on flanks and in band across breast; thighs brown, undertail-coverts whitish; upper mandible dark brown, lower mandible pale brown. Juvenile resembles female, but has broad buffy edges on all feathers prior to post-juvenile moult. Race *strictus* larger than nominate, male breeding has narrow black band on hindneck, yellow on side of neck extends to a point behind lores, chin to belly uniform black, female more buffy below and more heavily streaked than others; *taha* male breeding has prominent black band on nape, is black below from chin to belly, some yellow feathers on side of breast and flanks. Voice. Song, given from perch or during approach flight in courtship, some gargling introductory notes followed by "zzeeet zzzeeet zzzeeet" trills, ending with chipping "rik-rik-rik". Repetitive rattling calls given in flight, or in response to conspecifics flying over; alarm call a harsh "chuk".
Habitat. Open grassy valleys, generally at low altitudes, but in Ethiopia to 1800 m; breeds in very wet areas such as swamps or seasonally flooded habitats, and generally closely associated with wet areas.
Food and Feeding. Diet primarily grass seeds; captives readily take animal food, including mealworms, caterpillars, termites (Isoptera), wasps (Hymenoptera) and fly larvae (Diptera). In Nigeria, seeds incluse those of *Brachiaria brachylopha*, *Brachiaria julata*, *Brachiaria lata*, *Cymbogon*, *Dactyloctenium aegyptium*, *Digitaria ciliaris*, *Hyperthelia dissolute*, *Sporobolus pyramidalis*, also of sedges *Cyperus dilatatus*, *Mariscus alternifolius*, and of herbs *Boerhavia erecta*, *Boerhavia diffusa*, *Tridax procumbens*; in Kenya *Echinochloa* seeds; in South Africa chiefly *Panicum maximum* and *Setaria flabellata*, but in winter greater variety of species, including young maize (*Zea mays*). Often in mixed flocks outside breeding season.
Breeding. Season mainly Jul–Oct from W Africa E to W Sudan and in NE DRCongo, Oct in Ethiopia, Jan–Apr in S DRCongo and Angola; records in Jan–Jun in Kenya and Tanzania; in S Africa mainly Dec–Mar, some records as late as May in areas with erratic rainfall. Polygynous. Males territorial in small colonies, making fluffed flights at both rivals and females entering territory. Nest an oval ball with side entrance near top, built by male from thin grass strips, lined by female with fine grasses, often with seedheads attached and protruding from entrance, attached usually less than 1 m above ground or water to vertical stalks, hidden in tuft of grass or in bushes, rushes and sedges, often in flooded or waterlogged area. Clutch 2–4 eggs, average 3 (South Africa), white with fine dark spots, often concentrated at thick end, average size of 88 eggs 17·9 × 12·8 mm (South Africa); in captivity, incubation by female only, period 12–14 days, male assisted with feeding of young, nestling period c. 13 days. No information on breeding success of wild populations, but nests liable to flooding in ephemeral wetlands. Maximum longevity in captivity more than 15 years; oldest wild-living ringed bird reported in South Africa after only 3 years.
Movements. In S Africa may be nomadic, flocks arriving to breed following local heavy rains, and perhaps not returning to same locality for several seasons; in both Zimbabwe and Botswana birds in breeding plumage may appear, but leave without nesting; possible regular seasonal movements in Zambezi Valley. Individuals moving S at start of rainy season in Nigeria have stored 2·9 g of lipid, suggesting pre-migratory fattening for flight of up to 600 km; also categorized as a migrant in Central African Republic.
Status and Conservation. Not globally threatened. Locally abundant in many regions. Outside natural range, has established populations, primarily through escaped cagebirds, in USA and also in West Indies, where recently introduced in Puerto Rico and Jamaica; small introduced population established in Portugal; in Spain, present but considered not yet self-sustaining. Was introduced in Hawaii, but apparently now extinct there.
Bibliography. Adlersparre (1936), Ash & Miskell (1998), Aspinwall & Beel (1998), Balança & de Visscher (1997), Bannerman (1949), Barlow *et al.* (1997), Bates (1934), Beesley & Irving (1976), Benson *et al.* (1971), de Bie & Morgan (1989), Brosset & Érard (1986), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1932, 1954), Cheesman & Sclater (1936), Cheke & Walsh (1996), Cheke *et al.* (1985), Claffey (1995), Collett (1982), Costa *et al.* (1997), Craig (1976), Cunningham-van Someren (1949), Davidson (1975, 1978), Dean (2000), Demey (1995), Demey & Fishpool (1991), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Elgood *et al.* (1994), Farkas (1966), Fry (1971), Fry & Keith (2004), Fuggles-Couchman (1986), Garrett (1998), Gatter (1997), Gee (1984), Giraudoux *et al.* (1988), Grimes (1987), Guichard (1947), Günther & Feiler (1986), Heinrich (1958), Herholdt (1988), Hockey *et al.* (2005), Holyoak & Seddon (1989), Irwin & Benson (1982), Jones & Ward (1977), Lamarche (1981, 1993), Laycock & Hanmer (1981), Lever (2005), Lewis & Pomeroy (1989), Lippens & Wille (1976), Long (1981), Lynes (1924), Macdonald (1979a, 1979b), Morel (1968), Morel & Morel (1982), Musil (1969), de Naurois (1969), Newton (1937), Nikolaus (1987), Olson (1976), Ortman (1967), Paludan (1936), Parker, V. (1994), Penry (1994), Radtke (1957), Raffaele *et al.* (1998), Rand *et al.* (1959), Roos & Kok (1978), Sauvage & Rodwell (1988), Schifter (1986), Schüz (1968), Serle (1943b, 1950, 1957), Simmons (1961), Siroki (1974a, 1976), Skead, C.J. (1956a, 1965b, 1995, 1997), Skead, D.M. (1975), Skinner (1995), Stevenson & Fanshawe (2002), Tarboton *et al.* (1987), Thiollay (1985), Thonnerieux (1988), Thonnerieux *et al.* (1989), Urban & Brown (1971), Vieilliard (1972), Zimmerman *et al.* (1996).

19. Golden-backed Bishop

Euplectes aureus

French: Euplecte doré **German**: Goldrückenweber **Spanish**: Obispo Dorado

Taxonomy. *Loxia aurea* J. F. Gmelin, 1789, Benguela, Angola.
Previously thought to form a superspecies with *E. capensis*. Monotypic.
Distribution. São Tomé I and coastal Angola (from Luanda and Bengo S to Benguela).



Descriptive notes. 12 cm; 25 g. Small, short-tailed bishop. Male breeding has head black, upperparts golden-orange, posteriorly some feathers tipped black, uppertail-coverts grey-brown; upperwing and tail brownish-black with buff edging on feathers; chin, throat, breast and belly black, thighs and undertail-coverts white; iris brown; bill black; legs brown. Female and non-breeding male have top of head and upperparts rufous-brown with dark central streaks on feathers, wings and tail brown with rufous edgings, some greater coverts and especially median coverts white-tipped; yellow superciliary stripe, brown lores, cheek and ear-coverts; chin and throat white to pale yellow, breast and flanks rufous-brown with dark central streaks on some feathers, belly, thighs and undertail-coverts white; iris brown; upper mandible brown, lower mandible yellowish-brown; legs brown. Juvenile resembles female, but with yellowish wash in plumage. Voice. Song a repetitive series of loud, metallic notes, speeding up towards end of phrase, "bzic bzic-bzic-bzic-bzic-zic-zic-zic-zic"; captive male's song described as whistles followed by trills.
Habitat. Tall razor-grass, rank vegetation in open acacia (*Acacia*) savanna and floodplains; abandoned cotton fields and overgrown gardens. Below the escarpment in Angola; up to 300 m on São Tomé. Often in same habitat as that in which *E. hordeaceus* occurs.
Food and Feeding. Little information. Diet seeds and insects; small grass seeds selected by captive individuals. Generally encountered in small flocks; often in mixed-species flocks with congeners.
Breeding. Breeds Dec–Apr on São Tomé. Polygynous. Not colonial, but nests tend to be clumped in groups of up to ten. Male defends territory from three or four songposts; sings both from perch and in flight. Nest built by male, oval with large lateral entrance, rough outer shell incorporating living grass blades, dense inner lining of fine grass seedheads which protrude from entrance to form porch, attached to vertical grass stems. Clutch 2–3 eggs, white with fine black speckling; in captivity, incubation by female only, period 13–14 days, chicks fed by female alone, nestling period 15–21 days. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Western Angola EBA. Current status not well known, and limited range may render it vulnerable to habitat changes. Distribution odd; species possibly introduced from São Tomé to the mainland, or vice versa.
Bibliography. Borrow & Demey (2001), Brickell & Konigkramer (1997), Christy & Clarke (1998), Dean (2000), Dean *et al.* (1988), Eccles (1988), Fishpool & Evans (2001), Fry & Keith (2004), Günther & Feiler (1985), Heinrich (1958), Jones & Tye (2006), Nadler (1993), de Naurois (1983, 1994), Neunzig (1921), Traylor (1963a).

20. Northern Red Bishop

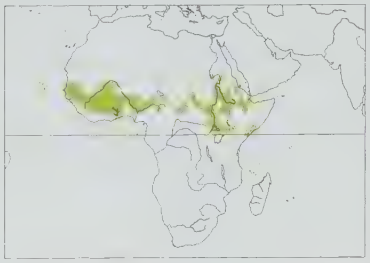
Euplectes franciscanus

French: Euplecte franciscain **German**: Feuerweber **Spanish**: Obispo Anaranjado
Other common names: Red/Orange/Franciscan Bishop

Taxonomy. *Loxia franciscana* Isert, 1789, Accra, Ghana.
Has been regarded as forming a superspecies with *E. orix* and *E. nigroventris*, and sometimes treated as conspecific with former, but such arrangements not supported by molecular data. Has hybridized in captivity with *E. afer* and possibly with *E. hordeaceus*. Birds in E of range sometimes recognized as race *pusillus* (described from L Chew Bahir, in S Ethiopia), often having longer tail-coverts covering rectrices completely, less red on breast, and plumage tending towards orange-red, rather than scarlet; plumage and other characters, however, variable throughout species' range, and naming of geographical races considered unwarranted. Monotypic.
Distribution. S Mauritania, Senegambia, Guinea-Bissau, Guinea, S Mali, N Sierra Leone, N Liberia, Burkina Faso, N Ivory Coast, Ghana (mainly inland, local on coast), Togo, Benin, SW Niger, Nigeria (primarily N of the great rivers), S Chad, N Cameroon; N Central African Republic; Sudan

On following pages: 21. Black Bishop (*Euplectes gierowii*); 22. Red-collared Widowbird (*Euplectes ardens*); 23. Southern Red Bishop (*Euplectes orix*); 24. Zanzibar Bishop (*Euplectes nigroventris*); 25. Fire-fronted Bishop (*Euplectes diadematus*); 26. Black-winged Bishop (*Euplectes hordeaceus*).

(especially R Nile and tributaries), W & NE Ethiopia, W Eritrea and NW & S Somalia, S to NE DRCongo, N Uganda and W Kenya (L Baringo and L Bogoria).
Introduced (escaped cagebirds) in SW USA (near Los Angeles, in California; breeding reported also Arizona); introduced c. 1960 in West Indies, on Puerto Rico, with breeding on Martinique and Guadeloupe, and recorded on Jamaica and St Croix (Virgin Is). Reported introduction in Japan of *E. orix* more likely to be referable to present species.



Descriptive notes. 11 cm; 12–22 g. Small, short-tailed bishop. Male breeding has forehead, crown, lores, cheek and ear-coverts black, nape red, mantle and upper back red to red-brown, lower back to uppertail-coverts red, tail brown (concealed, or almost so, by red uppertail-coverts); upperwing brown with paler feather margins; chin, throat and breast red, belly and flanks black, thighs brown, undertail-coverts red (almost covering rectrices below); red areas of plumage sometimes more orangey; iris dark brown; bill black; legs pale brown to flesh-coloured. Female and non-breeding male (partly distinguishable only by size) have forehead to uppertail-coverts brown with dark central streaks on feathers, wings brown, tail brown with paler edges of feathers; yellowish supercilium, brown to buff lores, cheek and ear-coverts; chin and throat white, breast buffy with faint streaking, belly and undertail-coverts white; iris brown, bill brown to flesh-coloured, legs pale brown to flesh-coloured. Juvenile resembles female, but with broad buff feather edges until post-juvenile moult; male does not moult into nuptial plumage until second year. Voice. Song of thin squeaky notes followed by guttural "zee-zee-zee" buzzes and sizzling sounds. Rattling call when flying over; contact call a high-pitched "tsip"; harsh "chak" in alarm.
Habitat. Tall open or bushed grassland, also tall crops and rank margins of cultivated areas, favouring seasonally flooded areas for nesting; nests also in cultivated crops, e.g. rice (*Oryza*) in Mali, sugar cane (*Saccharum*) in Mauritania, millet in Sudan and maize (*Zea mays*) in Ethiopia. At 600–1800 m in E Africa, up to 2000 m in Ethiopia, but also in lowlands and coastal areas. Introduced population in West Indies inhabits grassy margins of sugar-cane fields.
Food and Feeding. Diet primarily small grass seeds, also insects. Seeds of millet favoured, in W Africa also those of guinea-corn (*Sorghum bicolor*). Nestlings at first fed chiefly with insects. Forages mostly on ground; takes insects both on ground and in flight. Gregarious; large flocks form in non-breeding season, associating with other seed-eaters including canaries (*Serinus*) and waxbills (Estrildidae) in W Africa, also with congeners including *E. hordeaceus*, *E. afer* and *E. albonotatus*.
Breeding. Season Aug–Nov in Gambia and Senegal, May–Oct in Mali and Ivory Coast, Jul–Sept in Ghana, Jun–Jul in Togo, Jul–Nov in Benin, Jun–Oct in Burkina Faso and Nigeria, Oct in Niger, Feb–Mar and Aug–Nov in Sudan, May–Sept in Ethiopia; in Somalia, Apr and Jul in NW and Jul–Sept in S; May–Oct in NE DRCongo and May–Jun in Uganda; in captivity, produced two broods within five weeks. Polygynous, with up to five females per male. Territorial, but males may be clustered (e.g. 10 males in 4 ha in Benin); territory may overlap with that of *E. hordeaceus*. Male performs display-flight with body plumage fluffed out ("bumble-flight") over territory, followed by perched courtship if female lands. Nest built by male, a globular structure with side entrance, made from coarse grass strips, lined by female with grass flowerheads, which project from entrance, placed 1–2 m above ground and supported by vertical grass or weed stems, or in cultivated crops, rarely 3–6 m above ground in bamboo, bush or tree; captive female built own nest, and disregarded those built by male. Clutch 2–4 eggs, plain blue, average size of 48 eggs 17·3 × 12·8 mm (Nigeria); incubation by female only, period 13–14 days in captivity; chicks fed by female alone, nestling period 14–16 days (in captivity, more than 23 days recorded); captive male occasionally fed fledged young. Male survived for more than 8 years in captivity.
Movements. Considered resident over much of range, but W of 20° E regular seasonal movements apparent. In Mauritania, moves N (up to 17°30' N) at start of rains, and in Senegal absent from breeding areas in dry season; in Mali moves N to breed in Sahel zone after rain, whereas in Nigeria present in Sahel and soudanian zones but moves S at start of rains (with fat reserves sufficient for flight of 600 km), and appears to be non-breeding visitor S of R Niger and R Benue. In E range, Ethiopian birds return to breeding areas in non-breeding plumage in Jun–Jul, with prenuptial moult in Aug–Sept; nomadic in Dec after breeding, and then absent from many breeding areas Jan–May. In Somalia, was reported as returning in spring, often in flocks with *Quelea quelea*.
Status and Conservation. Not globally threatened. Common to abundant over much of its wide range. Regarded as a pest in some regions, and reported as damaging crops in Somalia. Breeds in important crops such as rice (Mali), sugar cane (Mauritania), millet (Sudan) and maize (Ethiopia); density of nests in millet estimated at ten times that of nests in wild grasses. Introduced population in West Indies appears to be thriving; breeds Mar–Nov in grassy edges of sugar-cane crops.
Bibliography. Adlersparre (1936), Aiyedun (1972), Ash & Miskell (1998), Baily (1926), Balança & de Visscher (1997), Bannerman (1949), Barlow *et al.* (1997), Barré & Benito-Espinal (1985), Benson (1947a), de Bie & Morgan (1989), Borrow & Demey (2001), Bowen (1926), Bruggers (1980a), Bullock (1938), Carswell *et al.* (2005), Chapin (1954), Cheesman & Sclater (1936), Cheke & Walsh (1996), Cheke *et al.* (1985), Claffey (1995), Cleghorn (1969), Craig (1976), Cresswell *et al.* (2009), Davidson (1978), Dücker (1970), Eckleben (1974), Eguchi & Amano (2004), Elgood *et al.* (1994), Friedmann (1937), Fry (1971), Fry & Keith (2004), Gajdacs & Keve (1968), Garrett (1998), Gatz (2001), Gee (1984), Giraudoux *et al.* (1988), Grimes (1987), Guichard (1947), Holyoak & Seddon (1989), Hopkinson (1938), Huff (1979), Jackson & Sclater (1938), Jones & Ward (1977), Jourdain & Shuel (1935), Kleefisch (1971), Kunkel (1962b), Lamarche (1981, 1993), Lever (2005), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1924), Macdonald (1979b), Mayr (1970), McCarthy (2006), Morel & Morel (1982), Mundy & Cook (1974b), Nikolaus (1987), Ogilvie-Grant (1910a), Paludan (1936), Phillipps (1905), Poulsen (1956), Proud (1987), Raffaele *et al.* (1998), Reichenow (1903), Roberts (1988), Rollin (1962), Rooke (1938), Sauvage & Rodwell (1998), Schifter (1986), Serle (1943b, 1957), Steiner (1967), Stevenson & Fanshawe (2002), Thiollay (1985), Thonnerieux (1988), Thonnerieux *et al.* (1989), Urban & Brown (1971), Winterbottom (1936), Zedlitz (1911), Zimmerman *et al.* (1996).

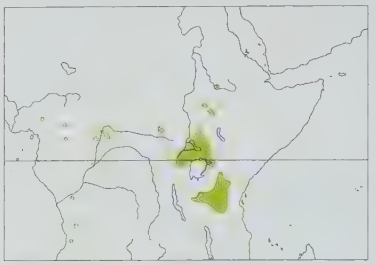
21. Black Bishop

Euplectes gierowii

French: Euplecte de Gierow **German**: Bischofsweber **Spanish**: Obispo Negro
Other common names: Gierow's Bishop; Angola Black Bishop (*gierowii*); Northern Black Bishop (*ansorgei*); Southern Black Bishop (*friederichseni*)

Taxonomy. *Euplectes gierowii* Cabanis, 1880, Malanje, Angola.
Sometimes placed with *E. aureus* and *E. hordeaceus* in a separate genus, *Groteiplectes*. Three subspecies recognized.

Subspecies and Distribution.
E. g. ansorgei (E. J. O. Hartert, 1899) – W, E & S Cameroon, S Central African Republic, N PRCongo, N & NE DRCongo, S Sudan, W & SW Ethiopia, Uganda and W Kenya.
E. g. gierowii Cabanis, 1880 – SW DRCongo and NW Angola.
E. g. friederichseni G. A. Fischer & Reichenow, 1884 – S Kenya and NC Tanzania.



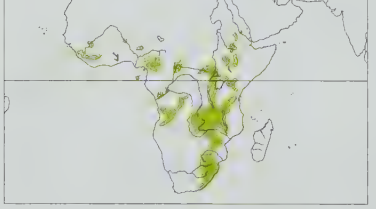
Descriptive notes. 15 cm; male 23–36 g, female 22–30 g. Short-tailed bishop. Male nominate race breeding has forehead, neck and back orange, rump and uppertail-coverts black; tail and upperwing black, all feathers edged buff in fresh plumage; lores, cheek, ear-coverts and chin black; broad orange patch on throat and upper breast joining orange of mantle; lower breast and belly black, vent ashy with broad black centres; iris dark brown; bill black; legs brown. Non-breeding male has crown, nape, mantle and back brown with heavy black central streaks on feathers, broad creamy supercilium extending well beyond eye, rump feathers brown with pale margins; wings and tail as in breeding plumage; chin and throat dull white, breast and flanks buff with dark spots (not streaks), belly, vent and undertail-coverts dull white, thighs buffy; iris dark brown; upper mandible dark brown, lower mandible yellowish-brown; legs brown. Female resembles non-breeding male, but central streaks on upperparts dark brown, not black, and wings and tail brown. Juvenile resembles female. Race *ansorgei* male breeding differs from nominate in having more extensive black on crown and throat, narrower orange collar on upper breast, lowermost underparts buff with broad dark streaks; *friederichseni* male has hindcrown and nape to back bright orange, rump buff with dark feather centres, broad orange band around breast, black lower breast and belly, buff thighs and undertail-coverts. Voice. Song, in flight and from perch, a long buzzy note followed by series of shorter notes, "zeeee-za-za-za-za-za-za-za". High, sizzling calls reported.
Habitat. Tall grassland, in swampy or drier bushy areas, also scrub and sugar cane. In Kenya at 700–1600 m and in areas with more than 1000 mm annual rainfall, whereas in Tanzania found in drier country; to 1800 m in NE DRCongo, perhaps to 2000 m in Ethiopia. Often sympatric with *E. hordeaceus* in E Africa.
Food and Feeding. Diet includes seeds and insects. Stomach contents consisted of grass seeds, winged ants (Formicidae) and alate termites (Isoptera). Forages mainly in pairs and small groups; joins mixed flocks in non-breeding season.
Breeding. Season May–Aug in NE DRCongo, Apr–Oct and Dec in Uganda, May in Kenya, and Apr–Jun and Dec in Tanzania. Polygynous, male holding territory containing three or four nests. Nest oval, with large entrance high on one side, rather coarsely woven from grass, lined with grass seedheads; in Uganda 2 m above ground in elephant grass, attached to one vertical stalk and some leaf blades, one nest in Tanzania was 1 m above ground in fork of wood shrub. Clutch 2–4 eggs, bright blue, sometimes with fine black or red-brown spotting, size 20·6 × 15·3 mm. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Relatively poorly known species, with scattered populations. In most parts of range said to be uncommon to rare.
Bibliography. Borrow & Demey (2001), Bowen (1931a), Carswell *et al.* (2005), Chapin (1932, 1954), Dean (2000), Delacour & Edmond-Blanc (1933), Dowsett & Dowsett-Lemaire (2000), Friedmann & Williams (1971), Fry & Keith (2004), Fuggles-Couchman (1953), Lewis & Pomeroy (1989), Lippens & Wille (1976), van Someren (1916), Stevenson & Fanshawe (2002), Traylor (1963a), Zimmerman *et al.* (1996).

22. Red-collared Widowbird

Euplectes ardens

French: Euplecte veuve-noire **German**: Schildweber **Spanish**: Obispo Acollarado
Other common names: Red-collared Whydah; Red-naped Widowbird, Eastern Red-collared Widowbird (*laticauda*); Black Widowbird/Whydah ("*concolor*")

Taxonomy. *Fringilla ardens* Boddaert, 1783, South Africa.
Molecular data indicate that this species is a long-tailed bishop, not closely allied to the other widowbirds. Has hybridized in captivity with *E. orix*, *E. hordeaceus*, *E. macroura* and *E. axillaris*. Race *laticauda*, segregated altitudinally from nominate in area of range overlap in Sudan, possibly represents a separate species; further study required. Males with all-black plumage, occurring through most of range of nominate, formerly recognized as race *concolor* (described from Sierra Leone), but now considered a melanistic morph; also, intermediates between these two morphs recorded in Angola, Tanzania and Zimbabwe. Proposed race *tropicus* (described from Karema, in Tanzania) considered inseparable from nominate. Three subspecies recognized.
Subspecies and Distribution.
E. a. ardens (Boddaert, 1783) – S Mali, N Guinea, inland Sierra Leone, N Liberia, N Ivory Coast, SW Niger, C & SE Nigeria, Cameroon, Central African Republic, S Sudan, S PRCongo, NE and S DRCongo, C & NE Angola, Uganda, W Kenya and C & NE Tanzania S to Zambia, Malawi, NW & S Mozambique, Zimbabwe (C plateau), Swaziland, Lesotho lowlands and E South Africa.
E. a. laticauda (M. H. C. Lichtenstein, 1823) – highlands of SE Sudan, Ethiopia and Eritrea.
E. a. suahelicus (van Someren, 1921) – highlands of Kenya and Tanzania.



Descriptive notes. male c. 25 cm, female 12–13 cm; male 20–26 g, female 16–22 g. Male nominate race breeding is all black except for narrow sickle-shaped red collar across lower throat, feathers of back to uppertail-coverts, wing, tail and upper flanks to undertail-coverts with pale brown to whitish fringes, narrowest on tail, broadest on underwing-coverts, and much more noticeable in fresh plumage; variable, some individuals in region from Sierra Leone E to Uganda lack red collar ("*concolor*"), some in Angola, S DRCongo and adjacent Zambia and Malawi have collar very narrow, and some in other populations have collar orange or even yellow; tail very long (mean for 25 males 22·8 cm), outermost rectrices longest; iris brown; bill black; legs blackish. Male non-breeding has forehead to rump brown, feathers with black central streaks, wings black with buff margins on coverts, tail short (mean

5·5 cm) and brown with paler feather margins; prominent yellowish supercilium, brown lores, cheek and ear-coverts; chin yellowish-white, throat and breast yellow-buff, flanks buff, belly white, thighs buff with black flecks, undertail-coverts black with whitish edges; iris brown, bill brown, lower mandible much paler, legs brown. Female and subadult male resemble non-breeding male, but dorsal streaking dark brown, not black, wings brown with pale edges, underparts with distinct buff band above white belly, undertail-coverts whitish with brown centres. Juvenile resembles female, but has broader buff feather margins on upperparts, stronger buff wash below. Race *laticauda* male breeding has most of crown to nape deep red, linked to red collar on foreneck, forehead always black, black tips on some crown feathers, tail shorter than nominate (mean for 37 individuals 14·1 cm), non-breeding male retains black tail and has some streaking on breast; *suahelicus* male breeding resembles previous, but extent of red on head variable, forehead sometimes red almost to base of bill, non-breeding male also retains black tail and has streaking on breast. VOICE. Song a high, sibilant trill, "chisisisisi-chisisisisi-chisisisisi", either sustained or in short bursts. Varied hissing and rattling calls, both from perch and in flight; alarm call a husky "sskip".

Habitat. Varied habitats, frequently away from water, including open or bushed grassland, rank herbs, scrub and cultivated areas, clearings in forested regions; often on slopes with sparse trees. Nominate race not above 1500 m in E Africa, but up to 1900 m in Cameroon and 2200 m in Zambia and Malawi; *laticauda* usually above 1800 m in Ethiopia; *suahelicus* at 1500–3000 m.

Food and Feeding. Diet includes seeds of sorghum (*Sorghum*), *Panicum maximum* and other grasses, including green seeds; also nectar of *Leonotis*, *Aloe candelabrum* and *Aloe marlothii*; small berries; also insects, e.g. stomach contents included beetles (Coleoptera), ants (Formicidae), caterpillars (Lepidoptera), termites (Isoptera). Often forages on ground; may hawk termite alates in the air. Flocks of 50–100 individuals, including males in breeding plumage, noted as feeding close together on slopes of Mt Kilimanjaro (N Tanzania). Forms large roosts, even in breeding season, in association with other species such as *Quelea quelea*, *E. axillaris*, *E. orix*, *E. albonotatus* and *E. capensis*.

Breeding. Season Oct–Nov in Sierra Leone, Sept–Oct in Liberia, Sept–Nov in Nigeria and Cameroon, Apr–May and Jul–Oct in Ethiopia; in DRCongo, Sept–Nov in NE and Jan–May in SE; Mar–Apr in Rwanda, Apr–Jun in Uganda, Apr–Jul and Dec–Jan in Kenya, and Jan–May in Tanzania; Jan–Apr in Zambia and Jan–May in Malawi; in Mozambique, Feb–May in W and Oct–Mar in S; Dec–Mar in Zimbabwe and Oct–Mar in South Africa. Polygynous, male typically with two or three females. Male holds large territory of 1000–15,000 m² (South Africa), territory containing 3–22 nest structures, often favours sloping hillsides, performs display-flights by gliding downhill with tail spread, central feathers curved downwards; males with large red collar held larger territory and reacted more vigorously to models with large collar, but collar apparently not significant to females (male tail length main factor in female mate choice). Nest an oval structure with side entrance, made from fine wiry grass woven on to grass stems by male, with green blades of grass bent over to create a living grass dome above, lined by female with grass heads stripped of seeds which may project to form porch over entrance (one nest contained 518 such seedheads); placed 1–3·5 m above ground in tall elephant grass, elsewhere often less than 1 m above ground; female often does most of building, continues to add lining during incubation period; old nests often occupied by Zebra Waxbills (*Amandava subflava*) in South Africa and Angola. Clutch 2–4 eggs (mean 2·7 in South Africa), greyish or blue-green, heavily speckled with brown, often forming ring near thick end, average size of 149 eggs 18·9 × 13·6 mm (South Africa); incubation by female only, period 12–15 days; chicks fed by female only, primarily by regurgitation, nestling period 14–17 days. Parasitism by Diederik Cuckoo (*Chrysococcyx caprius*) recorded. Fledging success in KwaZulu-Natal (South Africa) low, with 70% of nest destroyed by predators, mainly rats (*Rattus*) and snakes. In Zimbabwe, oldest ringed individual recaptured after 7·5 years, and estimated mortality rate of adults 46% per annum.

Movements. Local movements in non-breeding season; sex ratio at roosts varies seasonally in S Africa; one ringed individual had moved 100 km in Zimbabwe.

Status and Conservation. Not globally threatened. Very wide range, and common in many regions. Population in Kruger National Park, in South Africa, estimated at 2000 individuals; in adjoining S & C Mozambique 11,000. Isolated records from Gambia (pre-1965), Senegal, Ghana, Togo, Benin, Gabon and Botswana.

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23. Southern Red Bishop

Euplectes orix

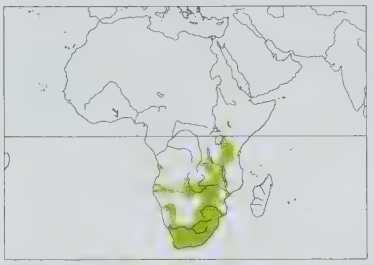
French: Euplecte ignicolore **German**: Oryxweber **Spanish**: Obispo Rojo
Other common names: Red/Little Bishop, Grenadier Weaver

Taxonomy. *Emberiza orix* Linnaeus, 1758, Angola.

Has been regarded as forming a superspecies with *E. franciscanus* and *E. nigroventris*, and sometimes treated as conspecific with former, but such treatments not supported by molecular data. In captivity, male mated with female *E. ardens* produced hybrid offspring. Several races have been proposed, e.g. *nigrifrons* (described from Karema, on E shore of L Tanganyika, in Tanzania) and, in South Africa, *turgidus* (from Citrusdal, in W Western Cape) and *sundevalli* (from SE Eastern Cape); this species, however, varies clinally in size, with largest birds in SW South Africa, and no populations constantly separable on basis of morphometrics or plumage characteristics. Treated as monotypic.

Distribution. E & S DRCongo, SW Uganda, Rwanda, Burundi, S Kenya, Tanzania, W & S Angola, Zambia, Malawi, Namibia, and Zimbabwe and C & S Mozambique S to N & E Botswana, South Africa, Swaziland and lowlands of Lesotho.

Descriptive notes. 13 cm; male 21–30 g, female 17–26 g. Short-tailed bishop. Male breeding has black face mask formed by forehead, forecrown, lores, cheek, chin and upper throat (extent of



black varies individually), rest of head down to lower throat and upper breast red; nape, rump and uppertail-coverts deep red to orange-red, mantle and back red-brown (rarely, streaked with black), upperwing and tail dusky grey-brown with pale fringing; lower breast, belly and flanks black, thighs brown, undertail-coverts red; iris brown; bill black; legs brown. Male non-breeding has forehead to uppertail-coverts brown with dark central streaks on feathers, yellowish supercilium, light brown lores, cheek and ear-coverts; wings and tail brown; chin and throat whitish, breast and flanks off-white to buff with narrow central streaks on feathers, belly, vent and undertail-coverts white; iris brown, bill brown, legs brown to flesh-coloured. Female is very like non-breeding male, and frequently indistinguishable except by measurements, but may be less heavily streaked on underparts. Juvenile resembles female, with broad buffy feather margins on upperparts, buffy wash on underparts until first moult. VOICE. Song, usually from perch, also in courtship flight or display, a hissing, prolonged sizzle, "tsssssssss zeeeeeeeee tssipitsipipi tsip-tsip-tsip". Short rattling call given in response to conspecifics flying over territory; "chip" call as contact; harsher "chak" in alarm.

Habitat. Tall grassland and cultivated areas in open country, usually near water; at 600–1500 m in E Africa, to 1700 m in Zimbabwe, and down to sea-level in South Africa.

Food and Feeding. Diet seeds and arthropods. Most common seeds consumed are those of maize (*Zea mays*), *Eragrostis curvula*, *Setaria flabellata*, *Panicum maximum*, *Eleusine indica* and wheat (*Triticum*); in Free State, in South Africa, 24 different plant seeds recorded, with most variety in summer, but greater crop mass in winter. Feeds at flowers of *Phragmites australis* and *Leonotis*, taking either nectar or insects. Insect food taken, especially when feeding young, includes beetles (Coleoptera), dragonflies (Odonata), caterpillars (Lepidoptera), flies (Diptera) and termites (Isoptera); termite alates caught on the wing, then eaten on ground or at perch. Spiders (Araneae) found in stomachs of chicks. In South Africa, forages with Common Starlings (*Sturnus vulgaris*) in seaweed on shoreline in Western Cape, feeding on kelp flies (Diptera) and their larvae, and takes kelp flies and the amphipod *Talorchestia* on Eastern Cape beaches. Generally two foraging sessions each day, in morning and in late afternoon, the birds gathering in daytime roosts in between. Forages in small flocks; in non-breeding season often in mixed flocks with *Quelea quelea* and *Quelea erythrops*, particularly when queleas are in minority.

Breeding. Season Apr–Jun in Uganda and Kenya, Jan–Apr in Angola and DRCongo, Mar–May in Rwanda, Feb–May in Tanzania, Dec–Apr in Zambia and Malawi, Feb–Mar in Mozambique, Feb–May in Namibia, and Dec–Mar in Botswana and Zimbabwe; in South Africa, Jul–Dec in winter-rainfall region of Western Cape, Oct–Mar/Apr in other regions; some birds double-brooded. Mating system highly polygynous, up to seven females nesting on a male territory at one time, and one male having up to 18 social mates in single breeding season; estimated extra-pair paternity in one colony 17% (and suggested that extra-pair matings by female represent insurance against temporary infertility of resident territory-holder). Male threat display emphasizing black face mask surrounded by red ruff. Often in dense colonies of several hundred birds in reedbeds, with territories as small as 3 m², whereas territories in open grassland up to 300 m² and nests in small groups, or even isolated males; some colony sites used annually, others only sporadically. Male courtship displays involve fluffing-out of body feathers and making flying approach ("bumble-flight") to female in territory, followed by perched courtship, swivelling around and calling; male mating success dependent primarily on nest-building, with number of nests constructed the best guide to individual reproductive output; breeding success influenced by rainfall in all years, but health of male (as measured by blood parasites and immune responses) a significant factor in some seasons only; two-year-old males produced fewer nests and were less successful in attracting females than were older males. Nest built by male, starting with a cross-bridge between two vertical supports, can be completed in single day, but usually takes 2–3 days, oval, with side entrance beneath a porch, tightly woven from thin strips of reed or grass blades, female adds lining of plant down and grass seedheads, continuing during incubation (initially eggs visible through side walls); most often placed in reeds, sedges or bulrushes (*Typha*) standing in water, in *Phragmites* reedbeds often 2 m above water, but sometimes in maize or other crops in fields, in bamboo or *Indigofera* thickets, or even in privet (*Ligustrum*) hedges; in Western Cape (South Africa) some nests occupied by Brant's climbing mouse (*Dendromus mesomelas*), which does not harm eggs; old nests may be used by other species, including Tawny-flanked Prinia (*Prinia subflava*), Black-chested Prinia (*Prinia flavicans*) and Bronze Mannikin (*Spermestes cucullata*), and regularly by Zebra Waxbill (*Amandava subflava*) in some regions. Clutch typically 3 eggs (mean of 670 clutches in South Africa), some clutches double normal size presumed result of two females laying in same nest, eggs pale bluish-green to turquoise, rarely with few dark spots, average size of 268 eggs 19·2 × 14·1 mm (South Africa); incubation by female only, in KwaZulu-Natal (South Africa) eggs covered for only 40% of daylight hours, incubation period 12–13 days; chicks fed by female, primarily by regurgitation, with seeds from early stage, nestling period 11–15 days, young liable to leave nest after 10 days if disturbed. Parasitism by Diederik Cuckoo (*Chrysococcyx caprius*) regular, rates varying from 7% to 50% (and 3–4 cuckoos involved at large colonies); male bishops attack cuckoos at colony, not only on own territories, and this apparently effective, as high rates of parasitism found only at small colonies where all territory-holders may be absent at same time. Fledging success (from eggs laid) in South Africa at two Western Cape colonies 45% and 35%, over four successive years at Eastern Cape colony varied from 13% to 38%, over two seasons in KwaZulu-Natal 9%, in Free State in one year 34%, for two seasons in Gauteng 25%; predation often the most important source of nest failure, snakes, rodents e.g. especially rats (*Rattus*), common slender mongoose (*Galerella sanguinea*) and water monitor (*Varanus niloticus*) destroying up to 40% of eggs and chicks, and Cattle Egrets (*Bubulcus ibis*) and White-browed Coucal (*Centropus superciliosus*) preying on adults; nest height has no apparent influence on breeding success, although flooding a significant cause of chick mortality in some years. First breeding by males from second year after hatching, by most females at 1 year. In ringing studies, maximum longevity more than 12 years; estimated annual mortality 44–47%, but over 17-year period in Malawi 28·5%.

Movements. Mainly resident. Fewer than 1% of ringed individuals recovered more than 100 km from original site. Males return to same colony, often to same territory, for up to five successive seasons; return rates much lower for females, although no indication of higher mortality. Juvenile sex ratios balanced; however, sex ratios at roosts show consistent imbalance in favour of males, suggesting some segregation of the sexes.

Status and Conservation. Not globally threatened. Common to locally abundant; one of the most numerous members of its genus. Less common in E regions of S Africa, where population estimates for Kruger National Park (South Africa) 4000 individuals, S Mozambique more than 5000, C Mozambique 2000; in Swaziland, however, numbers estimated at 80,000. Has expanded its range, benefiting from cultivation of seed crops and a concomitant increase in dams and irrigation canals.

Causes some damage to wheat, sorghum and millet crops. Considered a pest in wheat-growing areas of South Africa, and is an unprotected species in some provinces; mist-nets used locally in controlling birds. Introduced unsuccessfully in Atlantic Ocean on St Helena (where probably breeding in early 19th century), and in Pacific on Tahiti, in Hawaii and in South Australia; escaped cagebirds reported as breeding occasionally in Portugal. Reported introduction in Japan of present species more likely to be referable to *E. franciscanus*, which is very common in cagebird trade.

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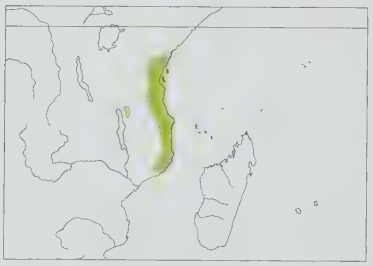
24. Zanzibar Bishop

Euplectes nigroventris

French: Euplecte de Zanzibar **German**: Brandweber **Spanish**: Obispo de Zanzíbar
Other common names: Black-bellied Bishop, Black-winged Bishop(!), Zanzibar Red Bishop

Taxonomy. *Euplectes nigroventris* Cassin, 1848, Zanzibar.
Has been regarded as forming a superspecies with *E. franciscanus* and *E. orix*, but such treatment not supported by molecular data. Proposed race *rufigula* (described from C Kenya), having some red on throat and breast, is considered no more than a variant. Monotypic.

Distribution. Coastal region from SE Kenya (irregularly inland to Tsavo) S, including offshore islands of Zanzibar and Pemba, to N Mozambique (S to Mocuba); in SW Tanzania W to Songea.



Descriptive notes. 10 cm; 11–14 g. Small, short-tailed bishop. Male breeding has forehead, crown and nape red, mantle bright rufous-brown, rest of upperparts, including uppertail-coverts, red; upperwing dusky grey-brown with paler edges, tail dusky grey-brown, rectrices with paler edges; lores, cheek, ear-coverts, chin, throat, breast and belly black, thighs buffy-orange to brown, undertail-coverts red; some individuals have scattered red feathers on throat and upper breast ("*rufigula*"); iris brown; bill black; legs brown. Male non-breeding and female are alike in plumage, having forehead to uppertail-coverts brown with dark brown central streaks on feathers, wings and tail brown, lores, cheek and ear-coverts brown with faint streaks, chin, throat, breast and belly dull white, buffy wash in centre of breast, thighs buffy, undertail-coverts white; iris, bill and legs brown. Juvenile is like female, but with broader and paler buff edges on feathers of upperparts. Voice. Song a soft sizzling, interspersed with chattering, nasal "zhhhnn" or "djeeeeen". Contact call "tsip"; hard "drrt" in alarm.

Habitat. Coastal grassland and cultivated areas, below 1000 m.

Food and Feeding. Diet mainly seeds, especially those of *Echinochloa haploclada* and *Panicum maximum*, also rice (*Oryza*) and sorghum (*Sorghum*). Insects fed to nestlings. Readily accepts termites (Isoptera) and spiders (Araneae) in captivity. Forages in small flocks, often with *E. hordeaceus*, also with other congeners and *Quelea* species.

Breeding. Breeds May–Oct in Kenya, and recorded in all months in Tanzania; on Zanzibar, May–Jul and possibly again Nov–Dec. Polygynous, with up to five females per male. Territory size variable, from 120–240 m² in open grassland and up to 800 m² in bulrushes (*Typha*) to smaller than 10 m² in *Phragmites* reeds; defends territory against *E. hordeaceus*, whereas *E. ardens* and *E. albonotatus* apparently tolerated. Male makes short flights with plumage fluffed ("bumble-flights") to female, then, in perched courtship, turns repeatedly to display both upperparts and underparts. Nest built by male, a thin-walled oval structure with side entrance, made from grass strips, lined by female with seedheads of grasses such as *Panicum maximum*, lining projecting to form porch over entrance, placed 1–1·5 m above ground in grass, reeds or bush. Clutch 2–3 eggs (mean 2·4 in Tanzania), pale blue, rarely with sparse brown speckles, mean of three eggs 16·5 × 12·5 mm (Tanzania); incubation by female, in captivity period 12 days; young fed by female only, nestling period 13–16 days (15–19 days in captivity). House Crow (*Corvus splendens*) an important predator of eggs and young at Mombasa, in Kenya.

Movements. Mainly resident, with some local movements; irregular visitor to Tsavo, in Kenya.

Status and Conservation. Not globally threatened. Locally common.

Bibliography. Bowen (1931a), Britton & Britton (1986), Brown & Britton (1980), Fry & Keith (2004), Fuggles-Couchman (1943), Lewis & Pomeroy (1989), Moreau (1950), Moreau & Moreau (1938), Pakenham (1936, 1979), Ryall (1992), Stevenson & Fanshawe (2002), Vaughan (1930), Vincent (1949a).

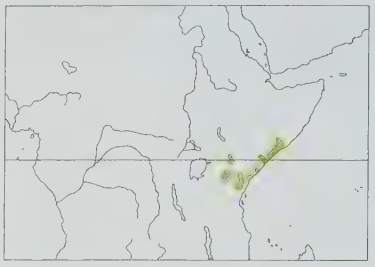
25. Fire-fronted Bishop

Euplectes diadematus

French: Euplecte à diadème **German**: Diademweber **Spanish**: Obispo Diademado

Taxonomy. *Euplectes diadematus* G. A. Fischer and Reichenow, 1878, Malindi, Kenya.
This species and *E. afer* have sometimes been placed in a separate genus, *Taha*, and considered to form a superspecies, but close relationship not supported by molecular data. Monotypic.

Distribution. C, S & E Kenya, SE Somalia and NE Tanzania.



Descriptive notes. 10 cm; mean 14 g. Small bishop with rather short tail. Male breeding has large red patch on forehead with some black in centre; rest of head black, mantle mottled yellow and black, lower back to uppertail-coverts yellow; tail dusky grey-brown, rectrices with buff margins, upperwing dusky grey-brown with pale yellow feather edges; chin, throat, breast and belly black, thighs whitish, vent and undertail-coverts yellow; iris dark brown; bill black; legs pale brown. Male non-breeding has forehead, crown, nape and mantle brown with dark central streaks on feathers, wings and tail brown with pale yellowish edges on remiges; lores, cheek and ear-coverts brown, faintly streaked, pale buffy supercilium; chin, throat and breast buffish, belly, thighs and undertail-coverts dull white; iris brown, bill brown, legs pale brown. Female is like non-breeding male. Juvenile undescribed. Voice. Song a thin sizzling "bzz-tizzzzzzzzzz tzizit-tzit". Contact call "chweep"; also liquid sounds "tilly" and "plee-pleew".

Habitat. Open grassland and cultivated areas below 1000 m; also bushy coastal dunes, rice fields and temporarily flooded areas.

Food and Feeding. Diet chiefly grass seeds such as those of *Sporobolus* and *Echinochloa*; in captivity, accepts seeds of *Panicum*, *Paspalum*, *Chloris*, *Setaria* and *Hyparrhenium*. During nesting, also takes termites (Isoptera) and spiders (Araneae). Forages in small groups; sometimes associates with other ploceids in flocks or at roosts.

Breeding. Breeds Aug–Sept in Somalia; May–Jun, also Dec–Jan following rain, in Kenya. Probably polygynous; territorial, nesting solitarily or in colonies with up to twelve males. Male in perched display bobs up and down with fluffed plumage, flicking wings. Nest a rounded structure, entrance near top under a small porch, very loosely woven with grass stems and leaf blades, attached within 0·5 m of ground to grass or herbs in grass clump; female may contribute to building, continues lining with softer grass during incubation. Clutch 2–5 eggs, pale blue, lightly blotched and spotted with black, average size of ten eggs 16·5 × 12·5 mm (Kenya); in captivity, incubation by female, period 10–12 days, nestling period 11–12 days. No other information.

Movements. Described as nomadic or migratory, with movements related to rainfall. At Tsavo, in S Kenya, common Dec–Feb but seldom seen at other times; during drought recorded at Dar-es-Salaam, in E Tanzania.

Status and Conservation. Not globally threatened. Locally common. Roosts containing more than 100 individuals in Somalia in Jul and Oct.

Bibliography. Ash & Miskell (1998), Baker & Howell (1992), Cunningham-van Someren (1971b), Fry & Keith (2004), Holcomb (1977), Lack (1985), Lewis & Pomeroy (1989), Nørgaard-Olesen (1970), Stevenson & Fanshawe (2002), Williams (1962), Zimmerman *et al.* (1996).

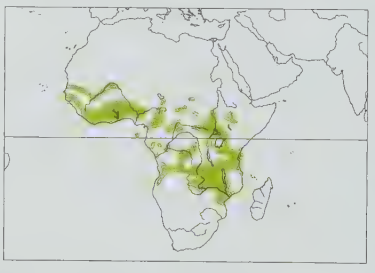
26. Black-winged Bishop

Euplectes hordeaceus

French: Euplecte monseigneur **German**: Flammenweber **Spanish**: Obispo Alinegro
Other common names: Fire-/Fiery-/Red-crowned Bishop, Black-winged Red/Black-crowned Red Bishop

Taxonomy. *Loxia hordeacea* Linnaeus, 1758, "In Indiis"; error = Senegal.
Sometimes placed with *E. aureus* and *E. gierowii* in a separate genus, *Groteiplectes*. In captivity, reported as having hybridized with *E. ardens* and "red bishop", probably *E. franciscanus*. Birds in NE of range sometimes separated as race *craspedopterus* (described from Ethiopia), supposedly differing in having pale (not black) undertail-coverts, but variation individual, rather than regional, and naming of geographical races considered unwarranted. Treated as monotypic.

Distribution. S Mauritania, Gambia, N & SW Senegal, C & S Mali, Guinea-Bissau, Guinea, Sierra Leone, Liberia and Ivory Coast E to extreme SW Niger, C Nigeria, Cameroon, São Tomé, N & S Central African Republic, SW & SE Chad, SW & S Sudan and SW Ethiopia, S discontinuously to Gabon, PRCongo, DRCongo (except C forested region), Uganda, W & SE Kenya, W Rwanda, W Burundi, much of Tanzania (including Zanzibar and Pemba I), N & W Angola, Zambia, Malawi, N & E Zimbabwe and C Mozambique.



Descriptive notes. 12 cm; male 22–29 g, female 17–21 g. Moderately short-tailed bishop. Male breeding has forehead, crown and nape orange-red to deep scarlet (intensity of red varying individually), mantle and back red-brown, rump and uppertail-coverts orange-red to red; upperwing and tail black, tawny to whitish fringes on wing-coverts, secondaries, tertials and rectrices, can be lost as plumage becomes worn; lores, cheek, ear-coverts, chin and throat black; breast orange-red to red, meeting red of nape, belly black, lower flanks, thighs, vent and undertail-coverts whitish variably tinged orange to cinnamon, with some black bases showing through on thighs; in NE of range (Sudan, Ethiopia, Uganda and W Kenya) undertail-coverts usually whitish, but variable; iris dark brown, bill black, legs darkish purple-brown to dull reddish-flesh. Male non-breeding retains black wings and tail, but wing-coverts have broad buff edges and remiges pale margins; lores, cheek and ear-coverts light brown, broad yellowish supercilium, upperparts brown with black central feather streaks, chin and throat whitish, breast light brown with some streaking, flanks and thighs light brown, belly and undertail-coverts whitish; iris dark brown, bill and legs brown. Female is brown with dark brown central feather steaks above, lores, cheeks and ear-coverts brown to buffy, yellowish superciliary stripe; wings and tail brown with paler feather margins; chin and throat whitish, breast, flanks and thighs brown to buffy, breast with variable amount of streaking, belly and undertail-coverts whitish; iris brown, bill and legs brown. Juvenile is like female, but has broad buff edges on feathers of upperparts in first plumage (before post-juvenile moult); subadult male differs from female only in measurements, acquires black remiges before first breeding plumage. Voice. Song, in flight and from perch, of three parts, with ticking and sizzling notes, "chussaka-tsipa-tsipa-tsipa-zzzzzzh-tututututu". Varied calls by perched male in territory, some more melodious notes audible only at close range, "seep-seep-seep-zzzzzzray-titi-zzzzzzray-titi-zzzzzzray sisisisi". Twittering call from male to returning female; female solicits copulation with soft, high-pitched call; harsh "chak" in alarm.

Habitat. Tall grassland, also savanna and cultivated areas, clearings in forested country, and overgrown areas of abandoned cultivation, from coastal up to 2000 m. Often found in areas wetter than those in which other red-plumaged bishops occur; thus, in Ethiopia, not found alongside *E. franciscanus*.

Food and Feeding. Diet mainly grass seeds, particularly those of *Panicum maximum*, *Hyparrhenia*, *Pennisetum*, *Rottboellia*; also rice (*Oryza*) and young maize (*Zea mays*). Insects taken, including termite alates (Isoptera); caterpillars (Lepidoptera) found in stomach contents. Perches on grasses when feeding, but often forages on ground; hawks flying insects from perch. Often in pairs or small groups, and joins mixed flocks with *E. franciscanus* and *E. albonotatus*; on São Tomé with *E. aureus*, and on Zanzibar with *E. nigroventris* and *Ploceus subaureus*.

Breeding. Season Jul–Aug in Senegal, Ghana and Togo, Aug–Sept in Mauritania, Mali, Liberia and Burkina Faso, Aug–Nov in Gambia, Sept–Jan in Sierra Leone, Aug–Oct in Nigeria, Sept–Dec in Cameroon, and Dec–Jan and Apr on São Tomé; breeds Aug–Oct in Sudan, and Apr–May and Aug–Oct in Ethiopia; Jan–May in Angola; in DRCongo, Aug–Oct in Uele and Jan–May in S region; Apr–Aug in Uganda, recorded in most months (mainly Apr–Jul) in Kenya, Feb–Jun in Tanzania (during drought, first nests three weeks later than average), but May–Aug on Zanzibar; Jan–Apr in Zambia and Zimbabwe, Feb–May in Malawi and Jan–Mar in Mozambique. Polygynous, with up to four females per male. Male defends territory of 400–1200 m²; tolerates *E. orix* in Zimbabwe, *E. aureus* on São Tomé and *E. capensis* in Tanzania, but aggressive towards *E. ardens*. Often solitary nester, sometimes a few males close together. Male in display perches prominently in territory, plumage puffed out, swivels while calling constantly; short fluffed flights and slow "bumble-flights" in approach to female landing in territory; close to female, male may flap wings slowly in front of breast, or hold them quivering above back. Nest built by male, oval with large side entrance, woven from grass strips, supported 0·8–3·0 m above ground by vertical stems of tall grass or other vegetation, nest lined by female with fine grass; during drought in Tanzania, more nests built in trees than in grass; old nests may be used by Zebra Waxbill (*Amandava subflava*). Clutch 2–4 eggs, light blue-green, rarely with tiny black spots, average size of 17 eggs 18·5 × 13·8 mm (DRCongo); incubation by female alone, one report of male on nest containing eggs, period 12–14 days; chicks fed by female only, nestling period 11–13 days, up to 16 days in unfavourable conditions. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*); males also mobbed, and sometimes chased off, White-browed Coucal (*Centropus superciliosus*). In captivity, one individual lived for more than 10 years.

Movements. Generally resident, but forms roving flocks in non-breeding season. Three ringed individuals in Zimbabwe recovered 44 km from ringing site.

Status and Conservation. Not globally threatened. Locally common to abundant in many parts of its extensive range.

Bibliography. Aspinwall (1985), Aspinwall & Beel (1998), Bannerman (1949), Barlow *et al.* (1997), Bates (1909, 1911), Benson & Benson (1977), Benson *et al.* (1971), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brooke (1970), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1998), Claffey (1995), Craig (1976, 1982a, 1993a), Dean (2000), Demey (1995), Dowsett (1965), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Eccles (1988), Elgood *et al.* (1994), Friedmann (1937), Fry & Keith (2004), Fuggles-Couchman (1943), Gajdacs & Keve (1968), Gatter (1997), Giraudoux *et al.* (1988), Green & Carroll (1991), Grimes (1987), Halleux (1994), Hermann (1973), Hockey *et al.* (2005), Holyoak & Seddon (1989), Irwin (1981), Jackson & Sclater (1938), Jones & Tye (2006), Jourdain & Shuel (1935), Kothe (1911), Lack (1935), Lamarche (1981), Lewis & Pomeroy (1989), Lynes (1924, 1938), McCarthy (2006), Moreau & Moreau (1938), Morel & Morel (1982, 1988), Newton (1937), Nikolaus (1987), Olson (1976), Parker (2005), Poulsen (1956), Rand *et al.* (1959), Ruwet (1964a, 1964b), Sclater & Moreau (1933), Serle (1949, 1950), Sjöstedt (1910), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1985), Thonnerieux (1988), Thonnerieux *et al.* (1989), Traylor (1963a), Urban & Brown (1971), Vaughan (1930), Verheyen (1953), Vincent, A.W. (1949a), Vincent, J. (1936), White (1946), Whybrow (1950), Winterbottom (1938), Zimmerman *et al.* (1996).



PLATE 4

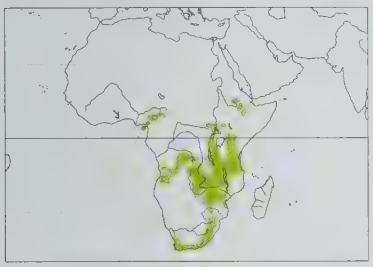
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27. Yellow Bishop

Euplectes capensis

French: Euplecte à croupion jaune **German**: Samtweber **Spanish**: Obispo Culigualdo
Other common names: Yellow-rumped Bishop/Widow, Black-and-yellow/Cape Bishop

Taxonomy. *Loxia capensis* Linnaeus, 1766, Cape of Good Hope, South Africa.
Molecular data indicate that this species is a short-tailed widowbird, not closely allied to the bishop group. Has hybridized with *E. axillaris* in captivity. Other proposed races are *sabinjo* (described from Sabinjo, in E DRCongo), *kilimensis* (from Moshi, in NE Tanzania), *litoris* (from Morogoro, in S Tanzania), *transvaalensis* (from Woodbush, in C Limpopo, in N South Africa) and *zambesiensis* (from Boror, in Mozambique), all synonymized with *crassirostris*; and, in South Africa, *macrorhynchus* (described from Klawer, on R Olifants, in NW Western Cape), included in nominate, and *knysnae* (from Knysna, in SE Western Cape), treated as a synonym of *approximans*. Six subspecies currently recognized.
Subspecies and Distribution.
E. c. phoenicomerus G. R. Gray, 1862 – highlands of SE Nigeria and W & C Cameroon; also Bioko I (Fernando Póo).
E. c. xanthomelas Rüppell, 1840 – highlands of Ethiopia.
E. c. crassirostris (Ogilvie-Grant, 1907) – SE Sudan, W & E Uganda, E & SE DRCongo, Rwanda and Burundi, C Kenya and coastal and highland Tanzania S to Zambia, Malawi, Zimbabwe plateau and highlands, NE South Africa and C & S Mozambique.
E. c. angolensis Neunzig, 1928 – highlands of Angola.
E. c. capensis (Linnaeus, 1766) – S South Africa (Western Cape E to Knysna region).
E. c. approximans (Cabanis, 1851) – E South Africa (from Gauteng S to Knysna), W Swaziland and Lesotho.



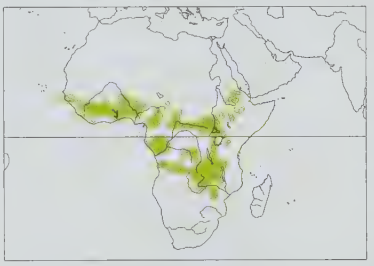
Descriptive notes. 15 cm; male average 37 g in W Cape but 24 g elsewhere, female average 30 g in W Cape but 19 g elsewhere. Short-tailed bishop-like bird. Male nominate race breeding has entire head to mantle black, back and rump golden-yellow, uppertail-coverts and tail black; lesser and median upperwing-coverts yellow, forming prominent epaulet, rest of wing feathers and scapulars dark brown with buffy to yellowish fringes (widest on scapulars), tertials blacker; chin to undertail-coverts black, concealed white feathers in mid-line of breast (visible during fluffed display), thighs brown; iris brown; upper mandible black, lower mandible white; legs brown to fleshy pink. Male non-breeding has forehead to mantle brown with darker streaks, rump golden-yellow; wing as in breeding plumage, tail feathers brown with pale edges; grey-brown to whitish below, heavily streaked except on chin, centre of belly and undertail-coverts; iris brown, bill and legs brown. Female is like non-breeding male, but yellow areas on wing-coverts and rump smaller and duller, rump often mustard-coloured. Juvenile resembles female, but less heavily streaked on underparts, and rump pale buffish with some streaking; subadult male like non-breeding male, with yellow on wing-coverts restricted to a fringe on feathers, and rump duller yellow. Races differ mainly in male wing colour, bill colour, also in size: *approximans* male breeding has brown wings and brown thighs, wholly black bill, is smaller than nominate (male wing average 7·65 cm, tail average 5·4 cm; nominate wing 8·5 cm, tail 6·1 cm); *crassirostris* male breeding has black wings, largely black thighs, upper mandible black, lower mandible white to blue-grey, similar in size to previous (wing 7·2 cm, tail 5·5 cm); *xanthomelas* male breeding is like last, but relatively longer-winged and shorter-tailed (wing 7·5 cm, tail 4·9 cm); *angolensis* breeding male has brown wings and thighs, upper mandible black, lower mandible blue-grey; *phoenicomerus* breeding male has dark brown wings, black thighs, black upper mandible often flecked with white, and white to blue-grey lower mandible. Voice. Song from perch a series of loud chipping calls followed by sizzling, "chip-chip-chip pa-tzee tee-zeet-ta-weet pa-zee-zee-zeep"; fast buzzy song in flight "chip psee-eee-ee tzee-zeeee-tzeee-seeep zzzzp zzzzp". Thin "tseep" contact call; high-pitched flight call; harsh "chak" in alarm.
Habitat. In N regions mainly montane grasslands, primarily at 1400–2300 m in E Africa, to 3200 m in Ethiopia and on Mt Cameroon, with height record of 3600 m on latter. At 40–1800 m in Malawi; also occupies some coastal and lowland areas in Tanzania. In South Africa, ranges from coastal regions in macchia, cultivated lands, rank vegetation along streams and forest fringes up to mountain fynbos and high grasslands; to 3000 m in Drakensberg of Lesotho.
Food and Feeding. Diet seeds, primarily grass seeds, also cultivated maize (*Zea mays*), rice (*Oryza*) and millet; also insects such as caterpillars (Lepidoptera), bugs (Hemiptera), termites (Isoptera) and ants (Formicidae). May be largely insectivorous at certain seasons. Takes seeds from grassheads and on ground. Insects captured on ground, or hawked from perch; will also search for insects in cowpats. Forages singly and in pairs. Outside breeding season forms small mixed foraging flocks with waxbills, particularly Common Waxbill (*Estrilda astrild*), viduids and also congeners, and large flocks with *E. ardens*, *E. albonotatus* and *E. orix* reported from Angola; joins roosts with other ploceids in non-breeding season.
Breeding. Breeds Nov in Cameroon and Jul–Oct in Ethiopia; in DRCongo, Jul–Nov in Uele, Jan–Mar in Itombwe, Dec in Katanga, and Feb–Apr in Lubumbashi; in Kenya mainly Mar–Jun, also Nov–Feb, and May–Sept (dependent on rainfall) on Laikipia Plateau; Apr–May in Tanzania; Mar–May in Angola, Dec–Apr in Zambia, Jan–May in Malawi, Dec–Mar in Zimbabwe and Dec–Feb in Mozambique; in South Africa, Aug–Dec in winter-rainfall region, Nov–Mar in summer-rainfall area; often double-brooded. Polygynous, with three or four females per male. Often solitary, and never truly colonial; may defend territory against congeners, as well as conspecifics, but in E Africa nested in close association with *E. hordeaceus* and *E. nigroventris*, and nest in Zambia within territory of *E. albonotatus*; territory size in Tanzania estimated at 3000–4000 m², in Ethiopia 10 territories in 80 ha. In "bumble-flight" display to females entering territory, male, with yellow rump feathers puffed up and tail depressed, flies on zigzag course during which burst of song alternates with wing-rattling noise; in perched courtship sways from side to side while leaning back with all feathers ruffled and white strip visible on lower breast (feather bases exposed). Nest domed with side entrance, woven by male from grass strips, living grass may be woven into structure, lined by female with grass seedheads, which may project from entrance to form a porch, one nest in South Africa lined with sheep's wool, placed 0·5–1·5 m above ground in grass or small shrub, male nips off tops of herbs around nest; old nests used by Karoo Prinia (*Prinia maculosa*) and by Zebra Waxbill (*Amandava subflava*). Clutch 2–4 eggs, very variable, five basic types, (i) bluish-white and heavily speckled with reddish-brown, (ii) green-tinged light brown and heavily blotched and streaked with dark brown and grey, (iii) olive-brown with ash-brown spots, (iv) cream or very pale greenish, evenly covered in bold freckling of olive, sepia and grey, (v) pale bluish-grey, blotched and spotted with reddish-brown and olive-brown, average size of 25 eggs 21·3 × 15 mm (South Africa); incubation by female, 13–16 days, in captivity 13 days reported; chicks fed by female, primarily by regurgitation, nestling period 16–20 days (14–15 days also reported). No confirmed records of brood parasitism, but adults attacked a stuffed Diederik Cuckoo (*Chrysococcyx caprius*). Many nests lost to predation; of 19 nests in Western Cape (South Africa), only four produced fledged young. Maximum recorded longevity in Malawi more than 9 years; annual mortality rate over 17 years of study estimated at 54%.
Movements. Primarily resident. Highland populations may undertake altitudinal movements, returning in subsequent breeding seasons. In DRCongo, Zimbabwe and Malawi, ringed individuals recaptured at same sites more than two years after ringing; maximum distance moved 20 km.
Status and Conservation. Not globally threatened. Locally common to common. Common in thinly populated montane regions. Population in Swaziland estimated at 20,000 individuals; in S & C Mozambique probably in excess of 100,000 birds. Apparently no recent breeding records in Uganda. On Bioko I, first reported in 1939, and possibly introduced.
Bibliography. Bannerman (1949), Basilio (1963), Beesley (1973), Blanford (1870), de Bont *et al.* (1965), Borrow & Demey (2001), Bowen (1931a, 1931b), Braun (1930), Brooke (1953, 1970), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1932, 1954), Cheesman & Sclater (1936), Colahan & Craig (1981), Craig (1993a), Dean (2000), Donnelly (1965), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Eisentraut (1963), Eyckerman & Cuvelier (1982), Ezra (1938), Fry & Keith (2004), Hanmer (1989), Hockey *et al.* (2005), Keast (1968), Lack (1935), Lippens & Wille (1976), Lloyd (2004), Loveridge (1923), Lynes (1938), Martin (1955), Martin & Broekhuysen (1961), Moreau (1960c), Mouritz (1913), Newton (1937), Nikolaus (1987), Olson (1976), Oschadleus & Underhill (2006c), Parker, V. (1994, 1999, 2005), Peach *et al.* (2001), Rowe (1942), Sclater & Moreau (1933), Serle (1943a, 1950, 1957), Short & Horne (2005), Skead (1995, 1997), van Someren (1916, 1956), Stevenson & Fanshawe (2002), Stuart (1986), Succow (1990), Swynnerton (1915), Tarboton *et al.* (1987), Traylor (1963a), Urban & Brown (1971), Vincent, A.W. (1949a), Vincent, J. (1936), White (1943, 1946), Wilson (1973), Winterbottom (1936, 1959), Zimmerman *et al.* (1996).

28. Yellow-mantled Widowbird

Euplectes macroura

French: Euplecte à dos d'or **German**: Gelbschulterweber **Spanish**: Obispo Dorsiamarillo
Other common names: Yellow-mantled Whydah, Yellow-backed/Yellow-shouldered Widow(bird)/Whydah; Ethiopian Widowbird (*macrocercus*)

Taxonomy. *Loxia macroura* J. F. Gmelin, 1789, "Africa, in regno Whidah et ad fluvium Senegal" = Ouidah, Benin.
In captivity, has hybridized with *E. ardens* and *E. axillaris*. Proposed race *intermedius* (described from E shore of L Tanganyika) synonymized with nominate. Three subspecies recognized.
Subspecies and Distribution.
E. m. macroura (J. F. Gmelin, 1789) – Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Ivory Coast, extreme S Mali, Burkina Faso, extreme SW Niger, Ghana, Togo, Benin, and Nigeria E, discontinuously, to Cameroon, SW Chad, Central African Republic and S Sudan, S to Gabon, PRCongo, N Angola, DRCongo, Uganda, SW Kenya, Rwanda, Burundi, Tanzania, Zambia, Malawi, Zimbabwe and extreme W Mozambique.
E. m. macrocercus (M. H. C. Lichtenstein, 1823) – highlands of Eritrea and Ethiopia.
E. m. conradsi (Berger, 1908) – Ukerewe I, in L Victoria.



Descriptive notes. 14 cm, breeding male 19 cm; male 22–29 g, female 17–20 g. Long-tailed widowbird. Male nominate race breeding is mainly black, with long, graduated tail (mean length 10·7 cm); mantle golden-yellow, variable, in W Kenya and Uganda most have black mantle, and intermediate forms occur; primaries black, lesser wing-coverts yellow, median and greater secondary coverts, secondaries and tertials black with buff edges; nape feathers long and square-tipped (forming ruff), some concealed white feathers in mid-line on breast (can be displayed when plumage ruffled); iris dark brown; bill black, variable blue-grey tip of lower mandible; legs blackish. Male non-breeding retains wing feathers of breeding, but tail moults to short, brown rectrices (mean 6·3 cm); forehead to back brown with dark central streaks on feathers, rump and uppertail-coverts light brown; light brown lores, cheek and ear-coverts, dull white supercilium; chin whitish, throat and breast light brown with faint streaking, belly white, thighs and undertail-coverts light brown; iris brown, bill and legs brown. Female resembles non-breeding male, but wing feathers brown with pale edges, lesser coverts with yellow margins, supercilium yellowish, underparts paler; bill brown, lower mandible paler, more flesh-coloured. Juvenile resembles female, but underparts generally washed with yellow; subadult male like adult female, but underparts slightly darker. Race *macrocercus* male breeding differs from nominate in having mantle always black (never yellow), tail longer (mean length 13·8 cm), non-breeding plumage has very dark streaking on upperparts, dark brown tips on remiges; *conradsi* is very poorly known, type specimen has much longer tail (14·3 cm) than nominate. Voice. Song from perch a rustling, sizzling "zzher-tsi-zzher-zzhyer", sometimes preceded by "tsee-piti tsee-piti"; in display at territory boundary a high-pitched twittering song alternating with hissing calls. Whistling call by male in flight.
Habitat. Moist grassland, marshy areas with trees and scrub; also rice fields and rank grass in abandoned farmlands in W Africa. Noted at up to 1700 m in Cameroon, at 1000–1800 m in Kenya and in areas of high rainfall (more than 1000 mm per annum); at 1000–2100 m in Ethiopia, and mostly above 1200 m in Zimbabwe. Roosts in reeds or papyrus (*Cyperus papyrus*) in swamps, also in thickets.
Food and Feeding. Diet mainly seeds, particularly of sedges (Cyperaceae), also grass seeds; also arthropods. In Ivory Coast savanna, diet estimated at 80% seeds, 20% arthropods. Insect food

On following pages: 29. Fan-tailed Widowbird (*Euplectes axillaris*); 30. White-winged Widowbird (*Euplectes albonotatus*); 31. Hartlaub's Marsh Widowbird (*Euplectes hartlaubi*); 32. Jackson's Widowbird (*Euplectes jacksoni*); 33. Montane Marsh Widowbird (*Euplectes psammocromius*); 34. Long-tailed Widowbird (*Euplectes progne*).

includes termites (Isoptera) and their alates. Nestling diet in captivity initially only insects, later also seeds and other material. Forages on ground and in low vegetation; hawks termite alates from perch. Joins flocks of other ploceids in non-breeding season; noted as flocking in groups of more than 100 individuals with *E. hartlaubi* and, in Ethiopia, with *E. ardens*. In Ghana, occasionally joins mixed-species flocks in savanna woodland, even during breeding season.

Breeding. Breeds Sept–Nov in Sierra Leone and Liberia, Jun–Aug in Ghana, Jun–Nov in Benin, Aug–Sept in Burkina Faso, Jul–Oct in Nigeria and Niger, Sept–Nov in Cameroon, Oct in PRCongo; in DRCongo, Jul–Oct in NE and Jan–Apr in S; Aug–Oct in Sudan, Jul–Oct in Ethiopia, Jun–Aug in Uganda, May–Sept in Kenya, Jun in Tanzania, Mar–May in Angola, Dec–Mar in Zambia and Zimbabwe, and Jan–Feb in Malawi. Polygynous, with up to five females per male. Territorial, but in areas of high density almost colonial; calculated territory size in Kenya 0·17–2·7 ha (mean 0·95 ha). Male makes pursuit-flights of females, with tail depressed in display; in courtship, makes jerky wing movements accompanied by flicks of spread tail; manipulation of male tail length in the field affected territory defence, but apparently not the attractiveness of the male to females. Nest a large oval structure with side entrance, framework woven by male (number of nest frames produced is best predictor of male mating success), with living grass blades included, female continues to add dry grass lining during incubation, placed 15–60 cm above ground in grass less than 1 m tall, generally in damp or waterlogged area; old nests sometimes occupied by Zebra Waxbills (*Amandava subflava*). Clutch 2–3 eggs (average 2·6 in Zimbabwe), pale green, heavily speckled with brown, average size of 25 eggs 18·9 × 13·8 mm (Zimbabwe); incubation by female only, in captivity period 12–14 days; chicks usually fed by female only (wild male seen to feed once), nestling period 15 days. Of 28 nests in Kenya, 27% fledged one or more young, and 24% of eggs produced fledglings; most failures at egg stage, with nests destroyed by grazing cattle or by grass-cutting, or abandoned after disturbance.

Movements. Generally resident; occurrence seasonal in parts of Ghana.

Status and Conservation. Not globally threatened. Common to locally abundant within extensive range; rare in Mali. No information on current status of race *conradsi*, which is very poorly known. Old reports of damage to crops caused by this species in Ethiopia.

Bibliography. Aiyedun (1972), Aspinwall & Beel (1998), Baily (1916b, 1918, 1924), Barlow *et al.* (1997), Bates (1927), Benson (1952), Benson & Benson (1977), Benson *et al.* (1971), de Bie & Morgan (1989), Blanford (1870), Borrow & Demey (2001), Brooke (1970), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Cheesman & Sclater (1936), Cheke & Walsh (1996), Christy & Clarke (1994), Claffey (1995), Colahan & Craig (1981), David & Gosselin (2002a), Dean (2000), Demey (1995), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire (1997), Dowsett-Lemaire & Dowsett (2006), Elgood *et al.* (1994), Fry & Keith (2004), Gatter (1997), Giraudoux *et al.* (1988), Green & Carroll (1991), Greig-Smith (1978a), Grimes (1987), Halleux (1994), Heinrich (1958), Hermann (1978), Hockey *et al.* (2005), Hopkinson (1938), Irwin (1981), Jackson & Sclater (1938), Jourdain & Shuel (1935), Lamarche (1981), Lewis & Pomeroy (1989), Lippens & Wille (1976), Macdonald (1979b), Marchant (1942), McCarthy (2006), Newton (1937), Nikolaus (1987), Olson (1976), Poulsen (1956), Rand *et al.* (1959), Reichenow (1873), Ruwet (1964a, 1964b, 1965b), Savalli (1993a, 1993b, 1994a, 1994b, 1994c, 1997), Schüz (1968), Serle (1949, 1950, 1957), Simmons (1961), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1973, 1985), Thonnerieux (1988), Thonnerieux *et al.* (1989), Traylor (1963a), Urban & Brown (1971), Verheyen (1953), Vincent, A.W. (1949a), Vincent, J. (1936), White (1946), Winterbottom (1936), Zimmerman *et al.* (1996).

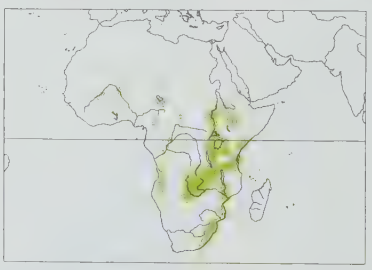
29. **Fan-tailed Widowbird**

Euplectes axillaris

French: Euplecte à épaules orangées **German**: Stummelweber **Spanish**: Obispo de Abanico
Other common names: Fan-tailed Whydah, Red-shouldered Widow(bird)/Whydah

Taxonomy. *Vidua axillaris* A. Smith, 1838, Eastern Cape, South Africa.
Hybridizes with *E. macroura* and *E. capensis* in captivity. Proposed races *batesi* (described from upper R Niger around Mali–Niger border) and *quanzae* (from W Angola) treated as synonyms of *bocagei*. Five subspecies currently recognized.

Subspecies and Distribution.
E. a. bocagei (Sharpe, 1871) – S & E Mali, SW Niger, NE Nigeria, SW Chad, W & N Cameroon, N Central African Republic, E PRCongo, W DRCongo, Angola, Zambia (except NE sector), NE Namibia (Caprivi region), N Botswana (Okavango region) and NE Zimbabwe (R Zambezi W of Victoria Falls).
E. a. phoeniceus (Heuglin, 1862) – S Sudan, Uganda, E DRCongo, Rwanda, Burundi, inland Kenya and Tanzania, S to NE Zambia and Malawi.
E. a. traversii (Salvadori, 1888) – highlands of W & S Ethiopia.
E. a. zanzibaricus (Shelley, 1881) – S Somalia S along coast, including Zanzibar and Pemba, to S Tanzania.
E. a. axillaris (A. Smith, 1838) – lowlands of Malawi (except extreme NE), C & S Mozambique, Swaziland and E South Africa.



Descriptive notes. 15 cm; male 26–32 g, female 20–25 g. Typical widowbird with medium-length tail. Male nominate race breeding is black except for buff-edged tertials, secondaries and greater coverts, fringes often lost with wear, cinnamon-brown on bases to primary coverts and on median coverts, forming distinctive epaulet together with red lesser coverts; tail fan-shaped and elongated (mean length 7·5 cm); iris brown; bill pale grey-blue; legs black. Male non-breeding has forehead and crown black with narrow brown feather edges, nape and upperparts brown with broad blackish central streaks on feathers; wings as in breeding plumage, but secondary coverts black with broad buff margins, rectrices dark brown with pale edges and shorter (mean 6·2 cm); supercilium buffy, lores, cheek and ear-coverts brown, chin and throat whitish, breast and flanks buff with faint streaking, belly whitish, thighs and undertail-coverts buff; iris brown; bill blue, but brown on birds which have just acquired black remiges; legs dark brown. Female and subadult male are like non-breeding male, except remiges brown with pale edges, lesser primary coverts edged with cinnamon to orange-brown (but no red on epaulet); iris brown, bill horn-brown to fleshy brown, darker on culmen, legs pale brown to flesh-coloured. Juvenile resembles female, except for very broad buffy edges on feathers of upperparts, bill uniformly pale brown. Races differ mainly in male breeding plumage: *bocagei* has lesser wing-coverts orange-yellow and greater coverts and primary coverts cinnamon-brown, forming much broader epaulet than in others; *phoeniceus* has wing-coverts orange (rather than red), generally an intermediate population; *traversii* has epaulet orange, proportionately longer tail (mean 8·5 cm) than other races (means 6·5–7·5 cm); *zanzibaricus* resembles *phoeniceus*, but male has dark spots on cinnamon wing-coverts, both sexes have heavier, deeper bill. Voice. Song, from perch or in flight, a high-pitched, scratchy series of notes combined with sizzling sounds, rendered as "skreep skrik skrik wirra skreek skreek wirrily wirrily wirrily chink chink". In flight, a rolling "tseek-wirra-wirra tseek-wirra-wirra" call; contact call a repeated "zip-zip", alarm a harsher version of same.

Habitat. Tall grassland, often in moist or swampy areas, even reeds and papyrus (*Cyperus papyrus*); also drier grassland with bushes and cultivated areas, including sugar-cane fields. Usually below 1500 m; locally above 2000 m in E Africa.

Food and Feeding. Diet mainly grass seeds, such as those of *Setaria*, *Digitaria*, *Paspalum*, *Panicum*, *Polygonum senegalense*, *Echinochloa colonum*; also maize (*Zea mays*), rice (*Oryza*) and herb seeds. Also insects, including termites (Isoptera) and caterpillars (Lepidoptera). After breeding forms large feeding flocks and roosts with other ploceids.

Breeding. Breeds Sept–Oct in W Africa, Aug in Sudan, Sept–Oct in Ethiopia and Aug–Oct in Somalia; in all months except Jan, primarily Mar–Jul, in Uganda; in DRCongo, Aug–Oct in N and Jan–Mar in S; Nov–Dec and Feb–Jun in Rwanda, Apr–Jul in Kenya, Mar in Tanzania, Jan–Apr in Angola, Jan–Mar in Zambia and Dec–Mar in Malawi; one Mar record for Zimbabwe; Oct–Mar in South Africa. Polygynous, up to eight nests in a territory of 0·6 ha. Male patrols territory in slow, undulating flight as a preliminary to perched courtship, or in defence against intruders. Epaulet colour appears to be important in male-male interactions, whereas tail length is important in attracting females; males with artificially elongated tails were apparently preferred as mates. Nest an oval ball of thin grass strips with side entrance, attached to vertical stems of grass or other vegetation; male weaves frame of long grass strands in a bower of living grass, female then adds dense lining of grass seedheads (which project from entrance as a porch); usually 60–80 cm above ground, sometimes only 10 cm from ground in shorter grass tufts. Clutch 2–3 eggs (mean 2·8 in South Africa), pale blue-green, irregularly marked with large olive-brown spots, or grey-green with interlaced brown flecks, or olive-green with sparse brown markings, or grey-white with overlying brown streaks and blotches, average size of 69 eggs 19·7 × 14·1 mm (South Africa); incubation by female only, period 12–14 days; chicks fed by female only, faecal sacs dropped 100 m from nest, nestling period 15–16 days; in captivity, young fed by female for 14 days after leaving nest. Ringed adults in South Africa have survived for longer than 8 years.

Movements. Mainly resident, with local movements in non-breeding season. Greatest distance moved by a ringed individuals less than 50 km. Sex ratios at roosts in South Africa showed imbalance in favour of males in most months, suggesting differences in dispersal of sexes.

Status and Conservation. Not globally threatened. Widespread, and locally abundant. Estimated population in C & S Mozambique greater than 60,000 individuals.

Bibliography. Andersson *et al.* (2007), Baily (1916b, 1918), Bannerman (1949), Bates (1934), Beesley & Irving (1976), Belcher (1930b), Benson (1947a, 1961), Benson & Benson (1977), Borrow & Demey (2001), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1932, 1954), Craig (1980, 1993b, 1993c), Craig & Manson (1979a, 1979b), Dean (2000), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Elgood *et al.* (1994), Fry & Keith (2004), Giraudoux *et al.* (1988), Granvik (1923), Hockey *et al.* (2005), Holcomb (1977), Hopkinson (1938), Hustler (2000), Jackson & Sclater (1938), Lawson (1965), Lewis & Pomeroy (1989), Lynes (1938), Mitchell, I.G. (1966), Nikolaus (1987), Osborne (1981), Oschadleus & Underhill (2006c), Paludan (1936), Parker (1999, 2005), Penry (1994), Pryke & Andersson (2002, 2003a, 2003b), Ruwet (1964a, 1964b, 1965b), Skead (1959, 1995, 1997), van Someren (1916), Stevenson & Fanshawe (2002), Tarboton *et al.* (1987), Urban & Brown (1971), Vande weghe (1973), White (1946), Winterbottom (1942), Zimmerman *et al.* (1996).

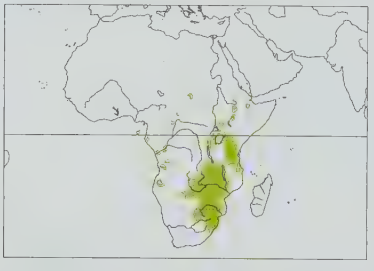
30. **White-winged Widowbird**

Euplectes albonotatus

French: Euplecte à épaules blanches **German**: Spiegelweber **Spanish**: Obispo Aliblanco
Other common names: White-fronted/White-shouldered Widowbird, White-winged/White-shouldered Whydah, Long-tailed Black Whydah; Cinnamon-shouldered Widowbird (*eques*)

Taxonomy. *Vidua albonotata* Cassin, 1848, Durban, South Africa.
Hybrids with "red bishop", probably *E. franciscanus*, reported in captivity. Race *eques* appears to interbreed with nominate in S Tanzania, but may be segregated in Burundi and W Tanzania. Proposed race *sassii* (described from NW shore of L Tanganyika) synonymized with *eques*. Three subspecies recognized.

Subspecies and Distribution.
E. a. eques (Hartlaub, 1863) – Central African Republic, W & S Sudan, S & E Ethiopia, W Rwanda, W Burundi, S Uganda and Kenya S to S Tanzania.
E. a. asymmetrurus (Reichenow, 1892) – São Tomé, W Gabon, PRCongo, W DRCongo and Angola.
E. a. albonotatus (Cassin, 1848) – S Tanzania, SE DRCongo, Zambia, Malawi, NE Namibia (Caprivi region), N & E Botswana, Zimbabwe, S Mozambique, Swaziland and E South Africa.



Descriptive notes. 14 cm; 20–27 g, female 16–24 g. Distinctive widowbird with medium-long tail. Male nominate race breeding has black plumage, except for white bases of primaries, narrow buff edges and white bases of secondaries, golden-yellow lesser wing-coverts, buff edges of median coverts, mostly white outer greater coverts; tail elongated (mean 8·5 cm) with rounded tip; iris brown; bill pale blue-grey; legs blackish-brown. Male non-breeding has wings as in breeding plumage, forehead to uppertail-coverts brown with dark central streaks, tail short (mean 5·3 cm), rectrices brown with paler edges; broad yellowish supercilium and yellow patch at base of bill; lores, cheek and ear-coverts buffy brown, chin and throat white, breast, flanks and thighs buffy brown, belly and undertail-coverts white; iris brown, bill blue-black, often blotchy in appearance, legs brown. Female and subadult male resemble non-breeding male, but underparts much whiter, remiges brown without white bases, lesser coverts brown with yellow fringes, bill with brown upper mandible, flesh-coloured lower mandible, legs brown. Juvenile resembles female, but with yellow or buffy wash on underparts; young male acquires adult wing pattern during second complete moult, at c. 13 months. Race *eques* male breeding has cinnamon-brown (not yellow) epaulet, female and subadult male have lesser wing-coverts edged with cinnamon; *asymmetrurus* male breeding has much longer tail (average length 13·0 cm; other races 8·5 cm). Voice. Song, both from perch and in flight, a swizzling phrase, "squee-squi-squeeze twirr zem-zem-zem tsisisisisisi". Chipping flight call.

Habitat. Tall bushed grassland in relatively dry country, generally below 2000 m; also rank growth of weeds and grass on edge of areas cleared for cultivation. Occurs alongside *E. aureus* and *E. hordeaceus* on São Tomé.

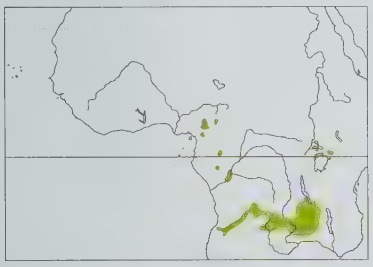
Food and Feeding. Diet chiefly seeds of the grasses *Brachiaria bizantha*, *Chloris virgata*, *Hyparrhenia*, *Pennisetum*, *Rhynchelytrum repens*, *Rottboellia exaltata*, *Setaria sphacelata*, *Urochloa pullulans*; also cultivated millet; in South Africa, also nectar of *Aloe marlothii*. Also insects, including alate termites (Isoptera); in captivity, readily takes animal food such as mealworms, earwigs (Dermaptera) and termites. Insects both caught on ground and hawked in air. Generally in small groups; in non-breeding season forms large flocks in association with *E. ardens*, *E. capensis* and *E. orix* (Angola), with *E. hordeaceus* and *E. franciscanus* (Darfur, in Sudan) and with *Quelea erythrops* (DRCongo).
Breeding. Breeds Sept–Oct in Sudan, Jun in Ethiopia; Feb–Apr in Rwanda and S DRCongo; peak Mar–Jun and recorded also Sept and Dec–Feb in Kenya; Dec–Mar in Tanzania; Apr on São Tomé, Jan–Apr in Angola, Zambia and Malawi, Dec–Feb in Botswana, Dec–Apr in Zimbabwe, Feb–Mar in Mozambique, and Oct–Apr in South Africa. Polygynous, with up to four females per male. Male defends territory of 600–1900 m² against conspecifics and sometimes against other species in genus. Male sings from high perch, in erect posture with tail fanned; in flight display, tail spread and epaulets conspicuous. Nest oval, with large side entrance, supported by vertical grass stems, male weaves framework of dry and partly green grass, lined with thick, woven layer of finer dry grass (e.g. *Sporobolus*), which may project as porch; generally less than 1·5 m above ground; old nests utilized by Zebra Waxbills (*Amandava subflava*). Clutch 2–4 eggs (mean 2·6 in Zimbabwe), pale greenish-blue, densely speckled with olive-green, average size of 49 eggs 18·5 × 13·6 mm (South Africa); incubation by female only, 12–15 days; chicks fed by female, primarily by regurgitation, nestling period 11–14 days; young independent at 36 days. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) occasionally, e.g. 2% of 167 nests in one study. Of 21 nests in Zimbabwe study, 14 destroyed by predators, including humans; eggs and newly hatched chicks eaten by multimammate mouse (*Mastomys natalensis*). Ringed individual recaptured in Zimbabwe after 7 years.
Movements. Predominantly resident. Local movements evident; seasonal visitor to Darfur region of Sudan, where absent in dry season; in Kenya, breeding visitor to Tsavo and Ruaraka regions.
Status and Conservation. Not globally threatened. Locally common in most of range, including São Tomé; uncommon in NW of range. Widespread in agricultural landscapes, as well as in protected areas. Estimated population in Kruger National Park, in NE South Africa, 16,000 individuals, more than 30,000 in C & S Mozambique. Introduced (nominate race) unsuccessfully on St Helena, in SC Atlantic Ocean; introduced also in E Australia (New South Wales) in 1931, but extinct by 1968.
Bibliography. Aspinwall & Beel (1998), Benson & Benson (1977), Benson *et al.* (1971), Borrow & Demey (2001), Braun (1930), Britton (1980), Brooke (1970), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Christy & Clarke (1998), Craig & Manson (1981), Dean (2000), Dowsett (1974), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Eccles (1988), Ewens (1938), Fry & Keith (2004), Günther & Feiler (1985), Haydock (1954), Hockey *et al.* (2005), Hopkinson (1938), Hornby (1967, 1970, 1977), Jones & Tye (2006), Kemp *et al.* (2001), Lane (1975), Lewis & Pomeroy (1989), Lippens & Wille (1976), Long (1981), Lönnberg (1911), Loveridge (1923), Lynes (1924), Manson (1982), Mitchell, I.G. (1966), Moreau & Moreau (1937), de Naurois (1983), Oschadleus & Underhill (2006c), Parker (1999, 2005), Payne & Payne (1967), Ruwet (1964a, 1964b, 1965b), Skinner (1995), van Someren (1918b), Stevenson & Fanshawe (2002), Succow (1990), Tarboton (2001), Urban & Brown (1971), Vande weghe (1973), Vincent (1936), Zimmerman *et al.* (1996).

31. Hartlaub's Marsh Widowbird

Euplectes hartlaubi

French: Euplecte des marais **German**: Hartlaubweber **Spanish**: Obispo Marismeño
Other common names: Marsh Widowbird/Whydah

Taxonomy. *Penthetria hartlaubi* Bocage, 1878, Caconda, Angola.
Previously thought to form a superspecies, and even to be conspecific, with *E. psammocromius*, but recent molecular studies suggest that the two species are not even sister-taxa. Two subspecies recognized.
Subspecies and Distribution.
E. h. humeralis (Sharpe, 1901) – E Nigeria, C Cameroon, E Gabon, S PRCongo, SW DRCongo (around R Congo), W & S Uganda and W Kenya.
E. h. hartlaubi (Bocage, 1878) – C & NE Angola, SE DRCongo, N Zambia and extreme W Tanzania (Ufipa region).



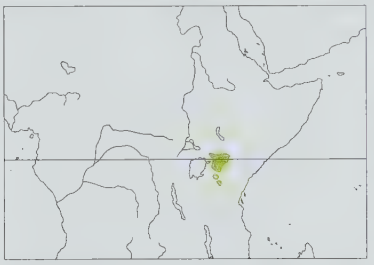
Descriptive notes. 18 cm, breeding male 36 cm. Large widowbird, breeding male with very long tail. Male nominate race breeding is almost wholly black, with long black tail (mean length 17·7 cm); greater wing-coverts with narrow buff margins, median and lesser wing-coverts bright orange, grading into buff on posterior border, forming large epaulet; iris dark brown; bill pale greyish-blue; legs blackish. Male non-breeding retains black remiges and coloured epaulets, but tail replaced by short brown rectrices (mean tail length 8·2 cm); crown and upperparts dark brown with buff feather margins, underparts tawny-white, some narrow streaking on breast feathers; short dark moustachial streaks; iris dark brown, bill dark brown, legs brown. Female and subadult male are like non-breeding male, except that wings have brown remiges and coverts, lack coloured epaulet, having only narrow orange-yellow margins on anterior wing-coverts; upperparts less heavily streaked, underparts more sandy-buff; bill pale brown. Juvenile resembles female, but wing-coverts edged tawny, underparts browner. Race *humeralis* differs from nominate in size, breeding male having much shorter tail (mean 11·2 cm). VOICE. Song opens with short, rising notes such as "grrreeng", followed by high-pitched buzz or trill, "chrrrrrritterweeeeeeee". Contact call a short "drrt".
Habitat. Swampy grasslands and nearby cultivated areas; may venture out over deeper water in reeds, perching on floating lily leaves or other masses of floating vegetation (sudd). Generally at 1100–1800 m in E Africa.
Food and Feeding. Diet grass seeds, insects and small fruit; grasshoppers (Orthoptera) and berries found in stomach contents. Forages usually in small groups, often with other widowbirds.
Breeding. Breeds in May in Uganda, Dec–Feb in Angola, Jan–Mar in S DRCongo and Dec–Feb in Zambia. Polygynous. Male defended territory against *E. axillaris*, as well as conspecifics, and seen to court female *E. albonotatus* from adjacent territory. Nest spherical, with side entrance, woven from fine grass stems and incorporating living grass, which forms bower over nest; frame constructed by male, female adds lining of dry grass, continues lining after first eggs laid; sited low down (usually within 20 cm of ground) in wet areas with dense grass c. 0·5 m tall. Clutch 1–3 eggs (mean 2 in DRCongo), those of nominate race pale greenish-blue with olive-grey spots and blotches, and some chocolate-brown spots at thicker end, average size of 16 eggs 22 × 15·4 mm (S DRCongo), eggs of race *humeralis* described as pale olive-green with irregular brown blotches and darker squiggles. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Poorly known; local and uncommon to scarce. Habitat and populations fragmented.
Bibliography. Aspinwall & Beel (1998), Bannerman (1949), Benson *et al.* (1971), Borrow & Demey (2001), Brosset & Érard (1986), Brown & Britton (1980), Carswell *et al.* (2005), Dean (2000), Dean & Milton (2007), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Lees (1932), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1938), Neave (1910), Newton (1937), da Rosa Pinto (1965), Stevenson & Fanshawe (2002), Vincent (1949a), White (1946), Zimmerman *et al.* (1996).

32. Jackson's Widowbird

Euplectes jacksoni

French: Euplecte de Jackson **German**: Leierschwanzweber **Spanish**: Obispo de Jackson
Other common names: Jackson's Whydah, Jackson's Dancing Widowbird

Taxonomy. *Drepanoplectes jacksoni* Sharpe, 1891, Kikuyu, Kenya.
Monotypic.
Distribution. Highlands of W & C Kenya S to N Tanzania.



Descriptive notes. 14 cm, breeding male (including tail) 30 cm; male 40–49 g, female 29–42 g. Male breeding is almost entirely black, feathers of crown and nape with squared ends (forming distinctive cape); flight-feathers dark brown edged with buff, tertials black with pale fringes, lesser and median wing-coverts orange-buff, latter with black central spots; tail feathers long and curved (mean tail length 21·2 cm); iris dark brown; upper mandible pale steel-blue, darker at base, lower mandible dark with pale bluish tip; legs black. Male non-breeding has forehead, crown, nape and upperparts dark brown with buffy margins, broad buff supercilium; tail dark brown, with pale edges of pointed rectrices (mean tail length 6·1 cm); upperwing brown with indistinct orange-buff epaulet; lores and cheek buff-brown, chin and throat whitish, breast buff with narrow dark central streaks on feathers, belly whitish, flanks with dark streaks, thighs and undertail-coverts buff; iris brown; bill bluish, darker than in breeding plumage; legs brown. Female and subadult male resemble non-breeding male, but bill brown to pinksih-brown above, fleshy pink below; very faint epaulet. Juvenile resembles female and subadult male. VOICE. Song from perch a series of sibilant notes; during jumping display, a wheezing, sizzling song. Contact and flight call a repeated "tu"; alarm call of male a rapid "cik-cik-cik".
Habitat. Open highland grassland at 1500–3000 m.
Food and Feeding. Diet mainly grass seeds, particularly those of *Themeda triandra*, also *Panicum*; also insects, including alate termites (Isoptera), which are hawked in flight. Nestling diet apparently almost entirely regurgitated grass seeds. Forages in mixed flocks, even during breeding season; often with *E. progne*.
Breeding. Breeds Dec–Jan and Apr–Jun, and recorded also in Aug–Sept and Nov in Kenya; timing in any year dependent on rains. Solitary nester, but nests may be clustered, with more than 20 in a small area. Males display at exploded lek, where they dance on separate circles of flattened grass (sometimes worn bare) surrounding a central tuft of grass, which male trims and shapes, each male owning up to three dancing rings; when dancing, male jumps up to 1 m above ground, with head thrown back and neck feathers ruffled, tail arched forwards to touch back of head, except for downward-hanging outer rectrices; females visit lek and, if one lands on ring, a ground-based display with focus on central tuft follows; male erects crown and nape feathers as aggressive signal to other males. Mating success of males varies markedly, e.g. 22 unsuccessful, six mated once only and one mated with five females during observations in Kenya. After mating, females nest elsewhere, usually within 300 m of male territory; breeding areas traditional, and used in successive years. Nest built entirely by female, a domed ball of woven grass with side entrance, living grass bent over it to form a bower, lined with grass seedheads, placed within 10 cm of ground in tuft of grass c. 50 cm tall. Clutch 2–4 eggs, pale blue, greyish or greenish, densely marked with fine grey and brown flecks, average size of eight eggs 22·5 × 15·4 mm; incubation by female only, period 12–13 days; chicks fed by female only, nestling period 17 days; on leaving nest, young hop through vegetation, roost with female. Male does not visit nest, but alarm calls cause female to leave nest quietly. No data on breeding success, but female deserts readily in early stages of incubation; nests in pastures easily trampled by cattle.
Movements. Resident. One male recaptured 5 years after ringing, on new display ground 12 km from original site.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Kenyan Mountains EBA. Locally common within small range. This species' highland grassland habitat is under severe pressure from agriculture, and is largely unprotected. Population in Nairobi National Park, in Kenya, could disappear as grass height is modified by grazing pressure from the large numbers of game animals. Occurs also in Mount Kenya National Park and Masai Mara Game Reserve, in Kenya, and in Ngorongoro Conservation Area, in Tanzania.
Bibliography. Andersson, S. (1989, 1991, 1992, 1993, 1994), Anon. (2009e), Baily (1916a), Fishpool & Evans (2001), Jackson (1899), Jackson & Sclater (1938), Kunkel (1962b), Lewis & Pomeroy (1989), Lönnberg (1911), Loveridge (1923), Moreau & Sclater (1938), Poulsen (1956), Serle (1943a), Sjöstedt (1910), van Someren, V.D. (1945, 1958), van Someren, V.G.L. (1956), Stattersfield & Capper (2000), Zimmerman *et al.* (1996).

33. Montane Marsh Widowbird

Euplectes psammocromius

French: Euplecte montagnard **German**: Reichenowweber **Spanish**: Obispo Montano
Other common names: Montane Marsh Widow/Whydah, Mountain Marsh Widowbird/Whydah, Highland Marsh Widowbird, Buff-shouldered Widowbird

Taxonomy. *Penthetria psammocromia* Reichenow, 1900, Ukinga, Tanzania.

Previously thought to form a superspecies, or even to be conspecific, with *E. hartlaubi*, but recent molecular studies suggest that the two species are not even sister-taxa; may be closest to *E. progne*. Monotypic.

Distribution. Highlands of SW Tanzania, and extreme NE Zambia and N Malawi (Nyika Plateau).



Descriptive notes. 15 cm, breeding male (including tail) 35 cm; one male 35·5 g. Male breeding is almost wholly black, with very long tail (mean length 24·7 cm); lesser wing-coverts bright yellow, median and greater coverts and bases of primary coverts pale cinnamon-buff, innermost greater coverts partially black, tertials and secondaries with narrower buffy fringes; iris dark brown; bill pale greyish-blue; legs blackish. Male non-breeding retains black remiges and coloured epaulet patch; has forehead to uppertail-coverts dark brown, feathers with buffy margins and heavy central streaks, rectrices short and dark brown (tail of two individuals 7·7 cm and 7·9 cm, respectively); throat and underparts tawny with faint streaking; iris brown, bill and legs dark brown. Female is like non-breeding male, but differs in having dark streaking on upperparts less pronounced, underparts dull white, wings brown with buff feather margins, and only faint yellow margins on coverts (no epaulet visible), bill flesh-coloured. Juvenile undescribed. Voice. Song described as a complex series of notes, very high-pitched. Whistling notes and a rattle call also reported.

Habitat. Short, dense grassland in montane areas, often near streams; at 1800–3000 m in Tanzania, generally above 2100 m in Zambia and Malawi.

Food and Feeding. Diet grass seeds and insects, but no details published. Large flocks reported in non-breeding season.

Breeding. Breeds May in Tanzania, Jan in Zambia and Oct–Nov in Malawi. Presumed polygynous; male territorial, with aerial flight display. Nest domed, with side entrance, loosely woven from fine grass, incorporating living grass, often within 20 cm of ground. Clutch 2 eggs, pale olive-green, densely marked with very fine brown spots and streaks. No other information.

Movements. Presumed resident within breeding range.

Status and Conservation. Not globally threatened. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Locally common within its very limited distributional range. Occurs in Nyika National Park, in Malawi–Zambia, and in Tanzanian reserves in Udzungwa Mts and on Mt Rungwe.

Bibliography. Aspinwall & Beel (1998), Benson & Benson (1977), Benson *et al.* (1971), Dowsett & Dowsett-Lemaire (1980), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Fishpool & Evans (2001), Fry & Keith (2004), Newman *et al.* (1992), Stevenson & Fanshawe (2002).

34. Long-tailed Widowbird

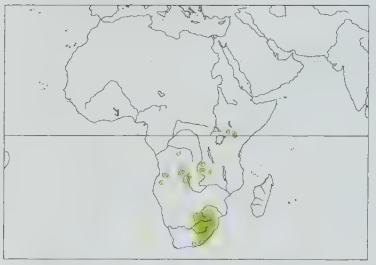
Euplectes progne

French: Euplecte à longue queue **German**: Hahnschweifweber **Spanish**: Obispo Colilargo
Other common names: Long-tailed Whydah

Taxonomy. *Emberiza progne* Boddaert, 1783, "Cape of Good Hope", South Africa.
Three subspecies recognized.

Subspecies and Distribution.
E. p. delamerei (Shelley, 1903) – highlands of C Kenya.
E. p. delacouri Wolters, 1953 – S DRCongo, S Angola and W & NE Zambia.
E. p. progne (Boddaert, 1783) – SE Botswana, E South Africa, W Swaziland and Lesotho.

Descriptive notes. Male breeding (including tail) 50–71 cm, male non-breeding 19–21 cm, female c. 15 cm; male 33–46 g, female 25–39 g. Male nominate race breeding is almost wholly black, with very long tail (mean length 41·1 cm); greater coverts, tertials, secondaries and tips of primaries have narrow buff margins, lesser wing-coverts bright orange-red, forming prominent epaulet, bordered below by pale buff median coverts; iris brown; bill pale blue-grey; legs dark brown. Male non-breeding retains black remiges and coloured epaulet on wing, but has broad buff margins on secondaries and greater wing-coverts; forehead to uppertail-coverts brown with dark central streaks on feathers, tail short (mean tail length 9·5 cm), rectrices pointed and brown with paler margins; whitish supercilium, brown lores, cheek and ear-coverts, whitish chin and throat; breast and belly buff to white, some central streaking on breast and flank feathers; thighs and undertail-coverts buff; bill brown on those which have just acquired adult remiges, older individuals retain some bluish in bill; legs brown. Female is like non-breeding male, but remiges brown, and wing-coverts plain, with coloured fringe very faint (epaulet visible only in the hand), bill dull horn-brown above, paler flesh-coloured below. Juvenile resembles female, with broad buffy edges on feathers of upperparts; subadult male resembles non-breeding male, but with brown remiges, and wing-coverts have narrow orange-brown margins only, lacking red, white and buff of adult epaulet, and all bare parts brown; neither age at which male first acquires black remiges nor age at which it first undergoes full prenuptial moult is known for certain in the wild, but captive took 3 years to attain breeding plumage (likely that both wing and tail lengths continue to increase after first breeding season). Race *delacouri* male has no white on epaulet, with broader buff area, and in breeding season upper mandible black, rather than bluish; *delamerei* is like nominate in plumage, but tail of breeding male longer on average (mean length 51·0 cm). Voice. Song in flight a high-pitched and repetitive "twi-twi-twi-twi-zizizizi"; also a sizzling "weezle weezle" song from perch. Bursts of chipping calls in response to activity; "zik" contact call; more intense "tseek tseek" in alarm.



Habitat. Grassland, often areas of short grass, not necessarily in damp or marshy habitats, at 1800–2800 m in Kenya and to 2800 m in S Africa; also locally on coastal grasslands in South Africa, and other lowland regions in C Africa.

Food and Feeding. Main food seeds of grasses such as *Setaria sphacelata*, *Paspalum dilatatum*, *Paspalum distichum*, *Pennisetum clandestinum*, *Themeda triandra*; also seeds of wheat (*Triticum*), achenes of *Senecio juniperinus*; in Free State (South Africa), greatest variety of seed types taken in spring and winter. Also arthropods, including spiders (Araneae), beetles (Coleoptera), aphids (Aphidoidea), cicadas (Cicadidae), alate termites (Isoptera), caterpillars and butterflies (Lepidoptera); in captivity readily takes mealworms, termites, grasshoppers (Orthoptera) and moths (Lepidoptera), as well as caterpillars and spiders. Nestlings fed primarily with grass seeds, with insects c. 25% by volume. Forages largely on ground, where it both walks and runs; hops on uneven surfaces. Also hawks insects in flight. Forms mixed flocks with *E. jacksoni* and *Quelea quelea* in Kenya, and in South Africa flocks with *E. orix*, *E. axillaris*, *E. ardens*, *Quelea quelea* and Pin-tailed Whydah (*Vidua macroura*); joins large communal roosts with other ploceids, even during breeding season, and females join roosts once young fledge.

Breeding. Breeds Feb in Angola, Dec–Apr in DRCongo, Apr–May in Zambia, Nov–Jan in Kenya, and Oct–Jun (primarily Nov–Feb) in South Africa. Polygynous with up to five females per male. Inter-nest distance mostly at least 25 m, but nests sometimes clumped within 5 m of each other, depending on suitability of habitat. Male advertises territory (0·5–3·0 ha) by calling from favoured perches, often less than 1 m above ground; pursues intruders in direct flight, with tail streaming straight out behind. When female enters territory, he gives highly characteristic flight display with "keeled" tail and laboured wingbeats, epaulets conspicuous; also has perched display, with bobbing movements accompanied by sizzling song. Experimental manipulation of male tail length suggests that females visit several territories in succession, and preferentially select longest-tailed males (likely to be oldest individuals). Nest built by female, usually unaided, domed and with side entrance, woven from fine grass and including living material, lined with flowering grass-heads, which may project as porch over entrance, lining continued during incubation; placed less than 50 cm above ground in tuft of short grass within male territory; male may produce simple nest rings, and captive male built a complete nest. Clutch 2–3 eggs, pale greenish or blue-green, heavily speckled with grey or olive-brown, average size of 110 eggs 21·6 × 15·7 mm (South Africa); incubation by female, period 12–14 days; chicks fed by female only, c. 1·6 feeds per hour per nestling in study in Kenya, nestling period c. 17 days; fledglings leave nest before fully able to fly, remain concealed in grass; captive female continued to feed young for 14 days after they left nest. Nests parasitized rarely by Diederik Cuckoo (*Chrysococcyx caprius*) in South Africa. Of 36 nests in Kenya, 22 were destroyed, with human predation, rodents and driver ants (*Dorylus*) responsible for some losses. Captive male survived for longer than 17 years, although flightless in last two years.

Movements. Resident, with local movements; birds not present at breeding sites throughout year.

Status and Conservation. Not globally threatened. Generally common. Abundant in S of range, although localized in Swaziland, where estimated population 1200 individuals. N populations, especially in Kenya, threatened by agricultural development of grassland areas within their limited range.

Bibliography. Andersson (1982a), Benson *et al.* (1971), Brown *et al.* (1979), Craig (1989), Davies (1910), Dean (2000), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Fry & Keith (2004), Haagner (1910), Hake & Andersson (1992), Heinrich (1958), Hockey *et al.* (2005), Kunkel (1962b), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lowe (1956), Norris (1968), Oakley (1879), Oschadleus & Underhill (2006c), Parker, V. (1994), Penry (1994), Poulsen (1956), Powell (1963), Roos & Kok (1978), Schifter (1970), Simmons (1961), Skead, C.J. (1995, 1997), Skead, D.M. (1975), Stevenson & Fanshawe (2002), Tarboton (2001), Teschemaker (1910), Verheyen (1953, 1956), Vincent (1949a), Zimmerman *et al.* (1996).

PLATE 5 ➤


inches
4
cm
10
ssp
eminentissima
ssp consobrina
36
37
35
38
ssp aldabrana
39
40
41
ssp
megarhynchus
42
43
44
45
ssp salimalii

Genus *FOUDIA* Reichenbach, 1850

35. Red-headed Fody

Foudia eminentissima

French: Foudi des Comores **German**: Komorenweber **Spanish**: Fodi de las Comoras
Other common names: Mascarene/Comoro Fody, Red(-headed) Forest Fody

Taxonomy. *Foudia eminentissimus* Bonaparte, 1850, Zanzibar; error = Mohéli (Mwali) Island, Comoro Islands.
Has been thought to form a superspecies with *F. omissa* and *F. rubra*. Races possibly represent more than one species; further research required. Five subspecies recognized.
Subspecies and Distribution.
F. e. consobrina A. Milne-Edwards & Oustalet, 1885 – Grand Comoro (Njazidja), in NW Comoro Is.
F. e. eminentissima Bonaparte, 1850 – Mohéli (Mwali), in WC Comoros.
F. e. anjuanensis (A. Milne-Edwards & Oustalet, 1888) – Anjouan (Ndzuani), in C Comoros.
F. e. algondae (Schlegel, 1867) – Mayotte (Maore), in SE Comoros.
F. e. aldabrana Ridgway, 1893 – Aldabra Atoll, in SW Seychelles.



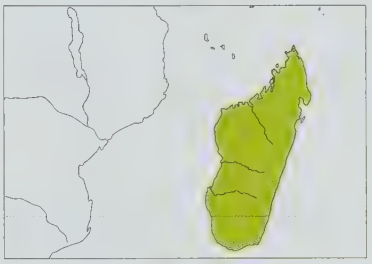
Descriptive notes. 13 cm; 22–27 g. Male nominate race breeding has forehead, crown, nape, chin, throat, chest, cheek and ear-coverts scarlet-red; lores black, eyestripe extending behind eye to variable degree; mantle and back blackish with olive-grey feather fringes, lower rump and uppertail-coverts scarlet; upperwing and tail dark olive-green, remiges and rectrices with yellowish margins; flanks and thighs grey, belly and undertail-coverts whitish with dull buffy tinge, some scarlet tips on central belly feathers; iris brown; bill black; legs dull brown to fleshy pink. Female and non-breeding male have forehead to back dull olive-green with darker central streaks on feathers (streaks tending to be more prominent on male), rump plain olive-green; wings and tail dark olive-green, remiges and rectrices with narrow yellowish margins; buffy supercilium extending behind eye; cheek and ear-coverts dull buff; chin and throat to undertail-coverts dull white, flanks and thighs greyish; iris brown; bill horn-coloured, lower mandible paler; legs dull brown to fleshy pink. Juvenile resembles female. Races differ mainly in size, and in details of male breeding plumage: *consobrina* is smaller and more slender-billed than nominate, greyer below and paler dorsally, lacking scarlet on rump, coloration more orange than red, forming bib on breast, and orange-red area not extending so far on neck and breast; *anjuanensis* is similar in size and bill shape to nominate, orange in colour on head and rump, coloration often extending to breast and belly, some orange wash on mantle, greater and especially median upperwing-coverts have pale fringing broader, forming wingbars; *algondae* is smaller than nominate, orange on head and rump, coloration not extending so far on nape, dorsally very plain-coloured, lacking contrast of dark central streaks on mantle feathers, wingbars as previous; *aldabrana* has scarlet head, nape, breast and rump, belly yellowish, wingbars as previous, female strongly tinged buffy yellow on face and underparts. Voice. Song a sequence of high-pitched yodels, then a short trill, followed by a rising series of notes; territorial advertisement a loud "tzeet tzeet two-eet". Single-note contact call in flocks.
Habitat. Forested areas, habitat choice varying somewhat among islands; on Mayotte not found in intact stands of evergreen forest. On Aldabra, which lacks forest, this species occupies scrub, coconut (*Cocos nucifera*) groves and *Casuarina* woodland. On Anjouan not below 300 m; on Grand Comoro, Mohéli and Mayotte found close to sea-level.
Food and Feeding. Mainly insectivorous; also consumes seeds, fruits and nectar. Insects include damselflies (Odonata), adult beetles (Coleoptera), caterpillars (Lepidoptera), cicadas (Cicadidae), alate termites (Isoptera), earwigs (Dermaptera), grasshoppers (Orthoptera), flies (Diptera), lacewings (Neuroptera), and ants (both adults and pupae) and bees (Hymenoptera); egg cases of cockroaches (Blattodea) found in stomachs of most individuals sampled on Aldabra. Occasionally takes spiders (Araneae). Seeds taken include those of *Casuarina equisetifolia*, *Cyperus niveus*, *Lepturus repens*, *Digitaria horizontalis*, *Digitaria setigera*, maize (*Zea mays*), *Acalypha claoxyoides*; fruit of *Passiflora suberosa*, *Polysphaeria multiflora*; nectar from coconut, *Pemphis acidula*, *Veronia grandis*, *Polysphaeria multiflora*. Rice and kitchen scraps taken in settlements, and palm toddy (liquid from coconut trees, to be fermented as alcoholic drink) sipped at trees where it was being collected. Reported that unripe maize seeds taken only if previously opened by rats (*Rattus*). On Aldabra, forages chiefly in *Casuarina* woodland, by gleaning leaves and tree trunks, probing and lifting pieces of bark. On Aldabra, foraging flocks of up to 30 individuals after breeding; will join mixed-species flocks of insectivores, but no more than four fodies seen together in such associations. Communal roosts may include *F. madagascariensis*.
Breeding. Breeds Nov–Apr on Aldabra and Oct–Mar on Mayotte. Monogamous. Male defends territory of c. 650 m² (average on Aldabra). Male starts nest and, once female has accepted it, both sexes build, and female may complete the structure with little male participation; a globular structure with side entrance, typically no porch, on Aldabra usually woven from dry creeper tendrils, grass, palm fronds, casuarina needles, lined with *Eragrostris* grass stems, suspended rarely 1 m above ground, most often higher than 10 m; often uses casuarina needles almost exclusively for nest construction. Clutch 2–3 eggs, pale blue-green, occasionally few black specks, average size of 45 eggs 20·1 × 14·3 mm (Aldabra); incubation by female only, period 13–16 days; chicks fed by both parents, male usually began feeding only after 3 days, nestling period 15–18 days. Of 134 eggs on Aldabra, 108 (81%) taken by predators, and only 11 chicks fledged; predation primarily by black rats (*Rattus rattus*) and Pied Crows (*Corvus albus*).
Movements. Resident. Patchy distribution on Mayotte and apparent genetic differentiation of subgroups no more than 30 km apart suggest very limited dispersal.
Status and Conservation. Not globally threatened. Restricted-range species: present in Aldraba EBA and Comoro Islands EBA. Reasonably common. Population on Aldabra 1000–3000 pairs; population on Mayotte estimated at several thousand birds. On individual islands, vulnerable to drastic habitat changes.
Bibliography. Adriaensen *et al.* (2000, 2001), Benson (1960, 1967), Benson & Penny (1971), Cheke & Diamond (1986), Frith, C.B. (1976, 1979), Gaymer (1967), Louette (1987c, 2001), Louette *et al.* (2008), Moreau (1960b), Skerrett *et al.* (2001).

36. Red Fody

Foudia madagascariensis

French: Foudi rouge **German**: Madagaskarweber **Spanish**: Fodi Rojo
Other common names: Madagascan/Madagascar Red Fody, Cardinal (Fody)

Taxonomy. *Loxia madagascariensis* Linnaeus, 1766, Madagascar.
Sometimes considered conspecific with *F. omissa*. Has hybridized with *F. sechellarum* in Seychelles (Aride I); an old report of hybridization in captivity with *Ploceus vitellinus* and with domestic canary (*Serinus*). Monotypic.
Distribution. Madagascar. Introduced on Reunion, Mauritius, Seychelles, Rodrigues, Amirantes and Chagos Is, in Indian Ocean, also on St Helena, in Atlantic Ocean; recently found breeding in Arabian Peninsula (Oman and Bahrain). Present also on Is Glorieuses and Comoro Is, which it may have colonized without human assistance.



Descriptive notes. 13 cm; 13–20 g. Male breeding is crimson-red, with short black line through eye, black central streaks on mantle, blackish upperwing and tail; pale fringes on upperwing, mantle and scapulars decrease with wear, giving blacker overall impression; notable variation in red plumage coloration (of both native and introduced populations), some individuals more orange-coloured, even yellowish, brightness of breast plumage positively correlated with male body condition (and with clutch size of breeding pair); iris dark brown; bill black; legs pale brown. Female and non-breeding male are olive-brown above, with faint central streaks on head and nape, dark streaking on mantle and back, rump unstreaked and paler; buffy stripe above, often also below, eye; buffy olive-grey below, browner or more olive-buff on breast, paler on belly, dull white on undertail-coverts; bill horn-coloured, often darker and greyer on culmen, paler on lower mandible; legs flesh-brown. Juvenile resembles female, but before post-juvenile moult quite buffy-looking, with broad buffy feather margins. Voice. High-pitched trilling song, "trrr tree tree", may include short, wheezy phrases. Male gives loud "seer" calls during courtship; female solicits copulation with "tsip" calls.
Habitat. Open country, including natural savanna, cultivated areas and towns, and clearings in forest; not found in intact forest in Madagascar (except in transit), but noted as foraging in forest on Rodrigues I. Recorded at up to 2400 m; on Comoros, most common below 1000 m, and occasional up to 2000 m on Grand Comoro. Roost-sites include sugar cane, bamboos, tall grasses, reedbeds, and mangroves and other trees.
Food and Feeding. Primarily seeds; also nectar, arthropods. Seeds including those of such grasses as *Eragrostis maxima*, *Panicum maximum*, *Pennisetum setosum*; rice (*Oryza*), both when ripe and when in milky stage, the main food source in many parts of Madagascar; on Mauritius, 63% of observations were of birds feeding on seeds of the grass *Stenotaphrum micranthum*; seeds of *Paspalum* grass, also of *Pathenium hysterophorus*, *Casuarina equisetifolia* and *Crotolaria anagroides* on Seychelles. Takes arthropods such as beetles (Coleoptera), caterpillars and moths (Lepidoptera), and spiders (Araneae); of 42 specimens collected on Comoros, stomachs of 40 contained seeds, nine held insects. Nectar taken from both native and exotic plants, including *Grevillea*, *Phytolacca*, *Lantana camara*, *Hibiscus*, *Montbrettia* and *Nephilium litchi*; often pulls out parts of flower to remove nectar from base. Nestling diet both seeds and insects. Often in flocks, sometimes of hundreds of individuals, when feeding on seeds. Introduced populations on other islands may join mixed-species flocks of foraging insectivores, which include sunbirds (Nectariniidae) and white-eyes (*Zosterops*); on St Helena, sometimes flocks with Java Sparrow (*Lonchura oryzivora*) and Yellow Canary (*Serinus flaviventris*). Well-synchronized entry into and departure from large roosts.
Breeding. Breeds Sept–May in Madagascar; introduced populations Nov–Apr on Mauritius, Oct–May (peak activity Feb–Apr) on Reunion, Oct–May in Comoros, Sept–Apr (peak in Dec) in Seychelles, Nov–Dec in Chagos Is and Oct–Feb on St Helena; probably double-brooded. Monogamous. Male defends territory of c. 1200 m² by singing from prominent perches; mean territory size on Mauritius 700 m², smaller than territories of *F. rubra*. Nest oval, with side entrance near top under projecting porch, sometimes extended to short tunnel, woven from grass strips, field observations suggest female participation in nest construction, in captivity males built nests and female lined them; on Mauritius moss used in roof, and grasses and sedges in construction, while female did not line nest during incubation (in contrast to *F. rubra*); attached to reeds, tall grass, near tips of branches of shrub or tree, or on mid-ribs of palm fronds, on St Helena usually in conifer, and within 1 m of ground or as high as 9 m (typically above 6 m in Seychelles, whereas often low down in Madagascar); one record of nest with chicks close to occupied wasp (Hymenoptera) nest; unused nests may be occupied by Madagascar Bibfinch (*Lepidopygia nana*). Clutch 2–4 eggs (mean 2 in Chagos Archipelago), pale blue-green, slightly glossy, average size 18 × 12·8 mm (Madagascar); female alone incubates, period 11–14 days; chicks fed by both sexes, primarily by regurgitation, nestling period 15–16 days; brood division may occur after young leave nest, each parent feeding some fledglings; later, immatures form discrete flocks. In one study, 57% of nests lost to flooding and predation; Madagascar Harrier-hawk (*Polyboroides radiatus*) destroys some nests.
Movements. Resident. Immature birds form discrete flocks, and dispersal across forested regions has been noted.
Status and Conservation. Not globally threatened. Abundant in Madagascar. Often common where introduced (population on Reunion estimated at 144,000 in 1983), except on Comoros, where not widespread; on Silhouette I, in Seychelles, during 1978/79–1996, population of this species apparently declined concurrently with a decrease in human activity on the island. May have colonized Is

On following pages: 37. Forest Fody (*Foudia omissa*); 38. Mauritius Fody (*Foudia rubra*); 39. Rodrigues Fody (*Foudia flavicans*); 40. Seychelles Fody (*Foudia sechellarum*); 41. Bob-tailed Weaver (*Brachycope anomala*); 42. Compact Weaver (*Pachyphantes superciliosus*); 43. Finn's Weaver (*Ploceus megarhynchus*); 44. Asian Golden Weaver (*Ploceus hypoxanthus*); 45. Chestnut Weaver (*Ploceus rubiginosus*).

Glorieuses and Comoro Is without human assistance. Co-exists with *F. rubra* and *F. sechellarum*, but observation of successful hybridization between a female of latter and a male of present species suggests further conservation problem in places where introduced. Possibility of hybridization with *F. eminentissima* unconfirmed; thought possibly to hybridize with *F. omissa* in Madagascar, on basis of individuals with intermediate plumage characters. Successful colonization of islands on which this species has been introduced may be a consequence primarily of its capacity to breed successfully in presence of black rats (*Rattus rattus*), although adults recorded as prey of very large Malagasy chameleon (*Furcifer oustaleti*), and regular prey of Common Barn-owl (*Tyto alba*) at one site in SW Madagascar. A serious pest in rice-growing areas, where traditional cage traps are used, and villagers attempt to scare birds from fields and destroy nests; mist-netting at roosts suggested as a control measure.

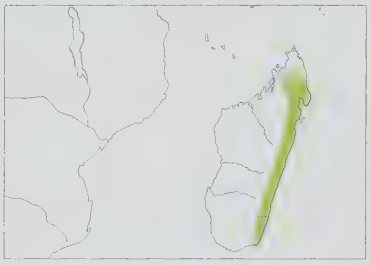
Bibliography. Andrianarimisa *et al.* (2000), Barré (1983), Barré & Barau (1996), Benson (1960), Benson *et al.* (1977), Brickell (2006), Cheke (1987a), Collias, N.E. & Collias (1964), Craig (1999b), Cresswell *et al.* (1997), Crook (1961), Delacour (1933), Estep *et al.* (2006), García & Vences (2002), Garrett *et al.* (2007), Gill (1967), Goodman & Benstead (2003), Goodman & Griffiths (2009), Goodman *et al.* (1997), Greig-Smith (1978b, 1982), Haydock (1954), Hirschfeld (2007, 2008), Kleefisch (1981), Koenig (2005), Langrand (1990), Long (1981), Lever (1987, 2005), Louette (2001), Louette *et al.* (2008), Loustau-Lalanne (1962), Lucking (1997), McCarthy (2006), Melville (1979), Moreau (1960b), Rand (1936), Rowlands *et al.* (1998), Ruempler & Ruempler (1996), Safford (1997a), Sama (1999), Short & Horne (1978), Simmons (1963), Skerrett *et al.* (2001), van Someren (1947b).

37. Forest Fody

Foudia omissa

French: Foudi de forêt **German**: Rothschildweber **Spanish**: Fodi Forestal
Other common names: Red Forest Fody, Rothschild's Fody

Taxonomy. *Foudia omissa* Rothschild, 1912, Tamatave, Madagascar.
Has been thought to form a superspecies with *F. eminentissima* and *F. rubra*; sometimes regarded as conspecific with former or with *F. madagascariensis*. Monotypic.
Distribution. E Madagascar from Montagne d'Ambre and Tsaratanana S to Tolagnaro.



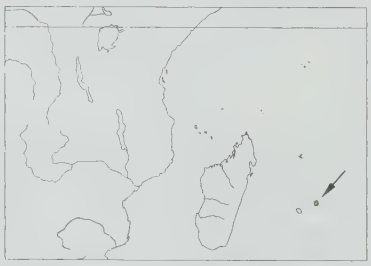
Descriptive notes. 14 cm; 15–24 g. Male breeding has forehead, crown and nape red, mantle and back olive-brown with dark central streaks (some feathers red-tipped), rump and uppertail-coverts red, upperwing and tail dark olive-green, narrow yellow edges on remiges, broad pale edges on wing-coverts; chin, throat, cheek and ear-coverts red, with black ring around eye and dark patch behind eye; upper breast red, lower breast, belly, flanks, thighs and undertail-coverts olive-grey (often yellowish wash on thighs and undertail-coverts); intensity of red variable; iris dark brown; bill black; legs brown. Male non-breeding and female not distinguishable in appearance: forehead, crown and nape olive-green with narrow central streaks, mantle and back olive-green with much broader streaks, rump unstreaked; wing and tail dark olive-green, as on breeding male; cheek and ear-coverts olive-green, throat and underparts olive-grey with some yellow streaking, palest on chin and in centre of belly; iris dark brown, bill and legs light brown. Juvenile resembles female, but upperparts tinged brown, rather than greenish, and edges of wing-coverts buffy. Voice. Song described as similar to that of *F. madagascariensis*.
Habitat. Intact evergreen forest, from sea-level to 2000 m.
Food and Feeding. Feeds on seeds, insects and nectar; recorded items include seeds of *Sloanea* and nectar from flowers of *Strongylodon*, *Bakerella* and *Symphonia*. Forages in small flocks of up to 15 individuals; may join mixed-species flocks.
Breeding. Birds in breeding condition in Jan. Apparently monogamous. Nesting not recorded as being distinct from that of *F. madagascariensis*. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Fairly common. Evidence of hybridization with *F. madagascariensis* suggests that fragmentation of forest could possibly lead to disappearance of this taxon by introgression, although little evidence of reduced genetic diversity in initial samples from forest fragments of different sizes.
Bibliography. Andrianarimisa *et al.* (2000), Benson *et al.* (1977), Goodman & Benstead (2003), Goodman *et al.* (1997), Langrand (1990), McCarthy (2006), Moreau (1960b), Rand (1936), van Someren (1947b).

38. Mauritius Fody

Foudia rubra

French: Foudi de Maurice **German**: Mauritiusweber **Spanish**: Fodi de Mauricio
Other common names: Mascarene Fody, Red-headed Fody(!)

Taxonomy. *Emberiza rubra* J. F. Gmelin, 1789, Mauritius.
Has been thought to form a superspecies with *F. eminentissima* and *F. omissa*. Monotypic.
Distribution. Mauritius.



Descriptive notes. 14 cm; 16–20 g. Male breeding has forehead, crown, nape, chin, throat, cheek, ear-coverts and breast red or orange-red, black mask through eye; mantle and back greyish-olive with diffuse dark streaks, lower rump and uppertail-coverts orange-red, upperwing and tail dark olive-grey, the feathers fringed greyish, broader and forming wingbars on greater and median coverts; belly, flanks, thighs and undertail-coverts dull olive-green; iris dark brown; bill black; legs brown. Male non-breeding and female have forehead, crown, nape and upperparts dull olive-green, dark streaking on mantle; upperwing and tail dark olive-grey, the feathers fringed greyish, broader and forming wingbars on greater and median coverts; lores and cheek lighter olive-green, pale supercilium; throat and underparts lighter olive-green, yellowish wash on chin, throat and breast; thighs light grey; iris dark brown; bill mostly dull dark brown above, paler horn-colour below; legs brown. Juvenile resembles female, except for pale brown bill, which may be retained for first year. Voice. Song of male an extended series of disyllabic notes, generally terminating in buzzy sound; female song very similar in structure, but quieter and shorter. High-pitched flight call.
Habitat. Remaining native forest; also degraded forest invaded by exotics, as well as forests of exotic vegetation such as pines (*Pinus*) and *Cryptomeria*.
Food and Feeding. Primarily insectivorous; seen to take grasshoppers (Orthoptera), beetle larvae (Coleoptera), caterpillars (Lepidoptera), also spiders (Araneae). Berries of introduced shrubs *Ardisia crenata* and *Ossea marginata* and of endemic *Eugenia* eaten regularly by some individuals. Takes nectar regularly from *Eugenia*, *Aphloia theaeformis* and introduced *Eucalyptus robusta*, *Syzygium*, *Rubus* and *Callistemon citrinus*; has brush-tipped tongue apparently adapted to such feeding. Forages in dead leaves; probes bark and epiphytes.
Breeding. Season Oct–Feb. Monogamous. Occupies permanent territory 4–5 ha in size in sparsely populated areas, or down to as small as 0·9 ha where more common. Nest domed, with side entrance and often porch, built primarily from grass with moss, lichens or small twigs, lined with down feathers, placed 2–9 m above ground in tree; division of work unclear, as both sexes seen to carry material, but in some cases female did most building. Clutch 2–3 eggs, pale blue, average size of ten eggs 19·2 × 13·9 mm; incubation apparently by female only, period reported as 14 days; chicks fed by both sexes, nestling period recorded as 18 days. Success rate evidently very low, with predation major cause of nest loss; of 41 failures, 34 the result of predation, and nests in exotic *Cryptomeria* trees had much higher success rate (46%) than did those in native forest (6%).
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Mauritius EBA. Formerly listed as Critically Endangered, but downgraded to Endangered because population, albeit extremely small, has been stable since early 1990s. Has suffered from habitat destruction and from introduction of predators, such as black rat (*Rattus rattus*) and crab-eating macaque (*Macaca fascicularis*). Estimated global population in 1975 was 247–260 pairs, but had declined by more than 50% by 1993, when species confined to three localities. Since then, following control of predators, numbers have remained stable, and species has even extended its range at main site; the two other subpopulations total fewer than ten pairs, and long-term viability of both considered doubtful. At start of 21st century, a captive-breeding programme was begun, and in 2005 a total of 45 hand-reared chicks was released on offshore islet of Île aux Aigrettes (where two previously released pairs had raised chicks). In 2006, c. 40 young fledged on this islet, and at end of 2008 total population there was 140 individuals (including 47 pairs). Studies suggest that this species can co-exist with introduced *F. madagascariensis*, and that competition between them should not be a serious threat so long as suitable habitat available in predator-free areas.
Bibliography. Anon. (2009e), Cheke (1987a), Cheke & Jones (1987), Cristinacce, Garrett *et al.* (2009), Cristinacce, Handschuh *et al.* (2009), Cristinacce, Switzer *et al.* (2009), Garrett *et al.* (2007), Horne (1987), Moreau (1960b), Newton (1959), Nichols *et al.* (2002), Owen (2004), Safford (1991, 1997a, 1997b, 1997c, 1997d), Short & Horne (1978), Stattersfield & Capper (2000).

39. Rodrigues Fody

Foudia flavicans

French: Foudi de Rodriguez **German**: Rodriguezweber **Spanish**: Fodi de Rodríguez
Other common names: Yellow Fody

Taxonomy. *Foudia flavicans* A. Newton, 1865, Rodrigues Island.
Monotypic.
Distribution. Rodrigues, in E Mascarene Is.



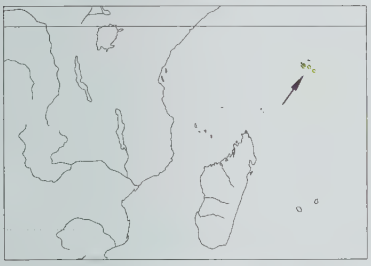
Descriptive notes. 12 cm; 13–17 g. Male breeding has golden-yellow head and nape, mantle and back more brownish-olive with broad dark central streaks, rump brown or pale yellow (variable); upperwing and tail brown, wing-coverts with buff to yellowish margins; forehead to upper throat orange, crossed by small black mask; lower throat and breast golden-yellow; flanks, belly, thighs and undertail-coverts buffy white; iris brown; bill black; legs brown. Male non-breeding retains yellow wash on face, black bill (usually only a short period in this eclipse plumage). Female has forehead, crown and nape to back dull olive-brown with narrow dark central streaks, streaking broadest on back, rump plain olive-brown; wing and tail dark olive-brown, broad pale edges on wing-coverts; indistinct grey-buff supercilium; cheek and ear-coverts pale olive-brown, chin, throat, breast, belly and undertail-coverts dull white with yellowish tinge, flanks and thighs dull white with buffy wash; bare parts as for male. Juvenile resembles female, but with some yellow on throat, and bill pale horn-coloured. Voice. Song includes melodious notes, terminating in a rattle or buzz; both male and female sing, although female song phrase significantly shorter. Contact call between individuals "plick", which used also in interactions between males; "chew" note in flight, also incorporated into song.
Habitat. Remnant natural forest; also exotic trees and shrubs where sufficiently dense.
Food and Feeding. Diet mainly insects, including caterpillars (Lepidoptera) and homopteran bugs; also spiders (Araneae); also takes some fruit, and seeds of *Casuarina*. Nectar-feeding frequent, with brush-tipped tongue apparently adapted for this; will pierce calyx or pluck out corolla of *Tabebuia* flowers, also feed from rose-apple (*Syzygium*), *Erythrina* and *Hibiscus*. Often forages by gleaning along branches and in canopy. Encountered in pairs or family parties; flocks reported in 1865, and three flocks (of 14–25 individuals) recorded in 1999. Occasionally in mixed-species flocks with *F. madagascariensis*, Rodrigues Brush-warbler (*Acrocephalus rodericanus*), House Sparrow (*Passer domesticus*) and Common Waxbill (*Estrilda astrild*).
Breeding. Perhaps not seasonal, but opportunistic; records for Jul–Sept, Nov and Feb–Mar. Monogamous. Pair defends territory of 1000–4000 m² throughout year. Nest oval, with side entrance and short porch, rather roughly woven from grass, a few feathers reported as lining, placed 1·5–4·5 m above ground at end of branch, most often of *Araucaria* tree; in captivity male built basic nest frame, whereas field observations suggest that female builds nest; may use same tree for successive nests. Clutch generally 3 eggs, pale blue, average size of seven eggs 18·3 × 13·6 mm; incubation by female only, period 13–16 days in captivity; of two captive pairs, only female fed chicks at one nest, whereas at other both parents fed chicks and removed faecal sacs, live food carried in bill, chicks fed also by regurgitation, nestling period c. 14 days (both in field and in aviary); fledglings fed by both male and female. Of 14 nests, six produced fledged young; nests destroyed by children apparently the only evidence of impact by predators, although rats (*Rattus*) present on the island.

Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Rodrigues EBA. Restricted to a single island, on which it has a small population. In 1964, noted as still common in natural vegetation, although greatly outnumbered by introduced *F. madagascariensis*. Apparently drastic reduction in numbers following cyclone in 1968, after which only five or six pairs found; in 1974 total of 20–25 pairs present, this increasing to 60 pairs in 1980s, and total population estimated at 300 individuals in 1991. Survey in 1999 recorded more than 300 pairs on territories, and total population more than 900 individuals, following a programme of reforestation, primarily with non-native tree species. Prior to introduction of *F. madagascariensis* (c. 1874) was reportedly common over the whole island, including in more open habitats; decline in 1960s coincided with clearance of natural vegetation for agriculture.
Bibliography. Anon. (2009e), Cheke (1978, 1987b), Cheke & Jones (1987), Darby *et al.* (1984), Gill (1967), Horne (1987), Impey *et al.* (2002), Newton (1865), Short & Horne (1978), Stattersfield & Capper (2000), Staub (1973).

40. Seychelles Fody
Foudia sechellarum

French: Foudi des Seychelles **German**: Seychellenweber **Spanish**: Fodi de Seychelles

Taxonomy. *Foudia sechellarum* E. Newton, 1867, Marianne Island, Seychelles.
Has hybridized with *F. madagascariensis*. Monotypic.
Distribution. Islands of Cousin, Cousine and Frégate, in Seychelle Is. Introduced on D'Arros (Amirantes Is), Aride and Denis.



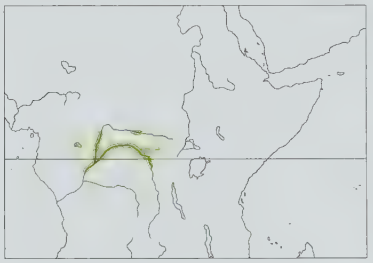
Descriptive notes. 12 cm; 15–19 g. Male breeding has dull yellow forehead, central crown, chin and throat, olive-grey cheek and ear-coverts; nape and upperparts olive-green, feathers of the mantle and back with dark central streaks; upperwing and tail olive-green, remiges with pale yellowish edges; breast, flanks, belly, thighs and undertail-coverts pale olive-grey; iris dark greyish; bill black; legs brown. Female and non-breeding male have forehead and crown plain olive-brown, chin and throat pale buff; iris greyish, bill and legs brown. Juvenile resembles female, but with buffy margins on wing-coverts, less contrast between dorsal and ventral plumage, pale brown bill. VOICE. Song a brief trill during courtship. Regular "tse tse tse" contact calls during foraging. Male and female territorial calls distinct.
Habitat. Inhabits coconut (*Cocos nucifera*) and *Casuarina* plantations. Originally occurred in native forest.
Food and Feeding. Primarily insectivorous (72% of observations), insects including homopteran bugs, beetles (Coleoptera), ants (Formicidae); also spiders (Araneae). Eats some seeds, from *Crotolaria anagroides* and *Casuarina equisetifolia*, and takes rotting fruit of cashews (*Anacardium*); will enter houses to eat over-ripe bananas (*Musa*); takes nectar readily. Recorded also as feeding on eggs of seabirds and of endemic Seychelles Grey White-eye (*Zosterops modestus*). Forages mostly by gleaning insects from palm fronds and other vegetation.
Breeding. Breeds May–Sept, with clearly defined moult and breeding seasons, on Cousin; has been suggested also that breeding occurs throughout year, with no fixed season, individuals sometimes nesting at intervals of more than 12 months. Monogamous; pair-members remain together for several consecutive seasons. At one nest three female-plumaged birds fed chicks, indicating possibly co-operative breeder at times. Pair defends territory of c. 50 m radius from nest-site throughout year. Nest bulky, built mostly by male but female contributing throughout, a domed structure with side entrance (but no obvious porch), made from palm fibres, grass, twigs, tendrils and casuarina needles, lining restricted to floor of egg-chamber, supported by twigs (rather than suspended) at 2–25 m above ground in tree; time from nest-building to egg-laying may extend to 14 days. Clutch 1–2 eggs, pure white, average size of nine eggs 18·7 × 14·5 mm; incubation by female only, period 14 days; chicks fed by both parents, both by regurgitation and with insects brought in beak, no information on duration of nestling period; single fledgling always cared for by female, and, in cases of two fledglings of different sexes, male parent cared for male fledgling and female parent for female offspring; average period of post-fledging parental care 12 weeks. Of 22 successful nests, 13 fledged two young each and nine produced one young each; some nests apparently lost to predation, with the snake *Lycognathopis sechellensis* or the large skink *Mabuya wrighti* the likely culprits; introduced Common Myna (*Acridotheres tristis*) also reported as taking fody eggs.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Granitic Seychelles EBA. Restricted to very small islands, with total population of c. 3500 individuals. Formerly occurred on Marianne, Praslin and possibly also La Digue; loss of habitat and introduction of mammalian predators presumably responsible for extermination of this species on these larger islands. Competition with introduced *F. madagascariensis* not considered a factor in reduction of population, since the two species differ significantly in ecology, and present species appears to dominate its congener during encounters. Introduced on D'Arros (Amirantes Is), Aride and Denis. Hybridization between female of present species and male *F. madagascariensis* recorded on Aride, when no conspecific mates available for the female.
Bibliography. Anon. (2009e), Brooke, M.L. (1985), Cheke & Jones (1987), Cresswell *et al.* (1997), Crook (1961), Frith (1979), Gaymer *et al.* (1969), Kraaijeveld & Komdeur (2003), Louette (2001), Lucking (1997), Moreau (1960b), Short & Horne (1978), Skerrett *et al.* (2001), Stattersfield & Capper (2000), Vega *et al.* (2007), Vesey-Fitzgerald (1940).

Genus *BRACHYCOPE* Reichenow, 1900

41. Bob-tailed Weaver
Brachycope anomala

French: Brachycope du Congo **German**: Kurzschwanzweber **Spanish**: Tejedor Anómalo

Taxonomy. *Ploceus anomalus* Reichenow, 1887, Stanley Falls (Boyoma Falls), DRCongo.
This species' generic affiliation uncertain; in the past has often been placed in *Quelea* or *Euplectes*. Monotypic.
Distribution. SE Cameroon (on R Sangha tributaries), PRCongo (on R Congo and R Ubangi drainage), S Central African Republic (on R Ubangi) and DRCongo (on R Congo, R Ubangi, R Uele and R Ariwumi, old record from Boma).



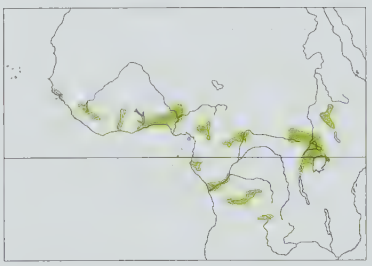
Descriptive notes. 12 cm; 20–30 g. Small, very short-tailed weaver. Male breeding has yellow forehead and crown, black lores, cheek, ear-coverts, chin and throat; nape, upperparts and tail dark brown with paler brown feather margins, upperwing dark brown, wing-coverts with pale edges; breast yellow, flanks, belly and undertail-coverts buffy, paling to whitish around vent; iris dark brown; bill black; legs brown. Non-breeding male has plain brown head lacking any yellow or black, buffy breast; bill brown. Female is like non-breeding male, but bill black. Juvenile resembles female, but iris dark grey, bill flesh-coloured, legs feet pale brown. VOICE. Song a few liquid chirping notes; harsh "jit" calls.
Habitat. Grassy cleared areas near major rivers in rainforest.
Food and Feeding. Diet apparently seeds (stomach contents); insects also likely. Forages on ground, where it hops.
Breeding. Breeding reported in Sept in Cameroon; in DRCongo, in Jan, Mar, Apr, Jun and Sept–Oct (may vary regionally). Mating system appears to be monogamous. Solitary nester. Nest a spherical structure with lateral entrance, woven from grass strips, placed 2–5 m above ground in bush or small tree. Clutch 2–4 eggs, uniformly dark grey, size 17·8 × 13·3 mm; in Cameroon, two adults seen to be feeding four fledglings. No other information.
Movements. Presumed to be predominantly resident. Dispersal evidently sufficient for colonization of recent clearings in forest.
Status and Conservation. Not globally threatened. Reported as locally common, but few recent data. Recent sight records from NE Angola. Few protected areas lie within this species geographical range, but it appears to take advantage of clearings created by shifting cultivation; often closely associated with human settlement.
Bibliography. Chapin (1954), Fishpool & Evans (2001), Fry & Keith (2004), Lippens & Wille (1976), Schouteden (1922), Sinclair (2007).

Genus *PACHYPHANTES* Shelley, 1896

42. Compact Weaver
Pachyphantes superciliosus

French: Tisserin gros-bec **German**: Augenbrauenweber **Spanish**: Tejedor Piquigrueso

Taxonomy. *Hyphantornis superciliosus* Shelley, 1873, West Africa.
Often placed in genus *Ploceus*, and then aligned with Asian *Ploceus hypoxanthus*, but may be closer to other weaver genera. Peculiar nest construction shared only with *Amblyospiza albifrons*, and has been suggested that the two are congeneric; DNA studies reveal that *Amblyospiza* differs from other ploceines at approximately tribal level, and present species possibly closest to that. Monotypic.
Distribution. Highly discontinuous: SW Senegal, coastal Guinea-Bissau, SE Guinea, N Sierra Leone, N Liberia, W & E Ivory Coast, S Ghana E to SW Nigeria (inland to Zaria), C & SE Cameroon, CW Gabon, N & S PRCongo, SW Central African Republic, S & SE Sudan, SW Ethiopia, Uganda (except E), also SW & NE DRCongo, extreme NW, N & E Angola, W Rwanda, NW Burundi, NW Tanzania (bordering L Victoria) and W Kenya.



Descriptive notes. 12 cm; 19–25 g. Medium-sized, short-tailed weaver. Male breeding has forehead rich ochraceous chestnut to level of eyes, forecrown golden-yellow, hindcrown blackish, nape brown with narrow yellow feather fringes; mantle and back brown, feathers with diffuse dark centres and narrow yellow fringes, rump plain brown; upperwing and tail dark brown, paler margins on wing-coverts; lores, cheek, ear-coverts and chin black; throat black (bib-like patch), breast yellow with orange-chestnut wash, flanks and belly yellow, paling to creamy buff near vent, with thighs and undertail-coverts creamy buff; iris brown; upper mandible black, lower mandible blue-grey; legs pinkish. Female breeding resembles breeding male, but forehead and crown blackish, grading into brown on nape (museum specimens often incorrectly sexed on basis of plumage alone). Both sexes non-breeding have forehead blackish, grading into dark brown on crown and nape; mantle and back paler brown with dark central streaks on feathers, rump brown; wing and tail dark brown, remiges with pale yellow margins, coverts with pale buff edges; lores black, extending in line behind eye, broad buff supercilium with chestnut tinge anteriorly, buff cheek and ear-coverts; buff below, paling to dull white in centre of belly; bill brown, lower mandible pale horn. Juvenile is like non-breeding adult, but much buffier, brown of head paler, yellow wash on underparts. VOICE. Song a series of chirping notes, "cheerr chrray-chrree-chrray chrree-chrray-chrree", sometimes terminating in a buzz. Calls include double-note "cheewery" and rapid, ticking flight call.
Habitat. Tall grassland and grassy savanna when breeding; occurs also in thickets and scattered bush, forest edge and forest clearings, and coffee plantations. Mainly below 1500 m; in Kenya at 1000–1700 m and in regions where annual rainfall exceeds 1000 mm.
Food and Feeding. Diet consists of grass seeds and arthropods; possibly also some small fruits consumed. Recorded stomach contents included insect fragments, a spider (Araneae), caterpillars (Lepidoptera), seeds and berries. In Ivory Coast, diet estimated at roughly 90% seeds, 10 % arthropods. Forages in pairs and in small flocks.

Breeding. Breeds Aug–Oct in W Africa (from Sierra Leone E to Nigeria), Jan–Feb in Gabon, and Jul–Sept in PRCongo; May–Jun and also Feb and Aug–Oct in Uganda; regional differences in DRCongo, Sept–Nov in Uele region, Feb–Apr in Kwilu area. Monogamous. Usually solitary as isolated pairs; nests sometimes within 10 m of each other. Male sings extended song, and fluffs plumage in flight display over territory. Nest globular with side entrance, 12 cm tall, densely woven from fine strips torn from grass blades, lined with down from *Ipomoea* and bulrush (*Typha*) seeds and involucres from *Phragmites* reeds; attached 1·4–2·8 m above ground to vertical grass stems, tops of supporting grasses stripped of seeds (and often nipped off); resembles nest of *Amblyospiza albifrons*. Clutch 3–4 eggs, white, grey or pale bluish-green with fine brown stipples and smears, or plain blue-grey or coffee-coloured, average size of six eggs 18·8 × 13·2 mm (Sierra Leone); no information on incubation and nestling periods. Male may roost in second nest near that used for breeding.
Movements. Resident; some local movements. Considered resident in Uganda. Non-breeding individuals foraging in forest and wooded areas, including oil palm (*Elaeis guineensis*) plantations, in Angola and Uganda indicate movement away from nesting areas.
Status and Conservation. Not globally threatened. Locally common, with wide but highly fragmented distribution. Isolated records from various other sites in countries where known to breed, as well as SW Niger and NW Zambia; possibly a breeding visitor to N Zambia.
Bibliography. Aspinwall & Beel (1998), Bannerman (1949), Barlow *et al.* (1997), Bates (1934), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Button (1967), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Colston & Curry-Lindahl (1986), Crook (1964b, 1969), Dean (2000), Dean *et al.* (1988), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire (1997), Friedmann & Williams (1970, 1971), Fry & Keith (2004), Gatter (1997), Germain *et al.* (1973), Giraudoux *et al.* (1988), Grimes (1987), Halleux (1994), Jackson & Sclater (1938), Lewis & Pomeroy (1989), Lippens & Wille (1976), Louette (1988b), Macdonald (1979b), Marchant (1942), Rand *et al.* (1959), Ripley & Heinrich (1966), Serle (1957), Seth-Smith (1913), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1973, 1985), Zimmerman *et al.* (1996).

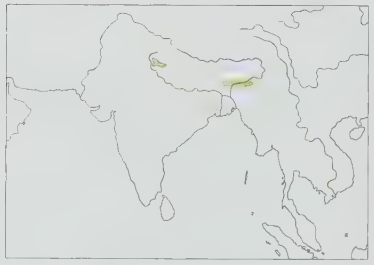
Genus *PLOCEUS* Cuvier, 1816

43. Finn's Weaver

Ploceus megarhynchus

French: Tisserin de Finn **German**: Großschnabelweber **Spanish**: Tejedor de Finn
Other common names: Finn's Baya, Yellow/Himalayan Weaver

Taxonomy. *Ploceus megarhynchus* Hume, 1869, Kumaon Terai, India.
Two subspecies recognized.
Subspecies and Distribution.
P. m. megarhynchus Hume, 1869 – N India (N Uttar Pradesh) and adjacent extreme SW Nepal.
P. m. salimalii Abdulali, 1961 – NE India (West Bengal and Assam; old records from salt lakes in S part of West Bengal).



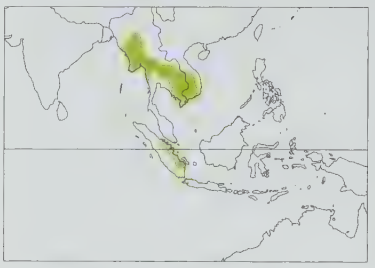
Descriptive notes. 15 cm; male 34–40 g, female 30–34 g. Medium-sized weaver. Male nominate race breeding has forehead, crown and nape golden-yellow, cheek and ear-coverts brown; mantle and back dark brown with narrow pale feather fringes, rump light brown with broad yellow tips; upperwing and tail dark brown, pale edges of remiges, broader edges on wing-coverts; chin, throat and underparts golden-yellow, dark patch at side of breast (may extend to form complete breastband on some individuals); iris amber-brown; bill black; legs brown. Female breeding is patterned like male, but with paler yellow head and underparts, and no breast markings; iris orange-brown or hazel-brown, bill brown with paler lower mandible. Both sexes in non-breeding plumage have forehead, crown and nape brown with dark central streaks on feathers, very broad streaking on mantle and back, unstreaked brown rump; wing and tail dark brown, remiges and wing-coverts with buffy margins; lores, cheek and ear-coverts buff-brown, chin and throat creamy white, breast, flanks and thighs buff-brown, centre of belly and undertail-coverts creamy white; iris, bill and legs brown. Juvenile resembles non-breeding adult, but with more buff on underparts. Race *salimalii* is like nominate, but male breeding usually has more solid sepia-brown mask from lores to ear-coverts, browner rump, and distinctively paler belly and undertail-coverts. Voice. Song a loud, harsh chatter terminating in wheeze; said to be harsher than song of *P. philippinus*. Short song used in nest-advertisement display, and courtship, often a chorus of males singing together. High "seep seep" follows song, and may accompany wing-beating display.
Habitat. Inhabits grassland with scattered trees, especially in seasonally flooded areas; also found in rice paddies and other cultivated fields. Roosts communally in tall grass and sugar cane. Occurs up to 1300 m.
Food and Feeding. Diet primarily seeds, including hemp (*Cannabis*) and rice (*Oryza*), also insects; young fed mainly with insects. Forages in grass and rice paddies, alongside *P. philippinus* and *P. benghalensis*.
Breeding. Season May–Aug in India, May in Nepal. Polygynous, with up to four females per male. Colonial, sometimes in close association with other weavers. Nest a ball-like structure lacking entrance tube, though often with porch-like projection over entrance, lined by female with soft grass-heads or bulrush (*Typha*) fluff, supported by (not suspended from) branches, leaves around nest stripped (so that nest conspicuous) and adjacent nests may be linked by strands of material; placed 9–20 m above ground in tree, frequently *Bombax* but other tree species also used, and sometimes within 1 m of water surface in reeds and bulrushes (possibly, early nests in trees and later in season a second round of breeding, in reedbeds); three reported cases of nesting in same tree as the jungle bee *Apis cerana indica*; some colonies in trees with nesting Black Drongos (*Dicrurus macrocercus*), which attack nest predators such as raptors and crows (Corvidae). Clutch 2–4 eggs (average 2·4), plain white, average size 20·9 × 15·2 mm; incubation by female only, period 14–15 days; chicks fed by female, occasionally also by male, nestling period 12–17 days. At one colony, 70% of 79 eggs hatched, 53% produced flying young; nestlings taken by House Crows (*Corvus splendens*) and Large-billed Crows (*Corvus macrorhynchos*).
Movements. Resident, with some local movements. Colonies utilized erratically; possibly vacates Nepal after breeding.
Status and Conservation. VULNERABLE. Global population small and apparently in rapid decline over the past 20 years, following human population pressure and changes in agriculture, the latter resulting in loss and degradation of terai grasslands. Recently discovered population in Royal Sukla Phanta Wildlife Reserve, in extreme SW Nepal, estimated to number fewer than 50 individuals and seemingly of erratic occurrence. This species has always been very local in distribution, and several colonies have disappeared in recent decades. Captured regularly for the cagebird trade, in which it commands a higher price because of its rarity.
Bibliography. Abdulali (1952, 1954, 1960), Ahmed (1997), Ali & Crook (1959), Ali & Ripley (1999), Ambedkar (1968), Anon. (2009e), Baral (1998), Barua & Sharma (1999), Bhargava (2000), Butchart & Stattersfield (2004), Collar *et al.* (2001), Crook (1969), Dhindsa (1986), Finn (1909), Grimmett *et al.* (1999), O'Donell (1916), Rasmussen & Anderton (2005a, 2005b), Saha (1967, 1976), Stattersfield & Capper (2000).

44. Asian Golden Weaver

Ploceus hypoxanthus

French: Tisserin doré **German**: Kernbeißerweber **Spanish**: Tejedor Dorado Asiático
Other common names: (Asiatic) Golden Weaver

Taxonomy. *Loxia hypoxantha* Sparrman, 1788, Sumatra.
Two subspecies recognized.
Subspecies and Distribution.
P. h. hymenaicus Deignan, 1947 – C, SW & S Myanmar (including Tenasserim), NW, C & NE Thailand, S Laos, Cambodia and S Vietnam; local within this range.
P. h. hypoxanthus (Sparrman, 1788) – EC Sumatra and W Java.



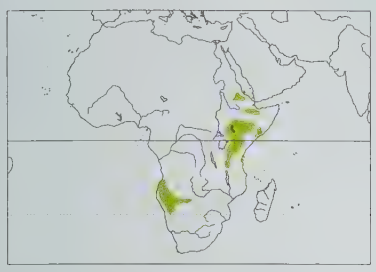
Descriptive notes. 15 cm; one male 19 g. Medium-sized, sexually dimorphic weaver, male generally yellow with black face mask. Male nominate race breeding has forehead, crown and nape golden-yellow, mantle, scapulars and back black with greenish-yellow feather fringes, rump yellow; upperwing and tail dark brown, remiges with narrow yellow fringes, wing-coverts with broad pale edges; lores to ear-coverts and to chin and throat black, black extending in a bib onto breast; breast orange-yellow, belly, flanks, thighs and undertail-coverts yellow; iris brown; bill black; legs pinkish-flesh. Female has forehead and crown dark brown with pale feather fringes, nape to back feathers paler brown with central dark streaks, rump pale brown; wings and tail dark brown, pale edges on wing-coverts; broad buffy supercilium, cheek buffy brown; underparts buff, paler on chin and throat, centre of belly and undertail-coverts dull white; bill pinkish-horn above with darker, greyer culmen, pale flesh-coloured below; legs pinkish-flesh. Non-breeding male is like female, but often with yellow wash on supercilium and underparts, more boldly streaked head. Juvenile resembles female. Race *hymenaicus* very similar to nominate, differing mainly in proportions of yellow and black on mantle and back. Voice. Song of chattering notes ending with long rattle; harsh "chit" calls. Voice similar to that of *P. philippinus*.
Habitat. Lowlands, always close to water: in marshes, rice paddies and flooded grasslands.
Food and Feeding. Diet mainly grass seeds, e.g. those of *Echinochloa colona* and *Eriochloa procera* recorded; during nesting period insects made up only 7 % of diet. Gregarious.
Breeding. Breeds in Jul in Myanmar, Jul–Sept in Thailand, Aug in Laos and Jan–Jun in Java. Apparently monogamous, perhaps occasionally polygynous. Breeds in small colonies. Nest built initially by male, completed with assistance of female, a rounded structure with side entrance, woven from thin strips of grass or palm leaves, strongly attached to vegetation over water or very swampy ground, often less than 1 m above surface, usually in reeds or bulrushes (*Typha*), less commonly in tree or shrub and then higher than 2 m above ground; at four sites in thornless bushes close to hornet (*Vespa*) nests, once near biting ants (Formicidae), and another report of nesting near wasps (Hymenoptera). Clutch 2 eggs, rarely 3, greyish-white, sometimes with a few spots, average size of eleven eggs 18 × 13·5 mm (Java); incubation apparently by female only; chicks fed primarily by female (most often by regurgitation), only occasionally by male; no information on duration of incubation and nestling periods.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Local, and generally scarce to uncommon. In Sumatra and Java (nominate race) formerly widespread, now localized and uncommon. Continued population decline throughout range as wetland converted for agriculture; also direct persecution and capture for bird trade. In addition, colonies often robbed and destroyed. Attempted introduction on Cocos Is (S of Sumatra) during 19th century unsuccessful.
Bibliography. Anon. (2009e), Butchart & Stattersfield (2004), Collar *et al.* (2001), Evans *et al.* (2000), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949b), Hoogerwerf & Rengers Hora Siccama (1938), Long (1981), Mackenzie (1916), Moreau (1936), Robson (2000), Saha (1976), Sankamethawee *et al.* (2008), Smythies (1986), Stattersfield & Capper (2000).

45. Chestnut Weaver

Ploceus rubiginosus

French: Tisserin roux **German**: Maronenweber **Spanish**: Tejedor Castaño

Taxonomy. *Ploceus rubiginosus* Rüppell, 1840, Ethiopia.
Has been though to form a superspecies with *P. badius*. Two subspecies recognized.
Subspecies and Distribution.
P. r. rubiginosus Rüppell, 1840 – W Eritrea, N, S & E Ethiopia, SE Sudan, NW & S Somalia, NE Uganda, Kenya (except coast and highlands) and interior plateau of Tanzania.
P. r. trothae Reichenow, 1905 – SW Angola, N Namibia and NW Botswana.
Descriptive notes. 14 cm; male 28–37 g, female 25–31 g. Male nominate race breeding has forehead, crown, lores, cheek and ear-coverts black, sharply divided from chestnut-brown of nape and upperparts; upperwing and tail dark brown, paler edges on wing-coverts; chin and throat black, forming curved bib; breast, flanks, belly and undertail-coverts chestnut-brown; iris cinnamon-brown to orange-red; bill black; legs grey to pinkish. Male non-breeding has forehead, crown and nape



grey-brown with dark central streaks on feathers, mantle and back brown, sometimes washed with chestnut, heavily streaked, rump unstreaked light brown; wings and tail as in breeding dress; side of head light brown to buff, sharply demarcated at level of bill from white of chin and throat; buff breastband, white belly and undertail-coverts, buffy or pale chestnut-brown wash on flanks and thighs; iris and legs as for breeding, bill brown, upper mandible darker than lower mandible. Female is like non-breeding male, but without any trace of chestnut (always light brown or buffy where male chestnut); iris hazel-brown, occasionally reddish; bill horn-grey to fleshy-grey, paler on lower mandible; legs grey to dull flesh-coloured. Juvenile resembles female, but with streaking on breast, iris brown, bill pale brown. Race *trothae* male has orange tone in chestnut plumage, rump light brown and not concolorous with back, and in Namibia some males have golden-brown mantle and duller black head. VOICE. Song a loud sizzling, reminiscent of *Quelea* species assembled at colony. High-pitched "pyewp" and "chik-chik" calls in flocks.

Habitat. Dry thornveld, generally below 1500 m.

Food and Feeding. Diet seeds, primarily of grasses, and insects, including termites (Isoptera); also nectar of aloes (*Aloe arborescens*, *Aloe candelabrum*, *Aloe ferox*, *Aloe marlothii*). Favoured grasses include *Panicum maximum*, *Panicum novemnerve*, *Panicum stapfianum*. In Kenyan agricultural region, seeds of wild grasses make up more than 70% of diet in Oct–Dec, and in Feb–Apr sorghum (*Sorghum*) and other cereal crops major component, with insects less than 10% of diet at this time. Young initially fed solely with insects, e.g. caterpillars (Lepidoptera) and grasshoppers and crickets (Orthoptera). Often forages in association with other birds, including starlings (Sturnidae), sparrows (*Passer*), other weavers, canaries (*Serinus*) and waxbills (Estrildidae). In non-breeding season flocks and roosts with other ploceids, and seems to associate with *Quelea quelea* even when alternative sites available; mixed roost in Somalia held more than 1000 of present species, along with *Quelea quelea*, *P. galbula*, *P. intermedius* and *P. vitellinus*. Flocks sometimes of one sex only.

Breeding. Breeds in Oct in Ethiopia, May in Somalia, May–Jul in Uganda, Apr–Jul (also Nov in N arid region) in Kenya, Mar–Apr in Tanzania, Apr in Angola, and Dec–May (mainly Jan–Mar) in Namibia. Monogamous and polygynous, but males leave breeding colonies once females incubating. Highly colonial, e.g. more than 100 trees each held 40–100 nests at site in Namibia; breeding activity within colony well synchronized. Male displays by beating wings while hanging below nest. Nest retort-shaped with short spout of c. 6 cm (spout sometimes lacking), ragged outside appearance, but tightly woven inside by male, lined with grass seedheads by female (continuing to line during incubation), generally suspended from tip of branch by cord of grass stems, sometimes several nests suspended one below another, 3–5 m above ground in large tree in open grassland, usually baobab (*Adansonia*) in Kenya and acacia (*Acacia*), *Albizia* or *Colophospermum* in Namibia; leaves of tree may be incorporated into nest, rather than stripped; at one site in Kenya, took over and reconstructed nests of *P. spekei*; may nest alongside *P. cucullatus*, *P. intermedius*, *Bubalornis niger* and *Dinemellia dinemelli* in Somalia, and in association with *P. intermedius*, *P. vitellinus*, *P. spekei*, *Quelea quelea* and Chestnut Sparrow (*Passer eminibey*) in Kenya; in Kenya, abandoned nests of present species used for breeding by Chestnut Sparrows, Cut-throat Finches (*Amadina fasciata*) and African Silverbills (*Euodice cantans*). Clutch average 3 eggs (Namibia), pale turquoise-blue, sometimes speckled or scrolled with dark green, average size of 20 eggs 22·8 × 15·7 mm (Namibia); incubation by female, period 11–14 days, hatching staggered, suggesting that incubation starts when first egg laid; chicks fed by female only, as males have already left colony, nestling period 13–16 days. In Namibia, hatching success of 172 eggs at one colony was 52%, some clutches preyed on by Cape Crow (*Corvus capensis*); Red-headed Finches (*Amadina erythrocephala*) appropriated nests in colony, causing 25–30% of females of present species to desert, and finches added eggs to incomplete weaver clutches (although some weaver chicks hatched, none survived).

Movements. Resident, migratory and nomadic. Near Nairobi and on Laikipia Plateau, in Kenya, extensive colonies established after good rains, but this species absent in other years; farther S in Kenya, at Tsavo, present only in Oct–Apr. In Somalia, reported as moving from highlands to lowlands following rain. In Namibia, apparently resident in some parts but in others migratory or nomadic, with visits to some regions irregular; near Windhoek, present in 1952–1954, then again during 1964–1971, but absent in intervening period. Dry-season visitor to Botswana. Male ringed at breeding colony in Kenya recovered five months later 213 km away.

Status and Conservation. Not globally threatened. Locally abundant. Considered a pest in some areas; damages crops in Kenya and Somalia.

Bibliography. Archer & Godman (1961), Archibald (1987), Ash & Miskell (1998), Backhurst (1977), Benson (1947a), Berry *et al.* (1987), Braine & Braine (1971), Brown & Britton (1980), Bruggers (1980a), Clancey (1989a), Clarke (1986), Collias, N.E. & Collias (1964), Cunningham-van Someren (1980), Dean (2000), Dean *et al.* (1988), Fry & Keith (2004), Gichuki (1984), Granvik (1934), Herremans (1994a), Hockey *et al.* (2005), Komen (1990), Komen & Buys (1990), Lack (1985), Lewis & Pomeroy (1989), Nikolaus (1987), Oschadleus & Osborne (2005), Short & Horne (2005), van Someren & Cunningham-van Someren (1945), Stevenson & Fanshawe (2002), Tomlinson (1947–1948), Urban & Brown (1971), Ward & Zahavi (1973), Zimmerman *et al.* (1996).

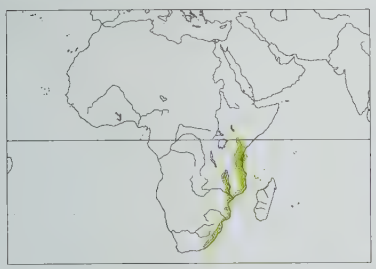

inches 3
cm 8
PLATE 6
ssp aureoflavus
46
ssp subaureus
47
48
ssp cabanisii
ssp intermedius
49
50
variants
51
52
ssp dimidiatus
53
ssp melanocephalus
variants
54
ssp abyssinicus
ssp spilonotus
ssp cucullatus
55
ssp collaris
56

46. African Golden Weaver

Ploceus subaureus

French: Tisserin jaune **German**: Goldweber **Spanish**: Tejedor Dorado Africano
Other common names: (African) Yellow Weaver, (Eastern) Golden Weaver

Taxonomy. *Ploceus subaureus* A. Smith, 1839, Algoa Bay, South Africa.
Formerly thought to form a superspecies with *P. xanthops*, but the two differ in breeding behaviour and ecology, and ranges overlap. Proposed race *tongensis* (described from S Mozambique) synonymized with nominate. Two subspecies recognized.
Subspecies and Distribution.
P. s. aureoflavus A. Smith, 1839 – SE Kenya (S from R Tana), coastal Tanzania (including Pemba I and Zanzibar), E Malawi and N Mozambique.
P. s. subaureus A. Smith, 1839 – C & S Mozambique S along coast to extreme E Swaziland and SE South Africa.



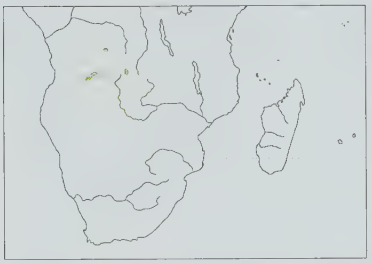
Descriptive notes. 15 cm; male 30–39 g, female 22–31 g. Male nominate race breeding has forehead, crown, cheek and ear-coverts yellow, nape and upperparts greenish-yellow; tail greenish-yellow, outer rectrices with yellow inner webs; upperwing-coverts greenish-yellow, remiges light brown with yellow outer margins and broad yellow inner webs; chin, throat and breast golden-yellow, often with some green wash, flanks, belly, thighs and undertail-coverts golden-yellow; iris red, sometimes with paler, yellow inner ring; bill black; legs pinkish-flesh. Male non-breeding has forehead and crown greenish-yellow, mantle and back greenish with faint central streaks on feathers, rump greenish-yellow; yellow supercilium; throat and underparts dull yellow, sometimes grey with yellow flecks, thighs grey; bill horn-brown, legs brown. Female breeding resembles non-breeding male, but with dark brown iris. Female non-breeding is uniformly olive-green above, with dark central streaks on mantle feathers, faint streaking on nape and crown, rump plain olive-green, chin, throat and breast buffy, belly, undertail-coverts greyish-white; iris deep reddish-brown; bill horn-brown above, pale flesh-coloured below; legs pinkish-flesh. Juvenile is like non-breeding female, but paler, particularly on underparts, which largely white. Race *aureoflavus* is smaller than nominate, male in breeding plumage has orange wash on head and is brighter yellow than nominate. Voice. Song an extended, rolling, swizzling sound introduced with short notes "tsip tsip tsweeezzzeerrr". Sharp "tzit" in alarm.
Habitat. Coastal plains, low-lying river valleys and river floodplains; primarily within 50 km of coast, but penetrates up to 100 km inland along river valleys. Below 1300 m in E Africa.
Food and Feeding. Mainly seeds, including rice (*Oryza*); also insects, regularly alate termites (Isoptera). Adults also took anthers of *Nicotiana glauca* flowers, and nectar of *Erythrina caffra* and *Aloe bainesii*. Young fed mainly with insects. In Kenya, forages in bushed woodland as member of mixed-species flocks; feeds on the ground alongside *P. ocularis* and Southern Yellow-billed Hornbill (*Tockus leucomelas*) in South Africa. Forms large flocks when not breeding, and roosts with other ploceids.
Breeding. Breeds Oct–Feb in Malawi; in Mozambique, Apr in C region and Sept–Feb in S; Sept–Feb in South Africa. Probably polygynous. Colonial; in reedbeds seldom more than 50 nests together, but 150 nests in tamarind tree (*Tamarindus*) on Zanzibar. Male displays with fluttering wings while hanging below nest entrance. Nest oval to spherical with entrance on underside, very neatly woven from grass blades or strips torn from reeds, lined with soft *Eragrostis* inflorescences, rarely a few feathers, 1–2 m above ground or water and often attached to a single reed stem on one side, sometimes supported by a reed on each side, or suspended from low bush, but on Zanzibar nests up to 9 m above ground in tall tamarind or coconut palm (*Cocos nucifera*); unused nests often demolished; may nest alongside *P. bojeri* in E Africa and with *P. xanthopterus*, *P. cucullatus* and *Amblyospiza albifrons* in South Africa. Clutch 2–3 eggs (South Africa), plain white, creamy or pale blue, or marked with darker spots, average size of 53 eggs 23 × 15·1 mm (South Africa); incubation by female only, period not recorded; nestling period 19–22 days in captivity. Occasional host of Diederik Cuckoo (*Chrysococcyx caprius*) in South Africa. Some nests at lakeside colony in Malawi robbed by African Fish-eagle (*Haliaeetus vocifer*). Oldest individual recaptured in Malawi more than 8 years after ringing.
Movements. Presumed resident; possibly irregular breeding visitor to E Swaziland. Of 13 recoveries of ringed individuals in S Africa, one had moved 78 km; the rest were found within 10 km of ringing location.
Status and Conservation. Not globally threatened. Locally common. Estimated population in S Mozambique more than 20,000 birds and in C Mozambique at least 2000. Single record from S Somalia, involving male apparently nest-building in Nov 1987; no observations of females at site.
Bibliography. Belcher (1924), Benson & Benson (1977), Brooke (1971), Brown & Britton (1980), Craig (1982a), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Hanmer (1989), Hockey *et al.* (2005), Jacot Guillarmod *et al.* (1979), Jensen & Vernon (1970), Johnston (1985), Lack (1985), Lewis & Pomeroy (1989), Meise (1937), Moreau (1944), Moreau & Moreau (1937), Oschadleus & Underhill (2006b), Pakenham (1936, 1979), Parker, V. (1994, 1999, 2005), Pomeroy & Tengecho (1982), Sjöstedt (1910), Skead (1995, 1997), Stevenson & Fanshawe (2002), Tarboton *et al.* (1987), Tomlinson (1947–1948), Tweddle & Tweddle (1984), Vaughan (1930), Vincent, A.W. (1949a), Vincent, J. (1936), Zimmerman *et al.* (1996).

47. Bocage's Weaver

Ploceus temporalis

French: Tisserin de Bocage **German**: Bocageweber **Spanish**: Tejedor de Bocage
Other common names: Bocage's Golden-weaver, Angola Weaver

Taxonomy. *Hyphantornis temporalis* Bocage, 1880, Caconda, Angola.
Has been thought to form a superspecies with *P. capensis*, or even to be conspecific, but affinities of both species unclear. Monotypic.
Distribution. C & NE Angola, S DRCongo and NW Zambia.



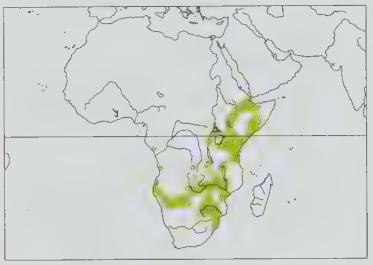
Descriptive notes. 15 cm; 34–37 g. Male breeding has golden-yellow forehead and crown, olive-green nape, upperparts and tail; upperwing olive-brown, remiges with narrow yellow edges; lores, cheek and ear-coverts dusky olivaceous; chin and throat with long bib of dusky olive, breast, belly, thighs and undertail-coverts yellow; iris cream; bill black; legs brown to flesh-coloured. Male non-breeding is olive-green from forehead to tail, with lores, cheek and ear-coverts olive-green, chin and throat yellowish, breast, flanks and thighs light olive-green, belly and undertail-coverts grey; bill and legs brown. Female resembles non-breeding male, but iris brown. Juvenile undescribed. Voice. Song a chattering series of notes, "shreti-shreti-shreti-shret shret". Contact call "chyap".
Habitat. Streamside vegetation such as rank grassland, tall forbs, bushes and trees; to 1400 m in Zambia.
Food and Feeding. Insects; beetles (Coleoptera), caterpillars (Lepidoptera) and grasshoppers (Orthoptera) recorded in stomach contents. Spiders (Araneae) in stomach of chick. Found in flocks of up to c. 50 individuals.
Breeding. Breeds in May, Aug and Oct in Angola Aug–Oct in Zambia. Probably polygynous. Colonial; more than 30 nests at one site and up to 20 in one tree. Nest ovoid, with entrance below, may have short entrance tunnel, loosely woven from grass stems or strips from grass blades and palm leaves, with grass seedheads in lining, suspended from branch over water or in elephant grass alongside river. Clutch 2 eggs (mean in Zambia), plain sky-blue, average size of 20 eggs 23·7 × 15·6 mm (Zambia); no information on incubation and nestling periods. Brood parasitism by Diederik Cuckoo (*Chrysococcyx caprius*) recorded in Zambia.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Not well known; considered uncommon within limited known range. Very local; range highly fragmented.
Bibliography. Aspinwall & Beel (1998), Colebrook-Robjent (1980, 1984), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Fry & Keith (2004), Louette (1988a).

48. Lesser Masked Weaver

Ploceus intermedius

French: Tisserin intermédiaire **German**: Cabanisweber **Spanish**: Tejedor Intermedio
Other common names: Masked-weaver

Taxonomy. *Ploceus intermedius* Rüppell, 1845, Shoa, Ethiopia.
Relationships uncertain; has been thought to be closest to *P. luteolus* (when this believed to form a superspecies with *P. pelzelni* and *P. subpersonatus*) or to *P. melanocephalus*, but neither possibility seems likely. Proposed races *beattyi* (described from W Angola) and *luebberti* (from Damaraland, in NC Namibia) synonymized with *cabanisii*. Two subspecies recognized.
Subspecies and Distribution.
P. i. intermedius Rüppell, 1845 – Djibouti, Ethiopia, NW & S Somalia, SE Sudan, Uganda, Kenya (except NE), NE DRCongo, Rwanda, Burundi, and NW, C & E Tanzania (except SE).
P. i. cabanisii (W. K. H. Peters, 1868) – SW PRCongo, coastal Angola, SW Tanzania, SE DRCongo, Zambia, Malawi, Zimbabwe, W & SW Mozambique, N Namibia, N & E Botswana, N & E South Africa and Swaziland.



Descriptive notes. 13 cm; 17–27 g. Male nominate race breeding has forehead and forecrown, lores, cheek, ear-coverts, chin and throat black, hindcrown orange-chestnut, nape and side of neck yellow; upperparts greenish-yellow, mantle and back with narrow central streaks on feathers; upperwing and tail olive-brown, remiges and rectrices fringed with yellow, broader yellowish edges on wing-coverts; upper breast washed with orange-chestnut, lower breast, belly, flanks, thighs and undertail-coverts yellow; iris whitish to straw-coloured; bill black; legs grey. Male non-breeding resembles breeding female, but with yellow wash on head and mantle, underparts brighter yellow; iris whitish to straw-coloured. Female breeding has forehead, crown and nape olive-green with faint streaking, mantle and back olive-green and heavily streaked, rump yellowish-green, wings and tail dull olive-brown with paler feather edges, notably on wing-coverts; faint yellow supercilium; cheek and ear-coverts olive, washed with yellow, chin, throat and breast pale greenish-yellow, grading to white on lower belly, with flanks, thighs and undertail-coverts yellowish; iris pale yellow, upper mandible grey, paler lower mandible. Female non-breeding is less yellow on underparts. Juvenile resembles non-breeding female, but browner above, whiter below, iris dark brown, bill horn-coloured. Race *cabanisii* breeding male has brighter yellow hindcrown and breast than nominate. Voice. Song a long swizzling call, interspersed with chattering notes and other elements, "swizzzzzz jubjub swizzzurrrrrrrr". Call notes "pew-pew-pew" and "tsop-tsop".
Habitat. Bushed and wooded grassland, also cultivated areas, favouring localities near water; often close to human habitation. Mainly below 1500 m, even in more arid savanna, but to 2000 m in E Africa.
Food and Feeding. Diet mainly insects, including caterpillars (Lepidoptera), grasshoppers (Orthoptera), termites (Isoptera); also seeds, mulberries, flowers of *Albizia*, also nectar, particularly from aloes (*Aloe*). Snail shells found in stomach contents. Takes maize (*Zea mays*) porridge in gardens. Often forages in canopy of trees in riverine woodland; probes leaves and flowers for insects. Face may be covered in pollen after feeding on nectar.
Breeding. Season Jan–May in DRCongo, Oct–Nov and Mar–May in Rwanda, Mar, May–Jul and Sept in Ethiopia, Jun in Somalia, Mar–Jun in Uganda; in all months except Aug–Nov (peak in Apr)

On following pages: 49. Heuglin's Masked Weaver (*Ploceus heuglini*); 50. Northern Brown-throated Weaver (*Ploceus castanops*); 51. Cape Weaver (*Ploceus capensis*); 52. Golden-backed Weaver (*Ploceus jacksoni*); 53. Black-headed Weaver (*Ploceus melanocephalus*); 54. Southern Masked Weaver (*Ploceus velatus*); 55. Village Weaver (*Ploceus cucullatus*); 56. Giant Weaver (*Ploceus grandis*).

in Kenya; Feb–Apr in Tanzania, Dec and Mar in Angola, Sept–Feb in Zambia, Nov–Mar in Malawi, Nov–Feb in Mozambique, Sept–Feb in Zimbabwe, and Oct–Feb in Botswana and South Africa. Polygynous, with two or three females per male. Colonial, up to 60 nests at a site, sometimes in mixed colonies, e.g. found in reedbeds with *Amblyospiza albifrons* and *P. subaureus*, in trees alongside *P. cucullatus* and *P. velatus* in Zimbabwe, also with *P. cucullatus* in Swaziland, Malawi and Ethiopia, with *P. spekei* in Kenya, with *P. melanocephalus* and *P. nigerrimus* in DRCongo; solitary pair within colony of *P. galbula* and with *Quelea quelea* in Somalia. Male displays at nest, fanning wings very rapidly, spreading tail, and swaying head while singing. Nest kidney-shaped, with short entrance tube c. 5 cm long, built by male from strips of grass blades, placed in reeds, or in trees over water or open ground, including exotic species such as eucalypt (*Eucalyptus*), or even suspended from roof edge or telephone line, 1–3 m above ground, lined with grass-heads by female after she accepts nest; sometimes sited near nests of *Belonogaster* wasps; abandoned nests in E Africa occupied by African Silverbills (*Euodice cantans*), possibly also by Cut-throat Finches (*Amadina fasciata*). Clutch 2–3 eggs (average 2·3 in E, C & S Africa), plain white or pale bluish-white, average size of 74 eggs 21·4 × 14·7 mm (South Africa); incubation by female, period 13 days; chicks fed by both sexes, male feeding only half as frequently as female, nestling period 15 days. Occasional host of Diederik Cuckoo (*Chrysococcyx caprius*) in S of range (2·6 % of nests) and reportedly also in E Africa. At a Kenyan colony, more than 30% of nests contained deserted eggs, and most single eggs infertile. Nests raided by African Fish-eagle (*Haliaeetus vocifer*) and vervet monkeys (*Cercopithecus aethiops*) at one colony; boomslang (*Dispholidus typus*) a regular predator of eggs and nestlings in Zambia and elsewhere. Oldest individuals in Malawi recaptured after more than 9 years, and individuals recaptured after 8 years in South Africa; maximum recorded longevity in captivity 19 years.

Movements. Presumed resident, but moves away from breeding areas. Rainy-season visitor to S Sudan. Greatest recorded distance travelled by ringed individual in South Africa 74 km. Radio-tracked birds from several colonies used same feeding grounds in E Africa.

Status and Conservation. Not globally threatened. Widespread and locally abundant. Population in Swaziland estimated at fewer than 1000 individuals; more than 4000 in C & S Mozambique, on SE fringe of range, but at least 130,000 in Kruger National Park, in South Africa. Record of breeding by escaped cagebirds in Germany, and breeding by escapees reported in Japan.

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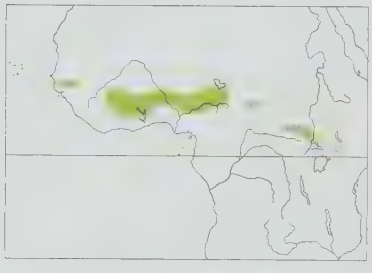
49. Heuglin's Masked Weaver

Ploceus heuglini

French: Tisserin masqué **German**: Heuglinweber **Spanish**: Tejedor de Heuglin
Other common names: Heuglin's Weaver

Taxonomy. *Ploceus heuglini* Reichenow, 1886, Bahr el Ghazal, Sudan.
Monotypic.

Distribution. S Senegal, Gambia, S Mali, N Ivory Coast and S Burkina Faso E to SW Niger, N Nigeria, N Cameroon and S Chad, also N Central African Republic, SW Sudan, NE DRCongo, and W & C Uganda E to extreme W Kenya.



Descriptive notes. 13 cm; 21–28·5 g. Male breeding has golden-yellow forehead and crown, greenish-yellow nape; mantle and back olive-green with faint central streaks on feathers, rump greenish yellow; tail olive-green, rectrices with narrow yellow margins; upperwing olive-green, narrow yellow outer margins on remiges, broader yellow margins and yellow tips on wing-coverts; lores, ear-coverts, chin and throat black; breast yellow, chestnut-brown wash at edges of black mask (which ends in a point on centre of breast), flanks, belly, thighs and undertail-coverts yellow; iris pale yellow; bill black; legs brown. Male non-breeding has forehead, crown and nape to back greenish, rump greenish-yellow, wings and tail as in breeding plumage; lores, cheek and ear-coverts greenish, underparts yellow; bill brown, darker on upper mandible. Female breeding has forehead, crown and nape to back dull olive-green, faint dark streaks on mantle feathers, rump paler green, tail dark olive-green; wings dark olive-green, narrow yellow edges on remiges, broader yellow margins on wing-coverts; lores, cheek and ear-coverts greenish-brown, pale yellow supercilium; chin and throat pale yellow, breast pale yellow with buffy wash, flanks buffy, belly grey, thighs and undertail-coverts yellowish; iris pale yellowish; upper mandible dark brown, lower mandible light brown. Female non-breeding is duller above, has paler underparts with ochre wash on breast; bill pale brown. Juvenile resembles non-breeding female, except for buffy edges of remiges and wing-coverts. Voice. Song described as a long phrase of swizzling sounds, chatters and rattles, such as "chukakakakaka-kew-kew-kew-kwee-kwee-kway-kway-jarrrrrrrr-chatatatatatat-turrrrrr" and other variations; or simple, monotonous "swi zhwee zhwee zhwee zhwee". Female also said to sing. Contact call a soft "chaar", also grating "chuk".

Habitat. Savanna woodland, coastal thickets, secondary scrubland and around farms and villages; generally dry, tall woodland areas. To 1800 m.

Food and Feeding. Diet apparently predominantly arthropods, including spiders (Araneae), caterpillars (Lepidoptera), beetles (Coleoptera), dragonflies (Odonata), grasshoppers (Orthoptera); also fruits, and seeds of *Pennisetum* grass. Diet at Lamto, in Ivory Coast, estimated as 70% arthropods, 10% fruit and 20% seeds by weight. Observed while examining leaves and flowers, apparently searching for insects. Once recorded in mixed-species flock foraging in woodland in Ghana.

Breeding. Breeds Aug in Senegal, Jul and Sept–Oct in Mali, Mar–Jul in Ghana, Aug–Sept in Togo, May–Sept in Benin, May–Aug and Jul–Oct at different sites in Nigeria, Aug–Sept in Sudan, Jan–Mar in NE DRCongo, and Jun and Feb in Uganda. Polygynous. Colonial or solitary nester, typically in groups of up to 15 nests; same sites used annually, seldom near water; may form mixed colonies with *P. vitellinus* and *P. cucullatus* in W Africa. Male displays by quivering wings and tail, or beating wings, while hanging below nest. Nest kidney-shaped, with tunnel up to 20 cm long extending from entrance, coarsely woven by male from strips of grass or grass stems, usually suspended at two points, lined with downy flowerheads of grasses, placed in tree, or often attached to telephone line (each nest woven to the wire throughout its width); one group of nests overhung entrance of busy rest house in Nigeria, and some also attached to base of nest of Augur Buzzard (*Buteo auguralis*), Crowned Hawk-eagle (*Stephanoaetus coronatus*) or African White-backed Vulture (*Gyps africanus*) or of Marabou (*Leptoptilus crumeniferus*) or Abdim's Stork (*Ciconia abdimii*) nests in both W & E Africa; association with stinging or biting insects noted at sites in several W African countries, and in Sudan insect species included mud wasps (*Megachile*), paper wasps (*Polistes fastidiosus*, *Ropalidia cincta*), bees (*Apis*) and red weaver ant (*Oecophylla smaragdina*); unoccupied nests taken over by Cut-throat Finch (*Amadina fasciata*) and African Silverbill (*Euodice cantans*), and active nest in Ghana taken over by Red-cheeked Cordon-bleu (*Uraeginthus bengalus*). Clutch 2–4 eggs (average 2·2 in Nigeria), plain turquoise-blue, or pale blue with very fine brown spots, average size of 30 eggs 20·9 × 14·6 mm (Nigeria); incubation by female, period 12–13 days; chicks fed by female alone, nestling period 14–18 days. Some nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) in Mali. At a colony in Nigeria, 45% of eggs produced fledglings.

Movements. Moves away from breeding areas after nesting. In Nigeria, movements apparently related to regional rainfall patterns; seasonal movements reported also in Benin and in DRCongo.

Status and Conservation. Not globally threatened. Locally common, although patchy in distribution. On Lamto savanna, in Ivory Coast, density of 4 pairs/50 ha in dry season and 7 pairs/50 ha in wet season. Unconfirmed sight records from Liberia.

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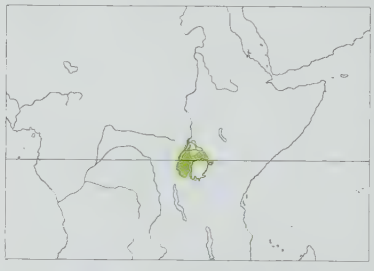
50. Northern Brown-throated Weaver

Ploceus castanops

French: Tisserin à gorge noire **German**: Riedweber **Spanish**: Tejedor Gorjipardo Norteño
Other common names: Brown-throated/Uganda Weaver; Victoria Masked Weaver, Entebbe/Lake Victoria Weaver (presumed hybrid with *P. melanocephalus*)

Taxonomy. *Ploceus castanops* Shelley, 1888, Wadelai, close to Sudan border, north Uganda.
Has been thought to form a superspecies with *P. xanthopterus*, but such a relationship now considered unlikely. May hybridize with *P. melanocephalus* or *P. jacksoni* in Uganda; both sight records and specimens of probable hybrids exist, and hybrid was previously described as a separate species, *P. victoriae*. Monotypic.

Distribution. NE DRCongo, Rwanda, N Burundi, Uganda (except E), W Kenya and NW Tanzania.



Descriptive notes. 14 cm; 18–27 g. Male has forehead chestnut-brown (width of band varying individually), crown and nape golden-yellow, mantle and back olive-green with darker streaks on some feathers, rump yellow; tail olive-brown, rectrices with yellow fringes; upperwing olive-brown, remiges with narrow yellow fringes, tertials and wing-coverts with brown fringes, wing-coverts with yellow tips; chin, throat and cheek to just behind eye chestnut-brown, this colour tapering to a point on breast; breast, flanks, belly, thighs and undertail-coverts golden-yellow; iris whitish to pale yellowish; bill black; legs brown. Female has forehead, crown and nape to back dull olive-brown with paler feather edges, rump dull buff, contrasting with back; tail olive-brown, rectrices with paler margins; wings olive-brown, wing-coverts with buff edges; buffy supercilium; cheek pale buff, chin and throat off-white, breast, flanks, belly, thighs and undertail-coverts dull white with buffy wash; iris grey to cream, bill brown with paler lower mandible. Juvenile has upperparts streaked brown and buff, narrow yellow margins on remiges, buffy throat and underparts paling to white on belly, iris brown, dark brown upper mandible, yellowish lower mandible, legs pale brown. Voice. Song a series of high-pitched chattering and squeaky notes. Long song in territorial defence, and when female enters nest; short song during courtship and nest advertisement.

Habitat. Waterside vegetation along lakes and rivers, particularly papyrus (*Cyperus papyrus*) and ambatch (*Aeschynomene elaphroxylon*); visits forest and woodland in non-breeding season. To 2100 m.

Food and Feeding. Diet seeds, including millet; also insects. Forages in small flocks, often with other weavers, on the ground, in vegetation and on floating aquatic plants. Foot structure shows adaptations typical of papyrus specialists.

Breeding. Breeds in all months, with peak egg-laying Mar–May and Sept, in Uganda; in Feb–May and Jul in DRCongo. Apparently monogamous. Colonial, with 5–6 nests in one tree, sometimes with other weavers such as *P. melanocephalus* and *P. intermedius*; also nests solitarily. Nest rounded, tightly woven, with entrance below and a small projecting porch; built by male from strips of grass and creepers, lined with fine grass and some feathers, placed in tall elephant grass or low shrub, or, in swamps, in reeds, papyrus, bulrushes (*Typha*) or ambatch. Clutch 2–3 eggs, either pinkish or pale blue, immaculate or spotted with red-brown, average size 22·5 × 14·5 mm (Uganda); chicks fed by both male and female; no information on duration of incubation and nestling periods. Egg-eating snake *Dasypeltis* found in some nests in Uganda.

Movements. Apparently resident.

Status and Conservation. Not globally threatened. Locally common.

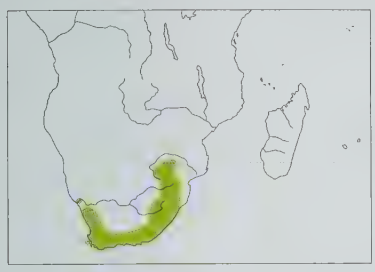
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51. Cape Weaver

Ploceus capensis

French: Tisserin du Cap **German**: Kapweber **Spanish**: Tejedor de El Cabo

Taxonomy. *Oriolus capensis* Linnaeus, 1766, Cape of Good Hope, South Africa.
Has been thought to form a superspecies with *P. temporalis*, or even to be conspecific, but affinities of both species unclear. Report of hybridization in captivity between "Olivaceous and Golden Weavers" probably refers to present species and either *P. xanthops* or (more likely) *P. subaureus*. Proposed races are *olivaceus* (described from Windvogelberg, in S Eastern Cape) and *rubricomus* (from NE South Africa), but male plumage exhibits considerable variation within any one colony, distribution is continuous, and size variation appears to be clinal; naming of geographical races, therefore, considered unwarranted. Treated as monotypic.
Distribution. South Africa (except arid interior and subtropical E lowlands), including Robben I (off SW coast), also W Swaziland and Lesotho lowlands.



Descriptive notes. 18 cm; male 44–52 g, female 36–45 g. Relatively large yellow weaver. Male breeding has chestnut-brown to orange-brown on forehead, chin and throat, grading into yellow on crown (extent and tone of brown on face and throat individually variable, tending to be more extensive in E); nape and upperparts olive-green, narrow dark central streaks on mantle and back feathers; upperwing and tail olive-brown, feathers edged with greenish-yellow; cheek, ear-coverts, most of throat, and entire underparts golden-yellow, sometimes with orange-brown flecks on breast and belly; iris creamy white; bill black; legs brown. Male non-breeding loses brown feathers on face and throat, these being replaced by yellow; yellow plumage generally duller, but extent of moult into an eclipse plumage varies greatly; bill brown. Female has forehead, crown, cheek, ear-coverts and nape to back dull olive-brown with faint central streaks on feathers, rump paler olive-brown and unstreaked; tail olive-brown, wings dark brown, remiges with narrow greenish-yellow edges; chin and throat pale yellowish, breast and flanks buffy to olive-brown, centre of belly, thighs and undertail-coverts with yellowish wash; iris dark brown (sometimes pale), bill brown, paler lower mandible, legs brown. Juvenile resembles female, but upperparts more olive-green, underparts more greenish, broader yellowish margins on wing-coverts, iris dark brown, bill pale horn; iris colour of male changes progressively from c. 6 months, but breeding plumage not acquired until second year. Voice. Song a long series of chattering and wheezing notes on one pitch, tailing off without clear termination, "chakkka-chakka-jkaa-kaa-ka-ka-kaka-kaka-swizz", may last up to 27 seconds. Male hanging below nest calls "a-zwit a-zwit"; female has squeaky call when soliciting copulation; contact call "chuck", given also when feeding young; harsh "chak" by both sexes in alarm.
Habitat. Open country with scattered trees and permanent water, including fynbos (macchia); in arid regions restricted to montane areas with water and taller vegetation. Avoids forest. Makes use of many exotic tree species for foraging and nesting. To 2000 m in montane areas.
Food and Feeding. More or less omnivorous, taking about equal amounts of animal and vegetable food; female may exploit wider variety of food than male. Seeds, including those of grasses such as *Ehrhata*, barley (*Hordeum*), maize (*Zea mays*), wheat (*Triticum*), also peas (*Pisum*), pine (*Pinus*) nuts, arils of *Acacia cyclops*; ate whole plants of sugarsnap beans, green ovaries of *Aloe arborescens*. Fruit of native figs (*Ficus*), *Lycium campanulatum*, olive (*Olea*), also apricots (*Prunus armeniaca*) and grapes (*Vitis*) in orchards; readily takes bread and other scraps in gardens. Nectar from *Aloe*, *Agave*, *Erythrina*, also *Grevillea robusta*, *Salvia africanalutea*, *Schotia brachypetala*, *Schotia africana*, *Strelitzia reginae*, *Tecoma capensis*; head often coated with pollen, and this species considered main pollinator of several *Aloe* species, and of *Strelitzia reginae*, and likely to contribute to pollination of *Colchicum*; may eat whole flowers. Animal food includes spiders (Araneae), and many insects, e.g. bees and ants (Hymenoptera), caterpillars (Lepidoptera), beetles (Coleoptera), termites (Isoptera), grasshoppers (Orthoptera), bugs (Hemiptera), flies (Diptera). Nestling diet mainly insects. Hawks flying insects including ant and termite alates. Forages on ground, turning over small stones and cowpats; also searches bark of trees, tears strips of bark off such trees as *Acacia sieberana* and *Acacia karroo*. Gregarious, always forages in flocks; forms large roosts throughout year, often with other ploceids, also with starlings such as Common Starling (*Sturnus vulgaris*), African Pied Starling (*Lamprotornis bicolor*) and Wattled Starling (*Creatophora cinerea*) in reedbeds.
Breeding. Breeds in Jul–Nov in winter-rainfall region of Western Cape (even Jun when high rainfall occurs early in season) and Aug–Feb (sometimes to Apr) in summer-rainfall region. Polygynous, with up to seven females per male; males with larger harems have significantly higher breeding success. Colonial, often in mixed colonies with other species e.g. *Euplectes orix* in reedbeds; colonies also in large isolated trees such as eucalypts (*Eucalyptus*) around farmhouses. Highly territorial, but defends only small area, usually 10–20 m². Male may hang below nest in display; also performs circular display-flight within territory, or perched display near nest. Nest a bulky, kidney-shaped structure with entrance below and no tunnel (although short "lip" sometimes added later), woven by male from broad strips of grasses and reed blades, inner ceiling may incorporate leaves, and completed nest highly waterproof, finally lined by female with fine grass, plant down and feathers, supported on each side by reeds or bulrushes (*Typha*), or suspended from tip of branch, occasionally on fence or telephone line; placed low in reeds, often less than 1 m above water, but in trees up to 10 m above ground; unused nests regularly demolished by male, leaves stripped from vegetation around nest; old nests may be used by Cape Sparrow (*Passer melanurus*) and African Dusky Flycatcher (*Muscicapa adusta*). Clutch 2–5 eggs (mean 2·6 in Western Cape), plain deep turquoise-blue, average size of 23 eggs 25 × 16·6 mm (South Africa); incubation by female, period 13–14 days; chicks fed by female, late in season sometimes also by male, and some males contribute as much as does female; nestling period 17 days; male may help with feeding of fledglings. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) in E part of range; of 41 nests at one KwaZulu-Natal colony, eight were parasitized. Over two seasons in Western Cape, 35–37% of eggs laid produced fledged young; nest predators include boomslang (*Dispholidus typus*), rats (*Rattus*) and African Harrier-hawk (*Polyboroides typus*). Oldest known individual a male ringed when at least 2 years old and recaptured 13 years later; estimated annual adult mortality 51%, but recent analyses of ringing data using different methods suggested mortality of 70% (with 95% of ringing recoveries occurring within 4 years of ringing).
Movements. Resident, with some local movements away from breeding areas. Of 173 individuals ringed, nine moved farther than 100 km, greatest distance reported 331 km. In Western Cape, mean distance from ringing site for 19 birds was 30 km; recent analysis noted that 50% of ringed birds recovered had moved less than 5 km. Overall sex ratio shows slight excess of males, and some catches at roosts strongly skewed in favour of one sex, suggesting differences in dispersal.
Status and Conservation. Not globally threatened. Abundant throughout most of its range. Likely to have increased in numbers as a consequence of agricultural development and expansion; has colonized offshore Robben I, off Cape Town. Considered a pest species in wheatlands and orchards of the Western Cape, where it is unprotected. Reported as having been introduced unsuccessfully on Mauritius in 1892, but possibly the species concerned was misidentified.

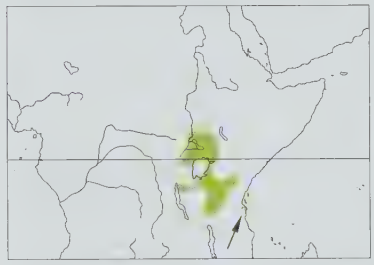
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52. Golden-backed Weaver

Ploceus jacksoni

French: Tisserin à dos d'or **German**: Jacksonweber **Spanish**: Tejedor de Jackson
Other common names: Jackson's Golden-backed Weaver, Eastern Golden Weaver

Taxonomy. *Ploceus jacksoni* Shelley, 1888, Kilimanjaro, Tanzania.
Molecular data suggest that closest relative is *P. ruweti*. May hybridize with *P. castanops* in Uganda. Monotypic.
Distribution. S Sudan, Uganda, W Kenya, N, C & E Tanzania and SE Burundi. Introduced in United Arab Emirates.



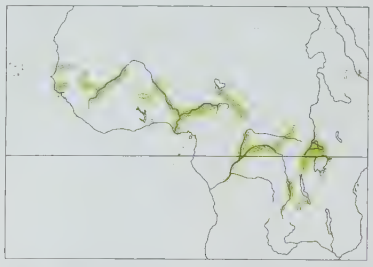
Descriptive notes. 15 cm; male 22–30 g, female 19–22. Male breeding has entire head to nape and throat black, sharply demarcated from chrome-yellow mantle, becoming greenish-washed or greenish streaked on back; rump chrome-yellow; upperwing dull brown, remiges with narrow yellow margins, wing-coverts with bright yellow edges and median coverts also with yellow tips; tail olive-green, rectrices with narrow yellow margins; black of hood extends into a bib on breast, breast otherwise chestnut-brown, flanks and belly chestnut-brown, centre of belly yellow with brown wash, thighs and undertail-coverts chrome-yellow; iris crimson-red; bill black; legs brown. Male non-breeding has forehead, crown and nape to back dull olive-brown with dark central streaks on mantle feathers, rump plain greenish-brown; wings brown, with yellowish or buffy edges on wing-coverts, tail olive-green, paler margins on rectrices; yellow supercilium; cheek and ear-coverts olive-brown, chin and throat yellowish-white, upper breast buff, lower breast, belly and undertail-coverts white with yellow wash, thighs and flanks buffy; dark brown upper mandible, pale brown lower mandible. Female breeding is like male non-breeding, but iris dark brown. Female non-breeding apparently lacks yellow wash on underparts, has upperparts duller, greyish, rather than greenish, upper mandible dark greyish, lower mandible light grey-brown. Juvenile resembles female, but buffier on underparts, bill paler brown. Voice. Song complex, a rambling series of high-pitched hissing notes and low snoring sounds. Short song used during nest-advertisement display of male, long song in territorial encounters and when female enters a nest.
Habitat. Primarily in wetland areas, in swamps, ambatch (*Aeschynomene elaphroxylon*), reeds and papyrus (*Cyperus papyrus*); also along rivers, moving out into acacia (*Acacia*) scrub and woodland. To 1800 m.
Food and Feeding. Seeds recorded; presumably also insects, as it uses prying action of bill.
Breeding. Breeds Feb–Jun and Oct–Dec (peak of laying Apr–May) in Uganda, Mar–Jun in Kenya, and Sept and Nov–Jun in Tanzania. Polygynous. Colonial, often nesting alongside other weavers such as *P. cucullatus*, *P. aurantius*, *P. melanocephalus* or *P. pelzelni*. Nest a compact oval, with entrance below and lacking tunnel, woven from strips of grass or palm leaves, lined with grass seedheads and some feathers, usually over water in papyrus or reeds, sometimes in tree, ambatch or even maize (*Zea mays*) field; a tunnel artificially added to fresh nests was removed by the birds, but ignored on occupied nests. Clutch 2–3 eggs, blue with purplish-brown or dark red spots, often very fine and dense, average size 20·6 × 14·3 mm (Uganda). No other information.
Movements. Presumed resident; irruptive movements reported in response to heavy rainfall. Male in Kenya recovered 5·5 years later 28 km from ringing site.
Status and Conservation. Not globally threatened. Locally common. Outside natural range, has bred in United Arab Emirates since 1992, presumably as a result of accidental escape of captives.
Bibliography. Backhurst (1977), Baker & Howell (1992), Brown & Britton (1980), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1954), Collias, N.E. & Collias (1964), Crook (1964a, 1969), Friedmann & Loveridge (1937), Fry & Keith (2004), Granvik (1923), Leisler (1995), Lever (2005), Lewis & Pomeroy (1989), Louette (1987a), Nikolaus (1987), Stevenson & Fanshawe (2002), Whybrow (1948), Zimmerman *et al.* (1996).

53. Black-headed Weaver

Ploceus melanocephalus

French: Tisserin à tête noire **German**: Schwarzkopfweber **Spanish**: Tejedor Cabecinegro
Other common names: Yellow-backed/Yellow-collared Weaver, Gambian Black-headed Weaver; Yellow-collared/Yellow-backed Weaver (*capitalis*); Victoria Masked Weaver, Entebbe/Lake Victoria Weaver (presumed hybrid with *P. castanops*)

Taxonomy. *Loxia melanocephala* Linnaeus, 1758, Guinea.
Has been thought possibly to form a superspecies with *P. dicrocephalus*. May hybridize with *P. castanops* in Uganda; both sight records and specimens of probable hybrids exist, and hybrid was previously described as a separate species, *P. victoriae*. Has hybridized with *P. taeniopterus* in NE DRCongo. Proposed race *fischeri* (described from Mwanza, in NW Tanzania) synonymized with *dimidiatus*. Four subspecies recognized.
Subspecies and Distribution.
P. m. melanocephalus (Linnaeus, 1758) – S Mauritania, N & SW Senegal, Gambia, S Mali and SW Niger.
P. m. capitalis (Latham, 1790) – W Guinea-Bissau, E Guinea, Burkina Faso, NE Ghana, N Togo, Nigeria (on major rivers), N Cameroon, SW Chad and N Central African Republic.
P. m. dimidiatus (Antinori & Salvadori, 1873) – SE Sudan, W Eritrea, NE DRCongo, Uganda, SW Kenya and NW Tanzania.
P. m. duboisi Hartlaub, 1886 – E PRCongo, S Central African Republic, SW Sudan, C & SE DRCongo and N Zambia.
Descriptive notes. 14 cm; male 20·1–25 g and female 17–21·2 g (*capitalis*), male 21–36·3 g and female 19·9–27·5 g (*dimidiatus*). Male nominate race breeding has forehead, crown, cheek, chin and throat black, black bib extending to centre of breast; narrow yellow collar on nape; mantle and



back greenish-yellow, rump yellow, tail olive-green; upperwing brown, primaries with yellow margins, wing-coverts with broad yellow edges; breast yellow except for black bib (which sometimes has chestnut-brown edges), belly, flanks, thighs and undertail coverts-yellow; iris dark brown; bill black; legs brown. Male non-breeding has forehead, crown and nape dull olive-green, mantle and back brown with broad central streaks on feathers, rump brown with greenish wash, tail olive-green; wings brown, paler edges on remiges and wing-coverts; yellowish supercilium, greenish-yellow cheek and ear-coverts; chin and throat dull white, tinged with yellow, breast buffy grey, flanks and thighs buff, belly and undertail-coverts dull white; bill with black upper mandible, horn-coloured lower mandible. Female is like non-breeding male, but with duller yellow margins on remiges, dull yellow throat. Juvenile resembles female, but with pale buffy underparts, broad buffy margins on wing-coverts, less streaking on mantle and back, bill brown with darker upper mandible; captive-bred males did not acquire breeding plumage in first year. Races differ in breeding plumage of male: *capitalis* has more chestnut below than nominate, and upperparts more yellow; *dimidiatus* has rich chestnut underparts, with yellow restricted to belly; *duboisi* has yellow underparts, lacking any brown wash, also longer and more slender bill. VOICE. Song a mixture of wheezing, grating and creaking sounds; short form "squeee-ki-kee", used in territorial defence and courtship away from nest. Harsh "chak" in alarm.

Habitat. Damp areas with tall grass near rivers or standing water, also reedbeds and papyrus (*Cyperus papyrus*); may forage in tree savanna in drier areas. Generally below 1500 m.

Food and Feeding. Seeds and insects; young fed largely with insects. Uses prying actions of the bill when foraging. Forms flocks in non-breeding season.

Breeding. Breeds May–Oct in Mauritania, Apr–Nov in Senegal, Jun–Sept in Gambia, Jul–Oct in Mali, Aug–Oct in Burkina Faso (Jul–Aug at Ouagadougou), Jun–Nov in Niger, Aug in Togo, May and Jul–Oct in Nigeria; in DRCongo, Jun–Aug in NE, Nov–Apr in Kimbombo, Jan–May in Itombwe and E region, Aug–Sept in C regions; Aug–Sept in Sudan and Ethiopia, Mar–May and Aug–Sept in Uganda, and Feb–Mar in Zambia. Polygynous, with two or three females in territory simultaneously; sometimes monogamous. Solitary nester, also colonial, nesting alongside *P. pelzelni* and *P. cucullatus*, sometimes with *P. intermedius* or *Euplectes orix*. When females arrive, male displays by fluttering wings while hanging below nest entrance. Nest globular or onion-shaped, entrance below without tunnel, outer shell tightly woven by male from grass, lined by female with fine grass, sometimes also some feathers, and with distinct ceiling layer of grass strips, slung between vertical stems (supported at one side only) in elephant grass, reeds or papyrus over water, sometimes suspended from pendulous twigs in bush or small tree, even in maize (*Zea mays*) field, generally more than 2 m above ground or water level; male will repair damage to nest during construction, but not once nest occupied, and female will attempt to block holes with lining material. Clutch 2–3 eggs, dull white, blue-green, pinkish-grey or brown, either plain or heavily freckled with olive-brown, average size of ten eggs 18·9 × 13·8 mm (Nigeria); incubation by female only, but both sexes feed nestlings and fledglings; no information on duration of incubation and nestling periods. Parasitizm by Diederik Cuckoo (*Chrysococcyx caprius*) recorded.

Movements. Apparently resident.

Status and Conservation. Not globally threatened. Common over much of range. More or less confined to rivers and similar wetlands.

Bibliography. Aspinwall & Beel (1998), Balança & de Visscher (1997), Bannerman (1949), Barlow *et al.* (1997), Bates (1934), Benson, Brooke, Dowsett & Irwin (1971), Benson, Brooke & Vernon (1964), de Bie & Morgan (1989), Borrow & Demey (2001), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1932, 1954), Cheke & Walsh (1996), Cheke *et al.* (1985), Claffey (1995), Collias, N.E. & Collias (1964), Crook (1964a, 1969), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Elgood *et al.* (1994), Friedmann & Loveridge (1937), Fry (1971), Fry & Keith (2004), Gee (1984), Germain & Cornet (1994), Giraudoux *et al.* (1988), Granvik (1923), Grimes (1987), Guichard (1947), Jourdain & Shuel (1935), Lamarche (1981, 1993), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Louette (1981, 1987a), Lynes (1938), McCarthy (2006), Morel & Morel (1982), Mundy & Cook (1974b), Nikolaus (1987), Olson (1976), Prigogine (1971), Ruwet (1964a), Sauvage & Rodwell (1998), Schifter (1986), Schürer (1978), Serle (1957), Seth-Smith (1913), van Someren (1916), Stevenson & Fanshawe (2002), Thonnerieux (1988), Thonnerieux *et al.* (1989), Urban & Brown (1971), Verheyen (1953), Zimmerman *et al.* (1996).

54. Southern Masked Weaver

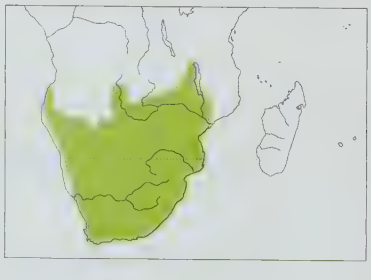
Ploceus velatus

French: Tisserin à tête rousse **German**: Maskenweber **Spanish**: Tejedor Enmascarado
Other common names: African Masked Weaver, Black-faced Weaver

Taxonomy. *Ploceus velatus* Vieillot, 1819, Namaqualand, South Africa.

Has been thought to form a superspecies, or even to be conspecific, with *P. vitellinus*, *P. reichardi*, *P. ruweti* and *P. katangae*, but current molecular data do not support any close links to these taxa. Proposed races *peixotoi* (confined to São Tomé, where introduced!), *finschi* (described from Namibe, in SW Angola), *caurinus* (from Damaraland, in Namibia), *shelleyi* (from Tete, on R Zambezi, in NW Mozambique) and, in South Africa, *tahatali* (from North West Province), *inustus* (from SW Northern Cape) and *nigrifrons* (from Eastern Cape) separated on basis of minor differences in male plumage; characters such as width of black on forehead exhibit considerable individual variation, however, and naming of races appears unwarranted. Monotypic.

Distribution. SW & SE Angola, W, S & E Zambia, Malawi and NW Mozambique S to coasts of South Africa. Introduced on São Tomé, apparently from Mozambique.



Descriptive notes. 13 cm; male 28–3 g, female 25–34 g. Male breeding has narrow black forehead and black facial mask covering lores, cheek, ear-coverts, chin and throat, extending to a point on breast; crown bright yellow becoming more greenish-olive on nape, mantle and back greenish-olive with faint central streaks on feathers, rump greenish-yellow; tail olive-green, rectrices with narrow yellow margins, upperwing brownish, remiges with yellow margins, wing-coverts with pale yellow margins; breast, belly, flanks, thighs and undertail-coverts bright yellow; iris red; bill black; legs brown to flesh-coloured. Male non-breeding has dull yellow supercilium; forehead, crown, cheek, ear-coverts and nape to back yellowish-green, faint streaking on crown and mantle, rump brighter greenish-yellow, wings and tail as on breeding male; chin, throat and breast pale yellow, belly, flanks, thighs and undertail-coverts whitish; iris red to red-brown, upper mandible brown, lower mandible horn-coloured, legs brown. Female breeding resembles non-breeding male, but with brighter yellow wash on underparts, iris brown to red-brown. Non-breeding female more olive on upperparts, paler on throat and breast than non-breeding male. Juvenile resembles non-breeding female, but with brown iris and pale horn-coloured bill. VOICE. Song a jangling chatter, with chuckles, buzzes and harsh notes interspersed and no clear terminal element, "chop-chop-cha-cha-cha cukcukcukcuk zwrrrrrrrrr-swizzzzzzzz-zweeeeee" or "chucky-chucky-chucky-zeeeeee-trrrrrr-zurrrrrr". Contact call and alarm call a sharp "chik".

Habitat. Open savanna, often in semi-arid areas, where it occupies scrub and riverine thickets; utilizes alien trees in farmland and plantations for nesting; often in urban and rural gardens. To 2600 m in Lesotho; elsewhere, below 1500 m.

Food and Feeding. Varied diet includes seeds of grasses and other plants, such as *Atriplex schmidtia*, *Brachiaria glomerata*, elm (*Ulmus*), pine (*Pinus*), *Cosmos*; nectar from *Schotia brachypetala*, *Boscia albitrunca*, *Tecoma capensis*, aloes (*Aloe*), and alien eucalypts (*Eucalyptus*), *Grevillea*, *Hibiscus*, *Phaedranthus*; this ploceid species (and not *Ploceus intermedius* as sometimes stated) likely to contribute to pollination of *Colchicum*. Often eats flower parts such as buds and ovaries from cultivated *Prunus*, as well as native *Rhigozum trichotomum*, also fruit of *Rhus*, *Prunus*, *Ehretia rigida* and mistletoe (*Viscum rotundifolium*). Insect food includes beetles (Coleoptera), larvae of which may be extracted from seed pods, also mayflies (Ephemeroptera), caterpillars (Lepidoptera) and alate termites (Isoptera). In gardens, feeds also on porridge and bread. Insects gleaned from leaves and bark of trees; aerial ones both captured on ground and hawked on wing. Drank water regularly in semi-desert area of Botswana. Forages in small to medium-sized flocks; in non-breeding season sometimes in large flocks of 500 individuals, and a regular member of mixed-species flocks foraging in woodland in winter in South Africa. Roosts of up to 2000; often roosts in association with other ploceids.

Breeding. Breeds Dec–Jan (sometimes to Mar) on São Tomé; Nov–Apr in Angola, Oct–Mar in Zambia, Jan–Apr in Malawi, Nov–Feb in Mozambique, Aug–Mar in Zimbabwe, Sept–Mar (peak in Nov) in Botswana; in South Africa, Aug–Oct in Western Cape (winter-rainfall region) and Jul–Mar elsewhere; within a region timing can vary locally depending on rainfall; probably multi-brooded, individual female making several nesting attempts in a year. Polygynous, with two or three females present in the territory simultaneously and up to twelve females acquired by one male during a season. Commonly, one male occupies an isolated tree, particularly in urban habitats; small colonies of up to nine males also recorded, and in Malawi sometimes in mixed colonies with *P. intermedius*. Male displays at nest by singing while fanning wings and spreading tail. Nest kidney-shaped, with semi-circular entrance below facing ground, no entrance tunnel, tightly woven by male from grass, roofed with green acacia (*Acacia*) leaves, lined by female with grass seedheads and feathers (availability of suitable nesting material may restrict nest-building activity); often placed at tips of branches over dry land, seldom in reeds, sometimes in tree over water; in Namibia nests sometimes placed near those of wasps (species of *Belanogaster*, *Polistes* and *Icaria*), and in Malawi may be near nests of *Belonogaster* wasps; in Zimbabwe single males nesting below nest structures of Wahlberg's Eagle (*Aquila wahlbergi*); one male apparently built 52 nests during single breeding season; unused nests demolished, with new nests built at same site or, in some cases, nest only partly destroyed and old material incorporated into new structure; nests sometimes taken over by the climbing mouse *Dendromus longicaudatus*, and used by other bird species e.g. Red-headed Finch (*Amadina erythrocephala*), Zebra Waxbill (*Amandava subflava*), Blue Waxbill (*Uraeginthus angolensis*), Bronze Mannikin (*Spermestes cucullata*), Cape Sparrow (*Passer melanurus*), and *Sporopipes squamifrons*; old nest used for roosting by Cape Penduline-tit (*Anthoscopus minutus*). Clutch 2–4 eggs (mean 2·5 in South Africa), white, pink, pale green or blue, either plain or speckled, spotted and blotched with grey, brown, red or purple, average size of 389 eggs 20·9 × 14·5 mm (South Africa); incubation by female, period c. 14 days; chicks usually fed by female only, nestling period average 16 days; male feeds nestlings or fledglings only rarely, but sometimes feeds second brood. In S Africa 6–12% of nests parasitized by Diederik Cuckooo (*Chrysococcyx caprius*); in one case, cuckoo attacked and apparently killed by weaver. Fledging success over two seasons at colony in South Africa 63% and 55%, respectively, at another colony 50%; nests raided by African Harrier-hawk (*Poyboroides typus*), Gabar Goshawk (*Micronisus gabar*), Black Kite (*Milvus migrans*) of yellow-billed race *parasitus*, African Grey Hornbill (*Tockus nasutus*), Purple Heron (*Ardea purpurea*), and vervet monkeys (*Cercopithecus aethiops*), as well as snakes such as boomslang (*Dispholidus typus*) and common egg-eating snake (*Dasypeltis scabra*); in addition, fly maggots cause death of some chicks, and Common Fiscal (*Lanius collaris*) took newly fledged chicks. First breeding by female in first year, male from second year onwards. Maximum recorded longevity in Malawi at least 12·5 years, and individuals recaptured at colonies in South Africa after 7–11 years; one captive survived for 23 years; mean annual survival of ringed individuals in South Africa 51–57% in different studies.

Movements. Resident and partial migrant. In SE Botswana, males remain in breeding areas while females and subadults temporarily disappear. Considerable fluctuations in numbers in non-breeding season, and at least local movements evident in many areas. One ringed individual had moved 466 km; 75% were recovered within 5 km of ringing site.

Status and Conservation. Not globally threatened. Abundant in most parts of range. Population of Kgalagadi Transfrontier Park, on Botswana–South Africa border, estimated at more than 15,000 individuals, and that of Kruger National Park, in NE South Africa, at more than 130,000, whereas only 3000 in Swaziland and c. 10,000 in C & S Mozambique. In Botswana, 28 birds/km recorded on transects near Gaborone. Current range expansion in S through formerly treeless regions, apparently facilitated by this species' ability to use exotic trees in farmland and plantations for nest-sites. Introduced on São Tomé, apparently from Mozambique; reported as being established locally in Israel; occasional breeding by escaped birds, as in Germany (in Lower Saxony, 1970–1971). Attempted introduction on St Helena, in SC Atlantic Ocean, in 1929 was unsuccessful.

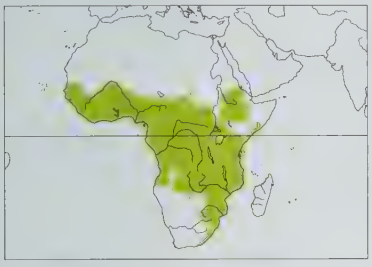
Bibliography. Bauer & Woog (2008), Beesley & Irving (1976), Benson, C.W. (1955b), Benson, C.W. & Benson (1977), Benson, C.W. *et al.* (1964), Benson, F.M. (1946), Borello (1989), Boswall (1994), Brooke, R.K. (1970, 1985), de Carvalho (1970), Cole (1958), Cooper (1970a, 1970b), Courtenay-Latimer & Clancey (1961), Craig (1982a), Craig *et al.* (2001), Dean (1973, 1996, 2000), Donnelly (1983), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Ewbank (2002), Fincham (1994), Forbes *et al.* (2009), Friedmann & Northern (1975), Fry & Keith (2004), Grindley *et al.* (1973), Hanmer (1989, 1999), Herholdt (1988), Herremans (1994b), Hockey *et al.* (2005), Hoesch (1940, 1956), Howman & Begg (1983, 1987, 1995), Hunter (1961), Irwin (1956, 1981), Jones & Tye (2006), Kemp *et al.* (2001), Kleizen *et al.* (2008), de Klerk (1942), Kopij (1999), Laycock & Hanmer (1981), Leventis & Olmos (2009), Long (1981), Lorber (1984, 1985), Louette (1984), Macdonald (1990), Markus (1960, 1968), de Naurois (1994), Niven & Niven (1969), Oatley & Skead (1972), Oatley & Underhill (2001), Oschadleus (1988, 1991, 1996, 2001b), Oschadleus *et al.* (2000), Parker, V. (1994, 1999, 2005), Payne & Payne (1967), Penry (1994), Roll *et al.* (2008), Rowan (1964), Schoeman (1995, 1997), Skinner, J.D. & Skinner (1974), Skinner, N.J. (1995), Smith (1974), Swynnerton (1908), Symes *et al.* (2008), Talbot (1979), Tarboton (1965, 2001), Taylor (1946), Thomson & Ferguson (2007), Traylor (1965), Tree (1979), Tucker (1975), Tyler (2001a), Vincent (1936), White (1946), Winterbottom (1982), Yom-Tov *et al.* (1994).

55. Village Weaver

Ploceus cucullatus

French: Tisserin gendarme **German**: Dorfweber **Spanish**: Tejedor Común
Other common names: Black-headed Weaver(!), Spotted-backed Weaver; Layard's (Black-headed) Weaver (*nigriceps*); Mottled Weaver (*collaris*)

Taxonomy. *Oriolus cucullatus* Statius Müller, 1776, Senegal.
May form a superspecies with *P. grandis*. Hybridizes with *P. nigerrimus*. Race *nigriceps* sometimes considered to represent a separate species. Proposed races *bohndorffi* (described from Stanley Falls, in DRCongo), *frobenii* (from Lomami, in DRCongo) and *graueri* (from N end of L Tanganyika) synonymized with nominate, *femininus* (from SE Rwenzori, in Uganda) with *abyssinicus*, *paroptus* (from Sokoke, in coastal Kenya) with *nigriceps*, and *dilutescens* (from S Mozambique) with *spilonotus*. Five subspecies recognized.
Subspecies and Distribution.
P. c. cucullatus (Statius Müller, 1776) – S Mauritania, Senegal, Gambia, and S & SW Mali S to Liberia and Ivory Coast, E to S Chad, N Gabon, NE PRCongo, Central African Republic and most of DRCongo; also Bioko I (Fernando Póo).
P. c. collaris Vieillot, 1819 – S Gabon, S PRCongo, W DRCongo and W Angola.
P. c. abyssinicus (J. F. Gmelin, 1789) – SW, S & E Sudan, N, W & C Ethiopia, C Eritrea, Uganda and NW Kenya.
P. c. nigriceps (E. L. Layard, 1867) – SE Somalia, S Kenya, Tanzania, SE DRCongo, E Angola, Zambia, Malawi, NE Namibia (Caprivi region), N & SE Botswana, Zimbabwe and N Mozambique.
P. c. spilonotus Vigors, 1831 – S Mozambique, Swaziland and E South Africa; occasional in Lesotho. Introduced in West Indies (nominate race) and on Mauritius and Reunion (*spilonotus*), and probably introduced on São Tomé (*nigriceps*).



Descriptive notes. 17 cm; male 33–46 g and female 26–37 g (*nigriceps*), male 33–47 g and female 29–40 g (*spilonotus*). Male nominate race breeding has head black, entire nape chestnut-brown; mantle and back yellow, with prominent black V-shaped mark at level of wings, rump yellow; tail olive-green, rectrices with pale yellow fringes; upperwing olive-brown, remiges with narrow yellow margins, wing-coverts with yellow fringes; black of head extends onto breast as a bib with dark chestnut-brown border; breast, flanks and thighs golden-brown, centre of belly and undertail-coverts golden-yellow; iris deep red; bill black; legs brown. Male non-breeding has forehead, crown and nape olive-green with some dusky streaking, upperparts olive-green with greyish tone, wings and tail as in breeding dress, yellowish supercilium over olive cheeks and ear-coverts, yellowish chin and throat, buffy breast and flanks, dull white belly and undertail-coverts; iris orange-red to red; dark brown upper mandible, horn-coloured lower mandible; in forest zone of C Africa, from Cameroon SE to Congo Basin, males appear to retain breeding plumage throughout year. Female breeding has forehead, crown and nape olive-green, tinged with yellow, mantle and back grey-brown with dark central streaks on feathers, rump plain grey-brown, tail olive-green, rectrices with narrow yellow fringes; wings olive-brown, broad pale yellowish edges on wing-coverts, narrow yellow edges on remiges; chin, throat and underparts generally yellow; iris orange-red to red; upper mandible blackish, lower mandible dark grey to black but horn-coloured at base; some aberrant females have some black flecks on head, nape, mantle and throat, and areas of deep saffron-yellow on underparts. Female non-breeding is much less yellow below, with side of breast and flanks grey-brown, belly, thighs and undertail-coverts dull white. Juvenile resembles non-breeding female, but with pale brown bill and dark brown iris. Races differ in characters of males in breeding plumage: *abyssinicus* male has black V-shaped mark on mantle like nominate, from which it differs in having chestnut-brown crescent on hindcrown but yellow collar on nape; *collaris* has black mask extending back to nape, no black V-mark on mantle, which is instead flecked black and yellow, a broad chestnut-brown band on breast surrounding black bib, and chestnut-brown flecking on flanks; *nigriceps* has black head lacking brown on crown or nape, mantle flecked with yellow and black, and golden-yellow underparts with no brown wash; *spilonotus* is distinctive, has yellow forehead and crown (so that black mask ends level with eyes), mantle flecked black and yellow, underparts plain yellow. Voice. Song an extended, descending chatter, "cheee cheee shrrr zzzzzrrr cheee ch-ch-ch-ch", terminating in a wheeze reminiscent of an intake of breath. Vocalizations well studied, and more than 20 different calls described, including calls directed to chicks, nest-invitation and copulation calls, also flock contact call, a short "chik"; harsh alarm calls in response to predator at colony.
Habitat. Bushy savanna, riverine woodland, wetlands, cultivated areas, rural villages, urban and suburban gardens, and villages and clearings in forest; frequent association with human habitation in W & C Africa, but this much less common in S Africa. Absent from arid regions, dense forest, and miombo (*Brachystegia*) woodland. To 2500 m in E Africa; elsewhere, usually below 1500 m.
Food and Feeding. Diet seeds, including grass seeds such as *Rottboellia exaltata*, *Sorghum arundicearum*, cultivated cereals (sorghum, rice, wheat, millet and maize), seeds of *Sterculia trigacantha*; also fruit of *Ehretia rigida*, wild figs (*Ficus*), cactus fruit and seeds, epicarp of oil-palm nuts (*Elaeis guineensis*), soft pericarp of *Cola millenii*, also nectar from *Bombax costatum*, *Parkia clappertoniana*, aloes (*Aloe*), *Erythrina*, *Schotia*, *Strelitzia* and exotic trees such as silver oak (*Grevillea robusta*); also insects, such as beetles (Coleoptera), ants (Formicidae), termites and their alates (Isoptera), grasshoppers (Orthoptera), mantids (Mantodea), caterpillars (Lepidoptera), bugs (Hemiptera). Stomach contents of 148 specimens from Somalia comprised cultivated grain (63% of specimens), wild plant seeds (36%) and insect material (79%); of 99 specimens from Chad, crop contents of 75% held cultivated seeds, 25% wild grains. Over a year in Uganda, diet (based on observations of feeding) comprised 79% plant material and 21% insects, but mainly insects during rainy season, and young fed primarily with insects. Diet overlaps with that of *P. nigerrimus* in W Africa. Forages by gleaning vegetation, including tree trunks; visits feedlots. Termite alates caught on the wing or on the ground. Experiments with captives indicate that this species uses colour in discriminating between different seed types, rejecting bitter-flavoured varieties. Gregarious, in large flocks; in non-breeding period joins large communal roosts, often shared with other ploceids; in Nigeria, wet-season roosts with *P. nigerrimus* generally in broadleaf trees, whereas dry-season roosts of the two in tall grass in swampy areas far from breeding colonies.
Breeding. Breeds Jul–Oct in Mauritania, May–Nov in Senegal and Gambia, Sept–Apr in Liberia, Jul–Aug inland in Ghana (Feb–Mar on coast), Jan–Oct in Togo, Jul–Oct in Mali and Burkina Faso, Jun/Jul–Aug in Niger and S Nigeria (Sept–Oct peak period in N Nigeria), in all months (peak May–Aug) in Cameroon, Nov–Jan on Bioko and São Tomé, May–Jun in Central African Republic, and throughout year in Gabon; in DRCongo, Oct–Nov in S, throughout year in Kivu, Sept–Mar in SE, Oct–May in Itombwe, Dec–May in W; Nov–Dec and Mar–May in Rwanda; Mar and Aug–Dec in Sudan, all months except Nov–Dec and Feb in Ethiopia; throughout year (peaks Feb–May and Oct–Nov) in Uganda; in Kenya, Jul on coast, throughout year (peaks Apr–May, Aug–Nov) inland; Oct, Dec–Jun in Tanzania, Sept–Mar in Zambia and Zimbabwe, Oct–Apr in Malawi, Jan–Mar in Botswana, Aug–Mar in Mozambique, and Aug–Feb in South Africa; also, introduced population breed Jun–Feb on Reunion and Mauritius and Dec–Jun in West Indies; sometimes double-brooded. Polygynous, up to five females simultaneously on territory, seven during a season; females may change mates, e.g. one ringed female successively mated to three different males. Highly colonial, with more than 200 nests in a single tree and colonies in excess of 1000 nests, mean inter-nest distance variable, 9–28 cm, but numbers of nests per territory (3–4) similar in dense and sparse colonies; larger colonies appear to be more attractive to females, with higher proportion of females per male; often in mixed colonies with other species, in W & C Africa particularly with *P. nigerrimus* (which appears to use same nest materials, select same tree species, and nest at similar heights), also with *P. intermedius*, *P. bojeri*, *P. subaureus*, *P. aurantius*, *P. albinucha*, and in E South Africa with *P. capensis*; low-density colonies included active nests of *P. nigricollis* and *P. melanocephalus*. Territorial behaviour in aviaries influenced both by hormonal levels and by behavioural interactions in a dominance hierarchy; aggressive displays emphasize black face mask, as male pecks at rivals. When females enter colony, males hang below nest entrances while uttering nest-invitation calls and flapping wings, revealing yellow wing-linings. Nest spherical, with spout-like entrance facing downwards, sometimes with very short tunnel, woven by male within c. 11 hours, generally from strips torn from reed or palm leaves, nest walls thickened, roofing layer often includes broad leaves from trees such as eucalypts (*Eucalyptus*) or acacias (*Acacia*), female lines nest with leaves, grass-heads and some feathers; may be suspended from drooping branches or supported at sides by reeds, and usually 6–18 m above ground, but in tall forest trees can be as high as 30 m, and in wetlands only 1–2 m above water; in Uganda favours giant bamboo (Bambuseae); strips leaves in immediate vicinity of nest; some colonies in heronries or attached to nests of raptors, including Black Kite (*Milvus migrans*), Bateleur (*Terathopius ecaudatus*), Wahlberg's Eagle (*Aquila wahlbergi*) and Palm-nut Vulture (*Gypohierax angolensis*), and mixed colony with *P. nigerrimus* in Sierra Leone surrounded occupied nest of African Harrier-hawk (*Polyboroides typus*); in West Indies (introduced), association with stinging wasps (Hymenoptera) noted; single male may construct more than 20 nests in a season, and unused/old nests regularly destroyed if not accepted by a female (captive male demolished nest used for breeding as soon as chick had fledged); empty nests often occupied by other animals, including snakes, wasps, mice and bats (Chiroptera), and in savanna regions used for breeding by Cut-throat Finch (*Amadina fasciata*), Zebra Waxbill (*Amandava subflava*), Bronze Mannikin (*Spermestes cucullata*), African Silverbill (*Euodice cantans*), Brown Firefinch (*Lagonosticta nitidula*) and Black-tailed Waxbill (*Estrilda perreini*), and in forested C Africa occasionally by White-collared Oliveback (*Nesocharis ansorgei*). Clutch 2–4 eggs in S Africa, usually 2 in tropics, white, pale green or blue, either plain or variably marked with red-brown speckling (in Nigeria, some indication that blue eggs with reduced markings more common in mixed colonies dominated by *P. nigerrimus*, which generally lays unmarked blue eggs), average size of 180 eggs 23·1 × 14·9 mm (South Africa); incubation by female only, period c. 12 days in wild, 14 days recorded in captivity; chicks usually fed by female alone, in South Africa, Ethiopia and E DRCongo male sometimes contributing, nestling period 17–21 days (both in wild and in captivity); of two fledglings produced by a captive pair, only one was fed by female after leaving nest. Regularly parasitized by Diederik Cuckoo (*Chrysococcyx caprius*), e.g. 3·4% of nests in S Africa; females recognize own egg pattern, which distinctive and constant throughout life, and discriminate against non-matching eggs; in West Indies, where introduced population now host to Shiny Cowbird (*Molothrus bonariensis*), initial studies suggested that discrimination against strange eggs had been lost and that it began to reappear under this new selection pressure, but differences in methodologies may account for apparent changes in the weavers' responses over past decades. Of 28 broods that hatched at one colony in Kruger National Park, in NE South Africa, only six produced fledglings; elsewhere, estimated productivity 1·3–1·9 fledglings per nest; nest predators include snakes, particularly boomslang (*Dispholidus typus*) and even mambas (*Dendroaspis*) and African rock python (*Python sebae*), monkeys and baboons (Cercopithecidae), Senegal Coucal (*Centropus senegalensis*), Pied Crow (*Corvus alba*), House Crow (*Corvus splendens*), African Harrier-hawk, Gabar Goshawk (*Micronisus gabar*) and Bat Hawk (*Macheiramphus alcinus*); African Goshawk (*Accipiter tachiro*) and Bat Hawk also captured adult weavers at colonies. Maximum recorded longevity at least 14 years in wild and 24 years in captivity; annual adult survival of ringed individuals in South Africa estimated at 63%.
Movements. Predominantly resident. Evidence of seasonal movements during dry season in W & E Africa. In S Africa, apparently faithful to breeding areas, as maximum distance moved by ringed individuals was 84 km and 75% of recoveries within 15 km of ringing site. Colour-ringed male in Nigeria occupied same territory in three successive breeding seasons.
Status and Conservation. Not globally threatened. One of the most abundant and widespread weaver species in Africa. Estimated population in Swaziland 20,000 individuals, in Kruger National Park (South Africa) more than 65,000, and in C & S Mozambique at least 20,000. Occasional in Lesotho (race *spilonotos*). Origin of São Tomé population (*nigriceps*) uncertain, probably introduced. Often exported as a cagebird, and numerous records of successful breeding in captivity, and by escapees. Introduced in West Indies in 1700s on Hispaniola, now also on Puerto Rico, and deliberately introduced on Martinique in 1970s; breeding reported also in Venezuela. Introduced in Cape Verde Is in early 20th century, but now extinct there; recorded also from Canary Is, but not established. Widespread on Mauritius and Reunion following introduction. Escaped cagebirds (probably of nominate race) breed periodically in Europe, where regular breeding currently reported from Portugal, and previously isolated records from Spain, France, Italy and Germany. Regarded as a pest in rice-growing areas, both in Africa and in West Indies, and also damages maize, sorghum and durra crops (*Sorghum bicolor*); considered major bird pest of seed crops on Mauritius and Reunion. Commonly nests in villages in W & C Africa, where often tolerated despite its depredations on crops at certain seasons. Considered a potentially invasive species in other regions, such as the Mediterranean, Caribbean and S USA. Specimens of this weaver species accounted for 5–9% of the birds on sale for use in traditional medicine at markets in Benin and Nigeria; in Nigeria, this species was employed in blessing ceremonies.

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56. Giant Weaver

Ploceus grandis

French: Tisserin géant **German**: Riesenweber **Spanish**: Tejedor Gigante

Taxonomy. *Hyphantornis grandis* G. R. Gray, 1844, São Tomé.
May form a superspecies with *P. cucullatus*. Monotypic.
Distribution. São Tomé I, in Gulf of Guinea.
Descriptive notes. 22 cm; 62–65 g. Very large, stocky weaver. Male has most of head down to chin and throat black, blending into chestnut-brown on rear crown; mantle to upper back dull greenish-yellow with thin dark central streaks, lower back and rump dull yellow; tail and upperwing dark



olive-green, tertials and wing-coverts with yellow edges, wing-coverts also with yellow tips (forming wingbars); chestnut-brown band across breast linked to similar-coloured area on nape; flanks yellow, washed with chestnut-brown, belly, thighs and undertail-coverts yellow; iris yellow; bill black; legs brown. Female has forehead, crown and nape to back olive-grey with dark central streaks (streaks most prominent on mantle and back), rump plain grey, tail dark olive-green, wings dark brown, remiges with narrow yellow edges, wing-coverts with broader pale tips; cheek and ear-coverts plain olive-grey, chin and throat cream, breast with broad buff band, flanks buff-grey, belly and undertail-coverts white, thighs grey; iris brown, bill dark brownish-grey to horn-brown, paler on lower mandible. Juvenile resembles female, but upperparts brown, rather than grey, broad buff edges on wing-coverts, and underparts and side of head buffy. Voice. Song a series of chattering notes terminating in a wheeze, "pche pche pche pche pche pche gzzzuinuiuinuinuinuin", described as being similar to that of *P. cucullatus*. Repeated "prric" calls in flight.
Habitat. Natural forest, plantations of cocoa, coffee and oil palms (*Elaeis guineensis*), and degraded habitats; seldom in savanna areas. Below 1500 m.
Food and Feeding. Grass seeds, crushed nuts of cocoa trees, fruit of oil palm, papaya (*Carica papaya*), berries of *Alchornea cordifolia*; snails found (Gastropoda) in some stomachs; also insects, e.g. beetles (Coleoptera). Feeds at all levels in vegetation, gleaning insects from branches and creepers; sometimes on ground. Forages singly, in pairs and in small parties; does not join mixed-species flocks.
Breeding. Egg-laying observed in Jan, copulation and nest-building noted in Dec, and juveniles in Mar–Apr. Monogamous. Solitary nester; highly territorial if conspecifics in same area. Male may beat wings in perched display near nest. Nest a large untidy ball with no entrance tunnel, made with strips from palm leaves, supported from below by branches. Clutch 1–2 eggs, plain blue. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in São Tomé EBA. Common on the island.
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PLATE 7 ➤

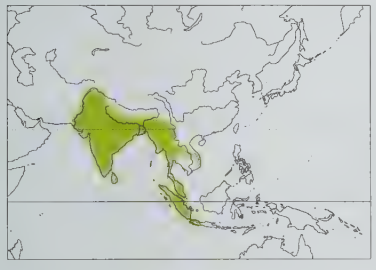

inches 2
cm 5
PLATE 7
ssp philippinus
57
ssp burmanicus
variants
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57. **Baya Weaver**

Ploceus philippinus

French: Tisserin baya **German**: Bayaweber **Spanish**: Tejedor Baya
Other common names: Indian/Common Weaver, (Indian) Baya; Eastern Baya Weaver (E races)

Taxonomy. *Loxia philippina* Linnaeus, 1766, Philippines; error = Sri Lanka.
Old report of hybridization in captivity with *P. manyar*. Race *burmanicus* intergrades with nominate in NE Indian Subcontinent. Five subspecies recognized.
Subspecies and Distribution.
P. p. philippinus (Linnaeus, 1766) – Pakistan (mostly on Indus floodplain), most of India (except SW), S Nepal and Sri Lanka.
P. p. travancoreensis Ali & Whistler, 1936 – SW India (from Goa S to Kerala and Travancore).
P. p. burmanicus Ticehurst, 1932 – NE India (West Bengal, Assam), S Bhutan, Bangladesh, N Myanmar and extreme S China (SW Yunnan).
P. p. angelorum Deignan, 1956 – N & C Thailand E to S Laos.
P. p. infortunatus E. J. O. Hartert, 1902 – S Myanmar (Tenasserim), W & S Thailand, S Vietnam, Peninsular Malaysia, Sumatra and Nias I, and (apparently almost extinct) Java and Bali.



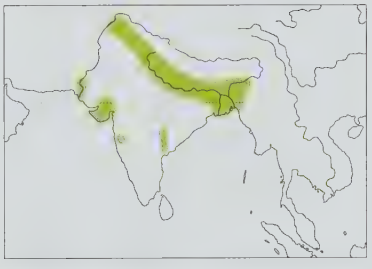
Descriptive notes. 15 cm; 18–28 g. Medium-sized weaver. Male nominate race breeding has forehead and crown yellow becoming browner on nape, with mantle and back feathers dark brown fringed yellow, rump light brown with faint streaks; upperwing and tail brown, remiges with narrow yellow margins, wing-coverts with buff margins; lores, cheek, ear-coverts, chin and throat dark chocolate-brown, this colour extending as bib onto upper breast; rest of breast yellow, flanks cream with some faint dark central streaks, belly, thighs and undertail-coverts creamy white; iris brown; bill black; legs brown. Male non-breeding and female have forehead, crown and nape to back brown with dark central streaks, streaking broadest on mantle, rump light brown with faint streaks; wings and tail brown, pale edges on remiges and broader edges on wing-coverts; broad buffy supercilium; lores, cheek and ear-coverts light brown, chin and throat white, buffy wash on breast and flanks and some streaking on side of breast and flanks; belly, thighs and undertail-coverts whitish; upper mandible light brown to yellowish, lower mandible horn-coloured to mostly yellow. Juvenile resembles female, but with fainter dorsal streaking, upperparts rusty buff with broad rusty margins on wing-coverts, no obvious supercilium, cheeks buffy and general buffy wash on underparts. Race *travancoreensis* is like nominate, but male darker above and with darker yellow breast; *burmanicus* is larger than nominate, male has face and throat paler, usually grey (not black), breast buff with darker mottling (rather than plain yellow), no yellow on back; *angelorum* has buff breast, black streaking on upperparts; *infortunatus* is more rufous than other races on upperparts, breast and flanks. Voice. Song a series of chittering notes, followed by a wheezy whistle, a buzz and finally some chirps, performed as undirected song, in threat, and in courtship; a similar, less intense song given in non-breeding season by males at day roosts. Harsh "chit" calls.
Habitat. Grassland, scrub with scattered trees, mangroves and cultivated areas; generally open country near water, though less restricted to marshy habitats than are other Asian weavers. Mostly in lowlands; to 1400 m in Himalayan foothills.
Food and Feeding. Diet seeds, including those of *Phalaris minor*, *Echinochloa colonum*, *Pennisetum typhoideum*, cultivated rice (*Oryza*), wheat (*Triticum*), maize (*Zea mays*), sorghum, millet and sunflowers (*Helianthus*); also nectar of *Bombax*, *Erythrina* and *Capparis*. Also animal food, insects mainly grasshoppers (Orthoptera), with flies (Diptera), termites (Isoptera), beetles (Coleoptera), caterpillars (Lepidoptera) and butterflies (of family Nymphalidae); also spiders (Araneae), small snails (Gastropoda); rice frogs (*Rana limnocharis*) in S India (Kerala) caught in paddyfield, battered on perch and then eaten piecemeal. Gecko (Gekkonidae) and changeable lizard (*Calotes versicolor*) fed to nestlings. Adults primarily granivorous, with rice often the most important food item; in trials with captives, *Echinochloa colonum* the preferred seed type. Nestling diet included 16% plant material. Gregarious. Daytime roosts near feeding grounds occupied during hottest period of day; communal roosts occupied throughout year, often in association with other species, e.g. *P. benghalensis* and *P. manyar*, starlings (Sturnidae), waxbills (Estrildidae), sparrows (Passeridae), wagtails (Motacillidae) and bulbuls (Pycnonotidae).
Breeding. Season May–Sept in Pakistan, Apr–Oct in India (local variation depending on monsoon rainfall, while timing of male sexual development is influenced by seasonal changes in daylength), Mar–Apr and Aug–Sept in Sri Lanka; mainly Dec–Jun in SE Asia, but Jun–Aug in Myanmar, Apr–May in S Laos; Mar–May in Java; duration of breeding may be influenced by growth of rice plants (resurgence of breeding where second crop grown in Nov in S India); often double-brooded. Polygynous, with 3–5 females per male. Usually colonial, with up to 60 nests in single tree and more than 200 in some colonies, sometimes in mixed colonies with other weavers; occasional solitary nests; records of males arriving, starting nest-building, but abandoning colony when no females appear. Highly territorial. Nest retort-shaped, with pendulous supporting section and usually long entrance tunnel, woven by male from strips of palm, grass or rice-plant leaves; male starts with wad of material woven around supporting branch, works downwards from this to form thick woven strap, at base of which he constructs a ring and then, perched on ring, completes the "helmet stage" (which resembles a helmet with a chinstrap), adding blobs of mud, sometimes cattle dung, to structure at this stage (reinforcement appears most plausible explanation for this); old reports of fireflies (Lampyridae) embedded in mud inside nest led to speculative second-hand accounts and explanations, but no recent observers have noted fireflies or other insects stuck in the mud; from helmet stage, nest completed only if accepted by female, male then building nest bowl, female sometimes participating by bringing lining material of fibres and a few feathers; entrance tunnel built last, very long, often 40–65 cm, once more than 90 cm; nest placed 2–30 m above ground or water, more than 35 tree and plant species (including mangroves and cycads) used, and in plantations selects open areas where canopy not too dense; in Rajasthan (W India) favours *Acacia nilotica* as nest-site, elsewhere mostly single nests in *Acacia arabica* though some of latter held 2–19 nests; often nests close to human habitation, with colonies regularly sited in or overhanging irrigation wells, rarely on house eaves or on power or telephone lines (nests on wires generally lack entrance tunnel); repairs damaged nests until nestling stage; nesting in association with wasps (*Vespa*) reported, and wasps have built nests inside deserted weaver nests; in Malay Peninsula regular nesting association with aggressive ants of genera *Crematogaster* and *Oecophylla*; abandoned nests used by Scaly-breasted Munia (*Lonchura punctulata*) and Indian Silverbill (*Euodice malabarica*), and munias seen also to enter active nests; one nest taken over by House Sparrows (*Passer domesticus*) and used for breeding after sparrows demolished tunnel; nests commonly occupied by long-tailed tree mouse (*Vandeleuria oleracea*), and nests abandoned at helmet stage used as roost-sites by painted bats (*Kerivoula picta*); empty nests survive through winter, regularly used by overwintering arthropods including spiders (of families Salticidae, Sporassidae, Scytotidae) and bugs (family Pyrrhocoridae). Clutch 2–5 eggs, most commonly 3 (regionally variable), white, average size of 100 eggs 20·3 × 14·5 mm (India); incubation by female, period 14–15 days; chicks fed primarily by female, some males assist in later stages (adults may feed through opening direct to nest-bowl, not entering through tunnel each time), nestling period typically c. 16 days (13–23 days reported); fledglings fed by both sexes, for up to 14 days. Of 291 eggs in one study, hatching success 76% and fledging success 41%, and in five studies hatching rate 44–81% and fledging success 18–58%; important nest predators include snakes, corvids such as House Crow (*Corvus splendens*) and Large-billed Crow (*Corvus macrorhynchus*), and probably monkeys, particularly bonnet macaque (*Macaca radiata*), with changeable lizard an occasional egg predator; nest destruction by humans likely to be most important source of loss. Females breed at one year, but most males not before second year.
Movements. Altitudinal migrant in Himalayas, moving to lower levels in winter months. Elsewhere resident, probably with some local movements. Ringed individuals recaptured within 2 km of ringing site; of 40 ringed in Malaysia, none had moved more than 20 km, with maximum interval 19 months.
Status and Conservation. Not globally threatened. Widespread and often locally abundant. Less common in Sundas, where formerly common but now greatly reduced in numbers; possibly extinct in E Java and Bali. Small breeding population in Hong Kong, but source and race of the birds involved not known; introduced in Hawaii, but not established there. Lives in close association with people in many areas. Half-built nests at helmet stage taken and utilized as temporary baskets by villagers when picking fruit. A significant pest in many rice-growing areas. Itinerant performers have trained this species to do tricks, e.g. to thread beads on a necklace, to select a particular number of a playing card, or to pick up small objects such as folded rupee notes; birds rewarded with food, and appear to perform these tricks willingly.
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58. **Black-breasted Weaver**

Ploceus benghalensis

French: Tisserin du Bengale **German**: Bengalenweber **Spanish**: Tejedor Bengali
Other common names: Black-throated Weaver (Bird), Bengal Weaver

Taxonomy. *Loxia benghalensis* Linnaeus, 1758, Bengal.
Monotypic.
Distribution. NE & SE Pakistan (in Indus floodplain), N India (mainly in Ganges floodplain from Punjab E to West Bengal and Assam) and scattered records in peninsula (S to Andhra Pradesh and Karnataka), also S Nepal and Bangladesh.



Descriptive notes. 15 cm; 18–22 g. Male breeding has forehead and crown golden-yellow, nape to back dark brown, mantle with some pale feather fringes, rump light brown; upperwing and tail dark brown, wing-coverts with paler edges; lores, cheek, ear-coverts and chin chocolate-brown, throat grey-brown, variable, some have white chin and throat and may also have cheeks and ear-coverts completely white (not clear if this age-related or a regional difference); breast dark brown (often as broad, clearly defined band), belly, flanks, thighs and undertail-coverts creamy white, some streaking on flanks; iris dark brown; bill bluish-grey; legs pale brown. Male non-breeding lacks golden crown, has top of head blackish, yellowish supercilium and submoustachial stripe, dark line through eye and dark line around ear-coverts; otherwise similar to breeding male, but extent of black breastband variable, often restricted to patch at each side. Female has forehead, crown and nape grey-brown with darker streaks, mantle and back feathers brown with very broad central streaks, rump light brown, wings and tail dark brown; yellow supercilium, greyish lores, darker grey-brown postocular stripe becoming a narrow dark border between greyish ear-coverts and yellow patch on side of neck, cheek a mess of yellowish and off-white feathers, short dark grey-brown moustachial stripe, yellow submoustachial area to chin and upper throat becoming pale cream on lower throat, sometimes with narrow, short dark malar stripe; breast may have solid dark band, broken dark-speckled pattern, or a dark patches at each side; centre of belly and undertail-coverts creamy white, flanks and thighs buffy with faint streaks; bill brown or horn-grey above, paler horn-grey or pale flesh-coloured below. Juvenile resembles female, but broad white supercilium may continue onto nape. Voice. Song a very soft

On following pages: 59. Little Weaver (*Ploceus luteolus*); 60. Rüppell's Weaver (*Ploceus galbula*); 61. Vitelline Masked Weaver (*Ploceus vitellinus*); 62. Tanganyika Masked Weaver (*Ploceus reichardi*); 63. Lufira Masked Weaver (*Ploceus ruweti*); 64. Katanga Masked Weaver (*Ploceus katangae*); 65. Northern Masked Weaver (*Ploceus taeniopterus*); 66. Juba Weaver (*Ploceus dicrocephalus*); 67. Cinnamon Weaver (*Ploceus badius*); 68. Clarke's Weaver (*Ploceus golandi*).

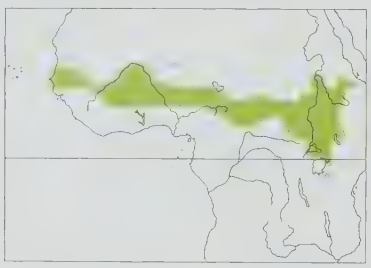
series of sibilant notes, ending in low-pitched buzzing, directed to female at close quarters. Quiet "chit-chit" flight calls.
Habitat. Lowland grassy areas near water, with tall standing grass and reeds; primarily in areas subject to periodic flooding.
Food and Feeding. Diet mainly seeds, including those of grasses *Echinochloa colonum*, *Phalaris minor*, *Perotis*, rice (*Oryza*), wheat (*Triticum*), millet and sorghum; millet the first choice in feeding trials with captives. Young fed primarily with animal food, insects, especially grasshoppers (Orthoptera), making up bulk of food; also caterpillars (Lepidoptera), beetles (Coleoptera), spiders (Araneae), and small snails (Gastropoda). Gregarious, in flocks; often forages with and forms mixed roosts with *P. philippinus*, *P. manyar*, waxbills (Estrildidae), starlings (Sturnidae) and other species.
Breeding. Season Jun–Oct in India. Polygynous. Colonial, often nesting together with other weaver species. Males court with quivering wings, bill pointed downwards and yellow crown maximally exposed. Nest retort-shaped with entrance tunnel 6–30 cm (seldom more than 20 cm), woven by male from strips of grass or reed blades, suspended 1–2 m above ground from *Pennisetum* or *Saccharum* grasses (with upper dome directly attached to grass) or attached to reeds or bulrushes (*Typha*), at one site to *Zizyphus* plants, and in *Acacia tortilis* plantation only in clearings and not where canopy dense; at "helmet" stage, inner rim plastered with cow dung or human faeces (but not mud), and bright yellow flowers of *Mamordia balsamina*, *Cucumis melo*, *Acacia nilotica*, *Lantana* and pink flowers of *Lagerstroemia indica*, as well as yellow fruit rinds, placed in many (but not all) nests; if female accepts nest structure, it is then completed, and no decorations added once nest occupied; deserted nests used for roosting and breeding by Indian Silverbill (*Euodice malabarica*), also occupied by long-tailed tree mouse (*Vandeleuria oleracea*). Clutch usually 3 eggs (mean of 110 clutches), white, unmarked, average size of 100 eggs 20·3 × 15 mm; incubation by female, period 13–15 days; chicks fed with insects by female, male contributing during final five days, nestling period 15 days. Of 372 eggs in one study, 76% hatched and 50% produced fledged young; in another study, 43% of eggs hatched, only 25% gave rise to flying young; in some areas, nests destroyed by grazing cattle, and by people harvesting reeds. Clutches that are double normal size suggest intraspecific brood parasitism.
Movements. Apparently resident; some local movements in non-breeding season.
Status and Conservation. Not globally threatened. Locally abundant. Occasional records in Bhutan. Old reports of this species from Myanmar considered doubtful, and reports from S China (Yunnan) more likely to be referable to *P. manyar*. Regarded as a pest of grain crops in some areas; one of the species causing damage at grain stores in Punjab region.
Bibliography. Ali & Ripley (1999), Ambedkar (1972a), Crook (1963a), Dhindsa (1983, 1986), Dhindsa & Toor (1981, 1990), Dhindsa *et al.* (1985), Gajera *et al.* (2009), Grimmett *et al.* (1999), MacKinnon & Phillipps (2000), Mistry (1988), Pittie *et al.* (1999), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Sharma (1985, 1986, 1990, 1992, 1993, 1997), Toor *et al.* (1986).

59. Little Weaver

Ploceus luteolus

French: Tisserin minule **German**: Zwergweber **Spanish**: Tejedor Chico
Other common names: Little Masked-weaver

Taxonomy. *Fringilla luteola* M. H. C. Lichtenstein, 1823, Senegal.
Has been thought to form a species group or a superspecies with *P. pelzelni* and *P. subpersonatus*, but such a relationship considered unlikely. Birds from W foot of Mt Elgon, in Uganda, sometimes separated as race *kavirondensis*, but considered inseparable from those in rest of species' range. Monotypic.
Distribution. Mauritania, Senegal, Gambia, C & S Mali, Burkina Faso and N Ivory Coast E to N Cameroon, S Chad, Central African Republic, Sudan, W Ethiopia, Eritrea, NE DRCongo, Uganda (except SW), W Kenya and N Tanzania (in Serengeti).



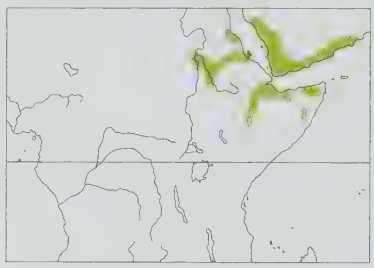
Descriptive notes. 12 cm; 11–15 g. Very small weaver. Male breeding has black face mask covering forehead, crown to just behind eye, cheek, ear-coverts, chin and throat, extending as bib onto breast; hindcrown and nape bright yellow, mantle and back dull yellow with dark central streaks on feathers, rump yellow; tail and upperwing dark olive-brown, remiges with pale yellow edges and wing-coverts with broader margins; neck side and underparts bright yellow; iris brown; bill black; legs blue-grey. Male non-breeding has forehead, crown and nape to back yellowish-green, dark central streaks on mantle and back feathers, rump yellower than rest of upperparts; tail and wings as on breeding male; pale buff supercilium, greenish cheek and ear-coverts; chin, throat, breast and belly washed with pale yellow, flanks and thighs buffy, undertail-coverts yellow; bill brown. Female is like non-breeding male, but wing feathers not so dark, underparts yellow when breeding, whitish in non-breeding plumage; iris dark brown; bill dark brown when breeding, light brown afterwards. Juvenile resembles female, but upperparts grey-brown, rather than greenish-yellow, pale lower mandible; captive-raised male first sang at 4 months, moulted into breeding plumage at 1 year. Voice. Song introduced by plaintive musical tones, "sweetiswiswi" or "chip-wop-weep-wop-wop-weep-wip-wop-cheep", followed by chattering series of notes, described as quieter and more varied than song of e.g. *P. cucullatus*. Call note a soft "tsip"; shrill, squeaky alarm call.
Habitat. Savanna woodland with large acacia trees (*Acacia*), also more open and arid scrubland; fringes of cultivation and large gardens. Mainly in lowlands; at 400–1500 m in E Africa.
Food and Feeding. Diet seeds and insects. Stomach contents included beetles (Coleoptera) and caterpillars (Lepidoptera). Forages usually in acacias and other small trees, searching foliage in manner of a warbler (Sylviidae); uses prying actions of the bill. In W Africa, also forages on ground with seed-eaters such as waxbills (Estrildidae). Generally in pairs and small groups.
Breeding. Breeds in Jun–Oct in Mauritania and Gambia, May–Nov in Senegal, Aug–Oct in Mali (from Jul in S), Jul–Oct in Ghana, Aug in Togo, Jun–Oct in Burkina Faso, May–Sept in Niger, Jun–Oct in Nigeria, Aug–Nov in DRCongo, May and Aug–Oct in Sudan, Mar–Aug in Ethiopia, Mar–May and Aug–Sept in Uganda, and Feb, Apr and Sept in Kenya. Monogamous. Often solitary nester, returning to same site in successive years; rarely in colonies. Nest built by male, globular, with vertical entrance tube 5–30 cm in length, woven from fine grass stems, grass blades and vine tendrils, also strips torn from fronds of *Borassus* palm, lined with grass seedheads and other fine material, suspended 3–5·5 m above ground from thorny branch; construction takes 3–4 days, after which male may continue work on entrance tunnel; in Sudan in association with occupied wasp (Hymenoptera) nests, and in Gambia typically near hornet (*Vespa*) nests; two active nests in Ghana were taken over by Red-cheeked Cordon-bleus (*Uraeginthus bengalus*). Clutch 2–3 eggs, plain white, average size of nine eggs 18·4 × 13·1 mm (Nigeria); incubation by both sexes, period 12 days in captivity; chicks fed by both sexes, nestling period in captivity 18–20 days. No published information on breeding success. Annual survival of small sample of adults in Nigeria estimated at 50%.
Movements. Resident; some seasonal movements related to rainfall in Mauritania and Nigeria, but in other parts of W Africa present throughout year.
Status and Conservation. Not globally threatened. Locally common; less common or even scarce at edges of range, e.g. Mauritania.
Bibliography. Balança & de Visscher (1997), Barlow *et al.* (1997), Beier & Tungbani (2006), de Bie & Morgan (1989), Blanford (1870), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1932, 1954), Cheke & Walsh (1996), Cheke *et al.* (1985), Claffey (1995), Collias, N.E. & Collias (1964), Cresswell *et al.* (2009), Demey & Fishpool (1991), Elgood *et al.* (1994), Fry (1971), Fry & Keith (2004), Gee (1984), Giraudoux *et al.* (1988), Granvik (1934), Greig-Smith (1978a), Grimes (1987), Guichard (1947), Holyoak & Seddon (1989), Lamarche (1981, 1993), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1924), McCarthy (2006), McGregor *et al.* (2007), Moreau (1943), Morel & Morel (1982), Mundy & Cook (1974b), Nakonzer (1986), Nikolaus (1987), Paludan (1936), Reichenow (1873), Serle (1943b), Shuel (1938), Stevenson & Fanshawe (2002), Thonnerieux (1988), Thonnerieux *et al.* (1989), Urban & Brown (1971), Zimmerman *et al.* (1996).

60. Rüppell's Weaver

Ploceus galbula

French: Tisserin de Rüppell **German**: Gilbweber **Spanish**: Tejedor de Rüppell

Taxonomy. *Ploceus galbula* Rüppell, 1840, Modat valley, Eritrea.
Monotypic.
Distribution. NE & E Sudan, N Eritrea (including Dahlak Archipelago), C & NE Ethiopia, Djibouti, N Somalia, and S Arabian Peninsula (SW Saudi Arabia, Yemen, W Oman).



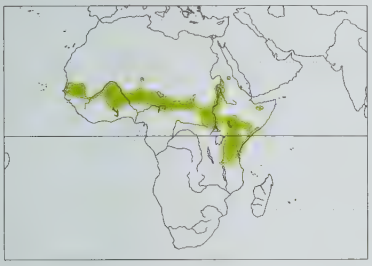
Descriptive notes. 14 cm; male 20–29 g, female 16–21 g. Male breeding has forehead back to level of eye and down to lores, cheek and ear-coverts chestnut-brown; crown golden-yellow, blending into greenish-yellow nape; mantle and back greenish-yellow, feathers with narrow dark central streaks, rump dull yellow; upperwing and tail olive-green, yellowish margins on rectrices and remiges, yellow margins on tertials and wing-coverts, median wing-coverts also with yellow tips; chin chestnut-brown, throat brown, passing into golden-yellow of breast and rest of underparts; iris orange-red; bill black; legs brown to flesh-coloured. Male non-breeding is greenish-olive above, with streaking on mantle and back, sometimes yellowish wash on crown and rump; cheek and ear-coverts greenish-olive; wings and tail olive-green, narrow yellowish margins on remiges and rectrices, pale margins on wing-coverts; chin pale yellow, throat and breast white, washed with yellow or buff; belly, flanks, thighs and undertail-coverts white with some yellow wash; bill brown, upper mandible darker; legs brown. Female has forehead, crown and nape to back grey-brown to olive-grey with dark central streaks, streaking most prominent on mantle and back; rump olive-green, tail dull olive-green with yellowish margins of rectrices, wings brown with outer margins yellow, pale edges on tertials and wing-coverts; faint buff supercilium, dull white cheeks, chin and throat, breast white with yellowish wash, belly, flanks, thighs and undertail-coverts dull white; iris dark brown; bill horn-coloured, upper mandible darker. Juvenile resembles female, but with deeper buffish-yellow breast; young male develops pale face mask, with yellow chin. Voice. Song a series of chattering sounds, followed by a swizzling element, and ending in chatter, "chuk-kuk-kuk-kukukukuk-zweeeeeezheeerrrrrz kakaka". Contact call "chee-chee"; explosive "chucka" in alarm.
Habitat. Savanna, arid coastal plains, cultivated areas and waterside vegetation; also gardens. From sea-level to 2000 m.
Food and Feeding. Diet reported as seeds, including those of cereal crops. Forages in small groups and in larger flocks. In Arabia usually in groups of 10–20 individuals, often associated with large flocks of granivorous sparrows (*Passer*). In African range, enormous post-breeding flocks reported from Sudan (mixed with *P. taeniopterus*), Somalia and Ethiopia, some estimated as containing tens of thousands of individuals; in Somalia, small numbers in mixed roost with *P. intermedius*, *P. rubiginosus*, *P. vitellinus* and *Quelea quelea*.
Breeding. In Sudan, season May–Aug in Gedaref area, Mar–May elsewhere; breeds in all months except Jun–Aug in Eritrea, all months except Mar–Apr in Ethiopia; Feb–Mar, May–Jun and Nov in Somalia; in Yemen mainly Mar–Aug, but in any month when rain falls (one observer noted breeding in Feb, Apr, Jun–Jul, Oct and Dec); Dec–Mar in Saudi Arabia and Mar–Sept in Oman. Polygynous, sometimes single male with up to three females and eight nests. Often colonial nester. Nest almost spherical or a flattened ball, woven by male from grass or long strips of palm fronds, lined with plant down, small feathers and leaves; entrance tunnel absent, or sometimes tunnel 5 cm long added later with fresh material (when remainder of nest already brown); suspended 2–6 m above ground, where possible over water, from end of branch in tree, bush or mature durra (*Sorghum bicolor*) stalks, sometimes eucalypt (*Eucalyptus*), date palm (*Phoenix dactylifera*) or tamarind trees (*Tamarindus*), in Arabia also *Ziziphus spinachristi*; unoccupied nests may be demolished, and leaf-stripping also noted; old nests used by African Silverbill (*Eudice cantans*) in Oman. Clutch 2–3 eggs, white or deep blue, usually heavily spotted with brick-red, sometimes only finely speckled, average size of 17 eggs 20 × 13·8 mm (Somalia); incubation by female, period 14–15 days; chicks brooded by female, initially food brought by male, which feeds chicks by regurgitation, after day 4 both sexes feed, nestling period c. 18 days.
Movements. Resident; move short distances away from breeding areas after nesting. Probably nomadic in more arid regions.
Status and Conservation. Not globally threatened. Locally abundant. An old record from NE Kenya. Considered a pest of grain crops in some areas; causes damage to cereal crops such as millet, sorghum, maize (*Zea mays*), wheat (*Triticum*) and sesame (*Sesamum*).
Bibliography. Al-Safadi (1996), Archer & Godman (1961), Ash & Miskell (1998), Barnes (1893), Bates (1936), Blanford (1870), Bruggers (1980a), Butler (1905), Cave & Macdonald (1955), Clarke (1986), Fishpool & Evans (2001), Friedmann (1937), Fry & Keith (2004), Gallagher & Woodcock (1980), Guichard (1947–1948), Meinertzhagen (1954), Nikolaus (1987), O'Grady & O'Grady (1990), Simmons (1961), Smith (1955, 1974), Stevenson & Fanshawe (2002), Trott (1947), Urban & Brown (1971), Zimmerman *et al.* (1996).

61. Vitelline Masked Weaver

Ploceus vitellinus

French: Tisserin vitellin **German**: Dotterweber **Spanish**: Tejedor Vitelino

Taxonomy. *Fringilla vitellina* M. H. C. Lichtenstein, 1823, Senegambia.
Has been thought to form a superspecies, or even to be conspecific, with *P. velatus*, *P. reichardi*, *P. ruweti* and *P. katangae*. E African populations sometimes separated as race *uluensis* (described from Ulu Mts, in Kenya), but considerable individual variation evident in the characters proposed. Treated as monotypic.
Distribution. SW Mauritania, Senegal, Gambia, S Mali, Burkina Faso and N Ghana E to S Chad, N Central African Republic, S & E Sudan, NE DRCongo, S Ethiopia, NW & S Somalia, NW Uganda and NC Kenya S to C Tanzania.



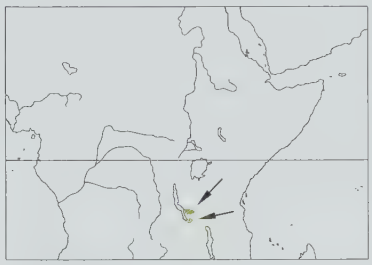
Descriptive notes. 14 cm; 18–22 g. Male breeding has narrow black band on forehead, black mask extending over lores, cheek, ear-coverts, chin and throat; crown chestnut-brown, nape golden-yellow, mantle and back greenish-yellow with faint dark central streaks, rump yellow; tail olive-green, rectrices with pale yellow fringes; upperwing dark brown, remiges with narrow yellow fringes, wing-coverts with broad yellow edges and yellow tips; breast adjoining facial mask has chestnut-brown fringe, side of breast, belly, flanks, thighs and undertail-coverts golden-yellow; iris red; bill black; legs brown. Male non-breeding has yellowish forehead and crown, nape olive-brown with faint streaking, mantle and back olive-brown with heavier streaks, rump dull yellow; tail olive-green with faint yellow fringes, wings dark brown, yellow edging as on breeding male; faint yellow supercilium, olive-brown cheek washed with yellow; chin and throat pale yellow, breast and flanks buff, washed with yellow, belly, thighs and undertail-coverts dull white; iris red to orange; bill dark horn-grey above, paler horn below. Female breeding resembles non-breeding male. Female non-breeding has forehead, crown and nape light olive-brown with faint central streaks, mantle and back olive-brown with broad dark central streaks, rump dull buff, tail olive-green, wings brown, narrow yellow edges on remiges and wing-coverts; iris red-brown to red, bill brown, darker upper mandible. Juvenile resembles non-breeding female, but upperparts more olive-green, rump duller, faint supercilium behind eye only, underparts washed with buff, iris brown, bill horn-brown, legs brown. Voice. Song a swizzling sequence, interspersed with rasps, whistles and chirps, short form "chick-chikleewer-chi". Contact call a sharp "pink".
Habitat. Dry savanna woodland and arid scrubland, as in Sahel region. Generally below 1800 m; to 2000 m on Laikipia Plateau, in Kenya.
Food and Feeding. Diet includes seeds and insects, also nectar from *Leonotis nepetifolia*; birds will bite flowers off at base, mandibulate them to extract nectar. Uses prying action of bill in foraging. Singly and in pairs; in non-breeding season also in flocks, and joins communal roosts, in Somalia along with *P. galbula*, *P. rubiginosus* and *Quelea quelea*.
Breeding. Breeds Mar on coast and Sept–Oct along river in Mauritania, Jul–Oct in Senegal, Gambia and Mali, Jun–Sept in Burkina Faso, Apr–Sept in Ghana, Aug in Togo, Jun–Sept in Nigeria, Niger and DRCongo, Feb–May in Ethiopia, Jun–Aug in Uganda (no recent records), Jul–Jul, Sept and Nov–Dec in Somalia, mainly Mar–May (also Jul–Aug, Nov–Feb) in Kenya, and Jan–Jun in Tanzania. Polygynous. Solitary or, often, a small group of nests with single male in attendance; never in large colonies. Male sings long song both in courtship and in territorial display; short song during nest advertisement, when he hangs below nest, wings spread and waving. Nest woven by male, oval or pear-shaped, tightly constructed (resembling an new ball of string according to one account), very short entrance tunnel below (or lacking tunnel), ceiling of grass-heads of different species, lined with softer grass-heads, suspended from single point of attachment, in Kenya over water but elsewhere often in tree far from water, 2–5 m above ground; in W Africa, may be placed near nest combs of polistine wasps (Polistinae); newly built nests actively usurped by Cut-throat Finch (*Amadina fasciata*) in Kenya, and active nest in Ghana taken over by Red-cheeked Cordonbleu (*Uraeginthus bengalus*); abandoned nests used by African Silverbill (*Euodice cantans*). Clutch 2–4 eggs (average 2·4 in Nigeria), blue-white, white (tinged with pink) or greenish, white eggs sometimes with fine black spotting, others with red or violet flecks (either large and sparse, or fine and dense), average size of 17 eggs 19·5 × 13·2 mm (Nigeria); incubation by female, period 12–13 days; nestling period 14–16 days. At 29 nests in Nigeria, 25% of eggs produced fledged young. Longevity in captivity least 8 years; estimated annual adult survival rate from small sample in Nigeria more than 80%. Field records of clutches that are double normal size suggest intraspecific brood parasitism.
Movements. Nomadic flocks form in non-breeding season. Movements likely, influenced by food supply and rainfall in semi-arid regions; described as being partially migratory by some authors.
Status and Conservation. Not globally threatened. Common to locally common; wide-ranging.
Bibliography. Archer & Godman (1961), Ash & Miskell (1998), Balança & de Visscher (1997), Bannerman (1949), Barlow *et al.* (1997), Bates (1934), Beier & Tungbani (2006), Benson (1947a), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1954), Cheke & Walsh (1996), Clarke (1985), Collias, N.E. & Collias (1964), Crook (1960c, 1964b, 1969), Cunningham-van Someren (1971a), Elgood *et al.* (1994), Fry & Keith (2004), Gee (1984), Giraudoux *et al.* (1988), Granvik (1934), Grimes (1987), Kunkel (1962b), Lamarche (1981, 1993), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Louette & Benson (1982), Lynes (1924), McGregor *et al.* (2007), Mitsch (1975), Morel & Morel (1982), Mundy & Cook (1974b), Nikolaus (1987), Paludan (1936), Reichenow & Lühder (1873), Sauvage & Rodwell (1998), Serle (1943b), Short & Horne (1978, 2005), Stevenson & Fanshawe (2002), Thonnerieux (1988), Thonnerieux *et al.* (1989), Tréca *et al.* (1996), Urban & Brown (1971), Zimmerman *et al.* (1996).

62. Tanganyika Masked Weaver

Ploceus reichardi

French: Tisserin de Reichard **German**: Reichardweber **Spanish**: Tejedor de Reichard
Other common names: Tanzanian/Swamp Masked Weaver

Taxonomy. *Ploceus reichardi* Reichenow, 1886, Karema, east shore of Lake Tanganyika, Tanzania.
Has been thought to form a superspecies, or even to be conspecific, with *P. velatus*, *P. vitellinus*, *P. ruweti* and *P. katangae*, but molecular data suggest that it is close only to *P. katangae*. Monotypic.
Distribution. Local in W Tanzania and extreme NE Zambia.



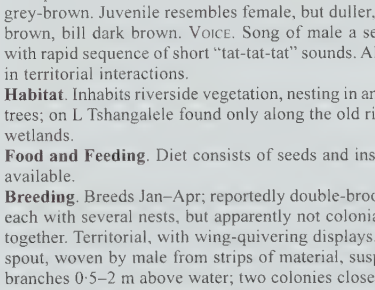
Descriptive notes. 14 cm. Male breeding has black forehead, lores, cheek, ear-coverts, chin and throat, black extending to a point on breast; crown dark chestnut-brown to behind eye, hindcrown and nape golden-yellow, mantle and back greenish-yellow, rump golden-yellow, tail greenish; upperwing brownish, remiges with narrow yellow margins, wing-coverts with broad yellow edges and yellow tips; breast and flanks chestnut-brown, thighs, centre of belly and undertail-coverts golden-yellow; iris red; bill black; legs brown. Female breeding has greenish-yellow upperparts, light streaking on head and mantle; yellow below, orange wash on breast; iris brown, bill and legs brown. Non-breeding plumages apparently undescribed. Juvenile resembles female. Voice. Song described as unmusical mixture of chattering and chirps with occasional trill. Also "click", "chuck" and rapid "chut-chut" calls.
Habitat. Swamps with papyrus (*Cyperus papyrus*), bulrushes (*Typha*) and *Phragmites* reeds, sometimes far from dry land; roosts in swamps.
Food and Feeding. Diet mainly grass seeds. Forages in woodland with termitaria; presumably takes termites (Isoptera).
Breeding. Breeds in Apr in Tanzania; probably Dec in Zambia. Probably polygynous. Males territorial, in colonies with up to 150 nests. Nest retort-shaped without entrance tunnel, tightly woven by male from narrow strips of grass blades, with distinct ceiling of grass strips, bowl lined with fine grass panicles and some feathers; suspended from bushes over water, or attached at side to single grass or reed stalks, 1·5–3 m above ground or water level. Clutch 2–3 eggs, either bluish with dark brown spots or greyish-olive with diffuse darker markings, average size of seven eggs 20·4 × 13·8 mm (Tanzania); no information on incubation and nestling periods. Some colonies in bushes were destroyed by feeding elephants.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Southwest Tanzanian Swamps Secondary Area. Very poorly known species, with apparently limited distribution. Current status at L Rukwa (Tanzania) uncertain; much of the area now falls within declared game reserves. Local people formerly collected nestlings for food; no information on whether this practice continues.
Bibliography. Aspinwall & Beel (1998), Beesley (1956), Benson (1955b), Chapin (1954), Collias, N.E. & Collias (1964), Dowsett & Dowsett-Lemaire (1993a), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Fishpool & Evans (2001), Fry & Keith (2004), Leonard & Beel (1999), Louette & Benson (1982), Stevenson & Fanshawe (2002), Vesey-Fitzgerald (1956).

63. Lufira Masked Weaver

Ploceus ruweti

French: Tisserin de Ruwet **German**: Ruwetweber **Spanish**: Tejedor de Ruwet
Other common names: Ruwet's Masked Weaver, Lake Lufira Weaver

Taxonomy. *Ploceus ruweti* Louette and Benson, 1982, Lake Lufira, DRCongo.
Has been thought to form a superspecies, or even to be conspecific, with *P. velatus*, *P. vitellinus*, *P. reichardi* and *P. katangae*; often treated as a race of *P. reichardi*. Molecular data suggest that its closest relative is *P. jacksoni*. Monotypic.
Distribution. L Tshangalele (formerly L Lufira) and Kiubo Falls, on R Lufira, in SE DRCongo.



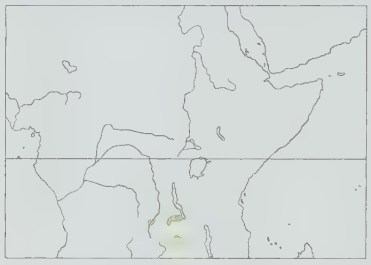
Descriptive notes. 13 cm; 17 g. Male breeding has black face mask covering forehead, crown, lores, cheek, ear-coverts, chin and throat; large yellow patch on nape, greenish streaking on mantle, rump pale yellow, tail olive-green; upperwing olive-green, pale yellow margins on remiges and wing-coverts; breast and flanks chestnut-brown, centre of belly, thighs and undertail-coverts yellow, rufous wash on undertail-coverts; iris reddish; bill black; legs grey-brown. Male non-breeding apparently undescribed. Female is greenish above, dull yellow below, underparts sometimes with brown wash; two wingbars apparent, more distinct pale bar on median coverts, indistinct bar on greater coverts; iris brown, bill greyish, legs grey-brown. Juvenile resembles female, but duller, more brown above and paler yellow below, iris brown, bill dark brown. Voice. Song of male a series of extended wheezing notes, some ending with rapid sequence of short "tat-tat-tat" sounds. Also short calls, one followed by a trill being used in territorial interactions.
Habitat. Inhabits riverside vegetation, nesting in ambatch (*Aeschynomene elaphroxylon*) and acacia trees; on L Tshangalele found only along the old river course in flooded trees, not in reedbeds and wetlands.
Food and Feeding. Diet consists of seeds and insects; young fed insects. No further information available.
Breeding. Breeds Jan–Apr; reportedly double-brooded. Probably polygynous; neighbouring males each with several nests, but apparently not colonial; 3–20 nests in some sites, typically 4–6 nests together. Territorial, with wing-quivering displays. Nest oval, with entrance below and little or no spout, woven by male from strips of material, suspended from a woven strip attached to ambatch branches 0·5–2 m above water; two colonies close to nests of the wasp *Ropalidia cincta*. Clutch 2 eggs in one nest, very pale green with brown spots, spots concentrated at thick end, one egg 19·4 × 13·9 mm; male seen to feed a fledgling. No other information.
Movements. Presumed to be mainly resident, although reported as moving away from the lake after breeding.
Status and Conservation. Data-deficient. Restricted-range species: present in Lake Lufira Secondary Area. Some recent observations suggest that present species may be locally common at L Tshangalele, while records of breeding birds observed at Kiubo Falls, c. 120 km downstream on R Lufira, imply that it may have a more extensive distribution in this river basin than was hitherto imagined.
Bibliography. Anon. (2009e), Barlow *et al.* (1997), Butchart & Stattersfield (2004), Dowsett & Dowsett-Lemaire (1993a), Fry & Keith (2004), Louette & Benson (1982), Louette & Hasson (2009), Ruwet (1965b), Stattersfield & Capper (2000).

64. Katanga Masked Weaver

Ploceus katangae

French: Tisserin du Katanga **German**: Katangaweber **Spanish**: Tejedor de Katanga

Taxonomy. *Sitagra velata katangae* Verheyen, 1947, Musosa, Zambia.
Has been thought to form a superspecies, or even to be conspecific, with *P. velatus*, *P. vitellinus*, *P. reichardi* and *P. ruweti*; formerly, often treated as a race of *P. velatus*. Molecular data suggest that it is close only to *P. reichardi*. Race *upembae* sometimes considered to represent a separate species; this is supported by some preliminary molecular data. Two subspecies currently recognized.
Subspecies and Distribution.
P. k. upembae (Verheyen, 1953) – SE DRCongo (R Lualaba).
P. k. katangae (Verheyen, 1947) – SE DRCongo (R Luapula) and N & W sectors of NE Zambia.



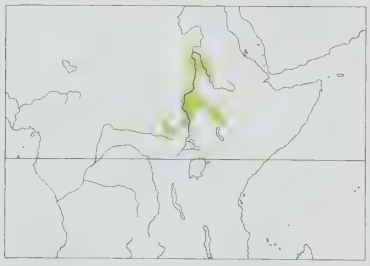
Descriptive notes. 13 cm; 16–21 g. Small weaver. Male nominate race breeding has black forehead, lores, cheek, ear-coverts, chin and throat, extending to breast as a bib; crown saffron-yellow, nape golden-yellow, mantle and back yellow-green with black shaft streaks, rump golden-yellow; tail olive green; upperwing olive-green, remiges with narrow yellow outer margins and yellow inner webs, wing-coverts edged yellow; breast, belly, flanks, thighs and undertail-coverts yellow; iris orange-red; bill black; legs brown. Male non-breeding has forehead to back, cheek and ear-coverts greenish-yellow, mantle streaked, rump brighter yellow; wings and tail as in breeding plumage; chin, throat, breast and flanks yellow, belly, thighs and undertail-coverts white; bill horn-coloured. Female breeding has narrow yellow supercilium; forehead, crown, cheek, ear-coverts and nape to back greenish-yellow, streaking on mantle, rump yellow; wings and tail olive-green; chin to undertail-coverts pale yellow; iris brown, bill horn-coloured. Female non-breeding is more olive above, underparts less yellow, with dull white belly, thighs and undertail-coverts. Juvenile resembles non-breeding female, but paler. Race *upembae* has longer bill than nominate, male with greenish nape, female with more olive wash on mantle. Voice. Song an extended chatter. "Chuk" contact calls.
Habitat. Wetlands and riverine vegetation with extensive reedbeds and papyrus (*Cyperus papyrus*); also in woodland some distance from water.
Food and Feeding. No information. Diet presumably seeds, at times supplemented with insects.
Breeding. Breeds Jan–Mar in DRCongo and Sept–Oct and Mar in Zambia. Presumably polygynous. In small colonies, but solitary nests also noted. Nest kidney-shaped with entrance below and no tunnel, in reeds or papyrus, or in tree or bush near water. Clutch 1–2 eggs, pale greenish to greenish-blue with very fine brown or chestnut-brown spotting, average size of nine eggs 19·2 × 13·5 mm (Zambia). No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Taxonomic status unclear, but very localized distribution and population numbers unknown. Occurs in several protected areas in Zambia.
Bibliography. Benson (1955b), Benson *et al.* (1971), Cotterill (2004, 2006), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Fishpool & Evans (2001), Fry & Keith (2004), Louette (1987b), Louette & Benson (1982).

65. Northern Masked Weaver

Ploceus taeniopterus

French: Tisserin du Nil **German**: Goldmantelweber **Spanish**: Tejedor del Nilo
Other common names: Sudan Masked Weaver

Taxonomy. *Ploceus taeniopterus* Reichenbach, 1863, Sudan.
Has hybridized with *P. melanocephalus* in NE DRCongo. Birds from Darfur (W Sudan) described as race *furensis*, but they fall within general range of plumage variation of the species. Monotypic.
Distribution. W, C & S Sudan, SW Ethiopia, NE DRCongo, and W Kenya (L Baringo and L Bogoria).



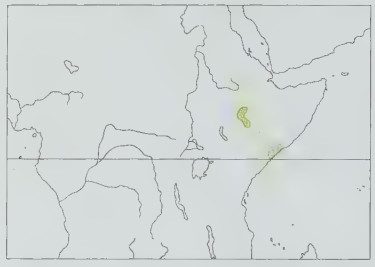
Descriptive notes. 13 cm; 20–27 g. Male breeding has black face from forehead back to just behind eyes and extending into bib on breast, bordered with dark chestnut-brown on crown and throat; nape golden-yellow, mantle and back greenish-yellow, rump yellow; tail olive-green, rectrices with yellowish margins; upperwing brown, remiges with narrow yellow edges, tertials and wing-coverts with broad yellow edges; breast chestnut-brown in centre, rest of underparts golden-yellow; iris dark brown; bill black; legs brown. Male non-breeding has olive-green head with whitish chin and throat, yellow supercilium; mantle and back brown with prominent black streaks, rump buffy brown; tail and wings as in breeding; breast and flanks buff, centre of belly white, thighs and undertail-coverts white with yellow wash; iris brown, black upper mandible, horn-coloured lower mandible. Female resembles non-breeding male, but whitish wingbars, narrow whitish to pale yellow edges to remiges, underparts paler, tail grey-brown. Juvenile is like female, but has broad buffy edges on wing-coverts, grey iris. Voice. Song hesitant and jerky, with unmusical terminal flourish. Harsh, grating alarm call reminiscent of that of Great Reed-warbler (*Acrocephalus arundinaceus*).
Habitat. Tall grassland with scattered acacia trees (*Acacia*); along larger rivers, and swamps. Below 1500 m.
Food and Feeding. Diet primarily seeds, including those of cultivated sorghum and millet; also insects. Stomach contents included beetle (Coleoptera), cockroach (Blattodea) and fragment of snail shell (Mollusca). Nestlings fed initially with insects. Outside breeding season forages in flocks, sometimes with *P. galbula*, and forms large roosts in marshes, away from nesting areas.
Breeding. Breeds Aug–Oct in Sudan, Jul–Nov in DRCongo and May–Sept in Kenya. Polygynous. Colonial, in small groups of up to ten nests or larger colonies with more than 30 nests. Nest oval, with entrance below, no tunnel, outer shell woven by male from strips of grass, thick inner layer of broad grass strips and ceiling of grass heads, lining of plant or papyrus (*Cyperus papyrus*) down on floor probably contributed by female; supported by vertical stems of reeds, grass or papyrus. Clutch 2–3 eggs, sage-green to brown, plain or spotted with brown and red-brown, 19·7 × 14 mm; incubation of eggs and feeding of chicks by female alone; no information on duration of incubation and nestling periods. Last-hatched chick in clutch often died of starvation. Intraspecific brood parasitism regular at some colonies.
Movements. Presumed resident, with small local movements.
Status and Conservation. Not globally threatened. Common to abundant in Sudan. Occurs in many isolated and sparsely populated areas. In the past, large flocks caused damage to crops in Sudan. Present in some protected areas in Kenya.
Bibliography. Britton (1980), Butler (1905), Cave & Macdonald (1955), Chapin (1932, 1954), Collias, N.E. & Collias (1964), Fry & Keith (2004), Jackson (1992a, 1992b, 1993, 1998), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1924), McCarthy (2006), Nikolaus (1987), Stevenson & Fanshawe (2002), Urban & Brown (1971), Zimmerman *et al.* (1996).

66. Juba Weaver

Ploceus dicrocephalus

French: Tisserin de Salvadori **German**: Gelbrückenweber **Spanish**: Tejedor de Salvadori
Other common names: Jubaland/Salvadori's/Yellow-backed Weaver

Taxonomy. *Hyphantornis dicrocephala* Salvadori, 1896, Somalia.
Has been thought possibly to form a superspecies with *P. melanocephalus*. Monotypic.
Distribution. S Ethiopia, extreme NE Kenya and SW Somalia.



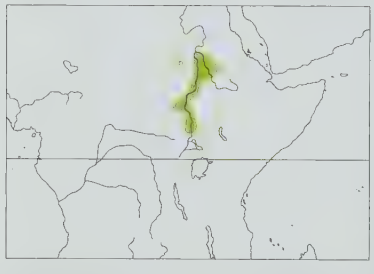
Descriptive notes. 13 cm; 18–20 g. Male breeding has blackish-brown head turning to bright maroon on nape and neck, mantle and back greenish-yellow, rump bright yellow; tail olive-green, rectrices with yellow fringes; upperwing olive-brown, remiges with narrow yellow edges, tertials and wing-coverts with broad yellow margins; dark bib on throat blends into rich orange-chestnut on breast and flanks; centre of belly, thighs and undertail-coverts yellow; iris deep red-brown to red; bill black; legs flesh-coloured. Male non-breeding and female have forehead, crown and nape dull olive-brown, mantle and back olive-brown with indistinct dark streaks, rump light brown; wings and tail olive-green, remiges and rectrices with narrow yellow margins, inner webs of remiges broad yellow, wing-coverts with yellow-buff margins; buff supercilium, light brown cheek and ear-coverts; chin and throat whitish, breast white with buffy wash, belly, flanks, thighs and undertail-coverts dull white with buffy wash; iris brown, dark brown upper mandible, light brown lower mandible. Juvenile resembles female, but with browner upperparts, buffy wash on underparts. Voice. Song described as rambling and unmusical, with squeaky, snoring and buzzing notes.
Habitat. Riverine bush in Kenya and Somalia; in Ethiopia savanna, even in semi-desert areas, and *Acacia–Commiphora* thornbush. Below 1500 m.
Food and Feeding. Diet seeds, probably also insects. Generally in pairs and small groups.
Breeding. Breeds in Mar in Ethiopia. Probably polygynous. Colonial, nesting in small groups in trees or reeds. Nest oval, with virtually no entrance tunnel, woven from grass, lined with fine grass, suspended from tip of branch or at side from a single reed. Clutch 2 eggs, pale greenish-blue or greyish-green, spotted with brown and lilac, size 20·5 × 14·5 mm (one egg from Ethiopia). No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Jubba and Shabeelle Valleys EBA. Locally common; uncommon in Somalia. No known breeding records for Kenya or Somalia. Very little known; occurs in sparsely populated regions. Present in Babelle Elephant Sanctuary, in Ethiopia, and recorded in Balcad Nature Reserve, in Somalia.
Bibliography. Ash & Miskell (1998), Benson (1947a), Fishpool & Evans (2001), Fry & Keith (2004), Lewis & Pomeroy (1989), Stevenson & Fanshawe (2002), Urban & Brown (1971), Zimmerman *et al.* (1996).

67. Cinnamon Weaver

Ploceus badius

French: Tisserin cannelle **German**: Schulterfleckenweber **Spanish**: Tejedor Canela

Taxonomy. *Hyphantornis badius* Cassin, 1850, Fazogli, Sudan.
Has been thought to form a superspecies with *P. rubiginosus*. Birds from S of range sometimes separated as race *axillaris* (described from Shambe district of White Nile). Monotypic.
Distribution. E & S Sudan (on Nile floodplain).



Descriptive notes. 14 cm. Male breeding has forehead and crown, lores, cheek, ear-coverts, chin and throat black, extending as bib onto breast; nape and upperparts dark chestnut-brown, tail dull olive-green; upperwing dark brown, remiges with narrow yellow outer margins and broad yellow inner webs, wing-coverts with yellow or sometimes chestnut-brown margins; breast dark chestnut-brown around black bib, paler at side, flanks chestnut-brown, belly golden-yellow with chestnut streaking, thighs and undertail-coverts yellow; individuals vary in amount of yellow on chestnut underparts and upperparts; iris brown; bill black; legs light fleshy-brown. Non-breeding male and female have forehead, crown and nape olive-green, mantle and back buffy brown with broad central streaks, rump plain buffish, tail olive-green; wings dark brown, remiges with narrow yellow outer margins and broad yellow inner webs, wing-coverts with broad yellow (sometimes chestnut-brown) margins on wing-coverts; lores black, cheek and ear-coverts buffy brown; chin and throat white, breast, flanks and belly buffy brown, except for white centre of belly; thighs and undertail-coverts white; iris red-brown to brown, upper mandible black, lower mandible horn. Juvenile resembles female, but with crown and mantle paler, rump greener, chin and throat washed yellow, underparts dull white, bill horn-brown. Voice. Vocalizations undescribed; reputedly noisy.
Habitat. Tall grassland near rivers, with some bushes and scattered trees.

Food and Feeding. Diet seeds; no details recorded. Gregarious, in small flocks in non-breeding season; roosts communally in tall trees with dense foliage.
Breeding. Breeds Sept–Oct. Possibly monogamous. Colonial. Nest roughly globular, with entrance at one side near top, closely woven from grass blades and strips torn from sorghum leaves, placed 1·5–2 m above ground or water, supported by vertical stems, in tall grass in flooded areas. Clutch 2–3 eggs, ground colour varying from off-white to brown, green and blue, lightly or heavily spotted with black, grey, brown, purple and reddish, average size 22 × 16 mm. No other information.
Movements. Nomadic, returning seasonally to breeding areas.
Status and Conservation. Not globally threatened. Locally common to abundant. Occurs in some protected areas, although heavy hunting pressure reported in Bandingilo National Park.
Bibliography. Cave & Macdonald (1955), Cunningham-van Someren (1971d), Fishpool & Evans (2001), Fry & Keith (2004), Heuglin (1870–1871), Nikolaus (1987, 1989).

68. Clarke's Weaver

Ploceus golandi

French: Tisserin de Clarke **German**: Golandweber **Spanish**: Tejedor de Clarke

Taxonomy. *Heterhyphantes golandi* S. R. Clarke, 1913, Mombasa, Kenya.
Has been thought to form a superspecies with *P. weynsi*. Monotypic.
Distribution. Coastal SE Kenya (vicinity of Malindi).



Descriptive notes. 13 cm; male 23–27 g, female 21–25 g. Male has black head to back and down to breast, rump bright olive-green with yellow feather fringes; tail dark olive-green; upperwing blackish-brown, broad yellow margins on wing-coverts (forming two prominent bars on folded wing); black breast rather sharply demarcated from yellow belly, increasingly mingled with white on rear underparts, thighs black; iris dark brown; bill black; legs light brown. Female has forehead, crown and nape bright olive-green, narrow yellow supercilium; mantle and back olive-green with black central streaks, rump plain olive-green, tail dark olive-green, wings blackish-brown with yellow margins on wing-coverts; lores, cheek and ear-coverts dull yellow, chin, throat and breast bright yellow, olive-green patch on side of breast; belly and flanks white, streaked with yellow, thighs grey with yellow streaks, undertail-coverts white; iris brown, bill horn-grey. Juvenile resembles female in pattern, but dull greenish above with little streaking, whitish washed with yellow below, bill brown. Voice. Song not described. Chattering and sizzling sounds, or insistent "sss sss" calls from foraging flocks; sharp "chip chip" calls in flight.
Habitat. Coastal forest; most frequent in miombo (*Brachystegia*) woodland.
Food and Feeding. Diet insects such as beetles (Coleoptera), caterpillars (Lepidoptera) and scale insects (Coccoidea); also fruits of *Loranthus*, *Brachystegia spicifomis*. Forages mostly in canopy. Feeding flocks of up to 30, occasionally more than 100 individuals. Sometimes in mixed-species flocks with Common Scimitarbill (*Rhinopomastus cyanomelas*), Eastern Black-headed Oriole (*Oriolus larvatus*), Black Cuckoo-shrike (*Campephaga flava*) and *P. bicolor*; often associated with Retz's (*Prionops retzii*) and Chestnut-fronted Helmet-shrikes (*Prionops scopifrons*).
Breeding. No definite information recorded; nest and eggs undescribed. Juveniles recorded in Apr and Jul–Aug, and male in breeding condition in Sept. It is speculated that nests may be solitary, high in trees, perhaps at start of rains (Feb–Mar).
Movements. Presumed resident. Observed most often in Aug–Mar, with few records Dec–Feb, suggesting possible local movement.
Status and Conservation. ENDANGERED. Restricted-range species: present in East African coastal forests EBA. Global population estimated in early 1980s at fewer than 4000 individuals, and no assessment since then; presumed declining. Has very small and fragmented range, within which woodland clearance for cultivation continues, accompanied by habitat modification through selective tree-cutting. Most records from Arabuko-Sokoke Forest Reserve, where area of c. 350 km² occupied by this species; recorded also farther N, in Dakatcha area (N of R Sabaki, near Malindi), and from E edge of Galana Ranch E to Marafa and Hadu. Possibly not a breeder in Arabuko-Sokoke Forest, where appears to be largely absent during Apr-Jul, but returns with young in Aug; thereafter observed regularly until Nov, but few records Dec-Feb. Thought to have bred in area N of R Sabaki in 1994 (many juveniles observed near Dakatcha in mid-Jul). Woodland clearance the main threat to the species; hilltops at Dakatcha being extensively cleared for fruit cultivation, and in same area woodland being damaged by cutting for fuelwood and for carving material; at Arabuko-Sokoke, continuing forest degradation through illegal logging and licensed wood removal a serious problem, and some political pressure for removal of protection of the Kararacha–Mpendakula section. Main stronghold considered to be Arabuko-Sokoke forest, where a long-term conservation project involving local communities is underway.
Bibliography. Anon. (2009e), Britton & Zimmerman (1979), Butchart & Stattersfield (2004), Clancey & Williams (1959), Collar & Stuart (1985), Fishpool & Evans (2001), Fry & Keith (2004), Short & Horne (1985), Stattersfield & Capper (2000), Stevenson & Fanshawe (2002), Taylor (1984), Williams (1957b), Zimmerman *et al.* (1996).

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PLATE 8

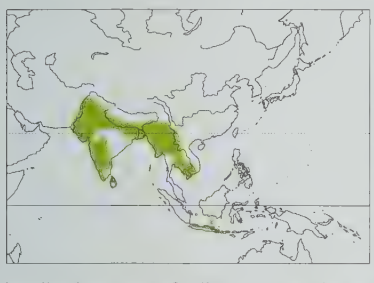


69. **Streaked Weaver**

Ploceus manyar

French: Tisserin manyar **German**: Manyarweber **Spanish**: Tejedor Estriado
Other common names: Striated/Manyar Weaver

Taxonomy. *Fringilla manyar* Horsfield, 1821, Java.
Old report of hybridization in captivity with *P. philippinus*. Four subspecies recognized.
Subspecies and Distribution.
P. m. flaviceps (Lesson, 1831) – C & SE Pakistan, India (Punjab, Gujarat, and scattered records E to West Bengal) and SE Nepal, S to E Sri Lanka.
P. m. peguensis Stuart Baker, 1925 – NE India (West Bengal, Assam), Bangladesh, SE Bhutan, N & C Myanmar, S China (W Yunnan) and N Laos.
P. m. williamsoni B. P. Hall, 1957 – NW, C & SE Thailand, Cambodia and S Vietnam.
P. m. manyar (Horsfield, 1821) – Java, Bawean (off N Java) and Bali.
Introduced in N Egypt (Nile Delta); apparently introduced in Japan.



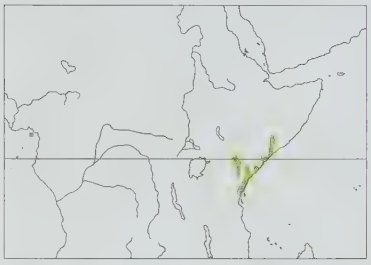
Descriptive notes. 15 cm; 16–22 g. Male nominate race breeding has forehead and crown golden-yellow, sharply demarcated from blackish-brown lores, cheek, ear-coverts, chin and throat; nape to back feathers brown with rusty-coloured edges, rump feathers rust-brown with narrow central streaks; tail and upperwing dark brown, remiges with yellow margins, wing-coverts with pale edges; breast and belly creamy white in centre, sides and flanks rust-coloured, dark brown streaking throughout; thighs buffy with dark streaking, undertail-coverts creamy white; iris dark brown; bill black; legs pinkish-flesh. Male non-breeding loses most of yellow on crown, has supercilium yellow, cheek brown, chin and throat yellowish but streaked; bill pinkish-horn. Female breeding similar to non-breeding male but less boldly patterned: crown and nape dull brown with dusky streaks; supercilium and patch on side of neck yellow, lores and ear-coverts greyish lightly streaked with dusky brown, short darker dusky brown moustachial stripe enhanced by pale yellowish crescent beneath eye and by similarly coloured submoustachial area; chin and throat pale yellowish buff, sometimes separated from submoustachial area by dusky-brown stripe; bill horn-colour to fleshy-orange; legs pinkish-flesh. Female non-breeding has forehead and crown dark brown, prominent yellow supercilium, yellow fleck below grey-brown ear-coverts; chin and throat creamy white. Juvenile resembles non-breeding female, but with buffy wash over plumage, less heavily streaked, yellow-brown bill. Races differ mainly in details of male breeding plumage: *flaviceps* has face mask and streaking black, rather than brown, crown paler yellow, ground colour of breast and flanks paler; *peguensis* has very heavy black streaking, breast and flanks intermediate in colour between nominate and previous; *williamsoni* also is intermediate in coloration, with side of head and streaking brown, rather than black. Voice. Song a soft, continuous trill of high-pitched whistles, ending in wheezy note. Different song, rendered "tililileekitee, tililileekitee", when female approaches nest; one singing male may set off chorus through whole colony. Displaying males often call "tre tre cherrer cherrer" in unison; flight call of flock-members a loud "chirt-chirt".
Habitat. Wetlands, reedbeds and rice paddies, often with bulrushes (*Typha*); associated especially with elephant grass.
Food and Feeding. Diet primarily seeds, including those of the grasses *Echinochloa colonum* (preferred by captives in feeding trials) and *Phalaris minor*, rice (*Oryza*), wheat (*Triticum*), millet and sorghum. Young fed chiefly with animal food, mainly insects, with grasshoppers (Orthoptera) major item, also caterpillars (Lepidoptera), beetles (Coleoptera), spiders (Araneae), and small snails (Gastropoda). Forages in flocks, often with other ploceids; forms daytime roosts near feeding grounds in hottest months; in non-breeding season, communal roosts in reedbeds and sugar cane (*Saccharum*); in Punjab, roosts shared with *P. philippinus* and *P. benghalensis* along with waxbills (Estrildidae), starlings (Sturnidae) and other species.
Breeding. Breeds Jun–Sept in Pakistan and India (in S India, nesting dependent on rainfall and suitable growth of bulrushes), Feb–Apr and Jul–Oct in Sri Lanka, Jun–Oct in Myanmar and Mar–May in Java; introduced population breeds in May in Egypt, and nest-building recorded Apr–May (but no eggs laid) in Saudi Arabia. Apparently monogamous, with occasional polygyny. Colonial, 15–50 nests at site in Java; often in mixed colonies with *P. benghalensis* in India, and found also nesting alongside Tricoloured Mannikin (*Lonchura malacca*). Flight displays over territory accompanied by song. Nest retort-shaped, woven on to leaves of supporting plants, sometimes with entrance tunnel as long as 30 cm (may be absent), entrance facing downwards, woven by male from strips of reed or palm leaves, female assists later and adds lining of fine grass stems (some nests with eggs apparently unlined), nest placed up to 2 m above water surface in reeds and bulrushes, or in elephant grass, sometimes in palm (favoured site in Java), or on mangrove close to human habitation, and in some areas suspended from vegetation growing out of sides of irrigation wells; small lumps of mud or clay applied to sides of entrance of many nests, perhaps to anchor loose ends of material, and yellow flowers (e.g. of *Acacia arabica*) sometimes affixed to mud blobs or wet buffalo dung, or placed elsewhere on nest; nesting near wasps (Hymenoptera) reported from India; deserted nests used for breeding by Indian Silverbill (*Euodice malabarica*), also occupied by long-tailed tree mouse (*Vandeleuria oleracea*). Clutch 2–3 eggs, white, average size of 50 eggs 20·3 × 14·3 mm; incubation shared by male initially, then done by female alone, period 14–17 days; chicks fed by both sexes, male contributing once nestlings c. 10 days old, nestling period c. 17–18 days. Of 70 eggs in colony in N India (Kumaon Terai), 73% hatched and 64% produced fledglings; snakes and crows (Corvidae) significant nest predators, and changeable lizard (*Calotes versicolor*) recorded as preying on eggs; in reedbeds, many nests destroyed by grazing cattle and by people harvesting reeds.
Movements. Leaves nesting areas after breeding; extent of movements not known.
Status and Conservation. Not globally threatened. Common to locally abundant. Huge flocks reported around L Inle, in EC Myanmar. In some regions causes significant damage to rice crops; one of the species implicated in grain losses in Punjab region of N Indian Subcontinent. Introduced (probably race *flaviceps*) successfully in Nile Delta region of N Egypt, where breeds regularly; apparently introduced also in Japan. Breeding recorded also in Saudi Arabia, United Arab Emirates and Bahrain, presumably by escaped captives.
Bibliography. Ali & Ripley (1999), Ambedkar (1972a), Betts (1952), Choudhury (2003), Cramp & Perrins (1994), Crook (1963a), Dhindsa (1983, 1986), Dhindsa & Sandhu (1988), Dhindsa & Toor (1981, 1983, 1990), Dhindsa *et al.* (1985), Eguchi & Amano (2004), Fry & Keith (2004), Goodman & Meininger (1989), Grimmett *et al.* (1999), Hellebrekers & Hoogerwerf (1967), Hoogerwerf (1949b), Hoogerwerf & Rengers Hora Siccama (1938), Hutson (1947), Lever (2005), MacKinnon & Phillipps (2000), McCarthy (2006), Meininger & Sorensen (1984), Moreau (1936), Phillips (1948), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Saha (1976), Sarson & Athendriou (1992), Sharma (1997), Smythies (1986), Spennemann (1937), Srinivasulu *et al.* (2000), Toor *et al.* (1986).

70. **Golden Palm Weaver**

Ploceus bojeri

French: Tisserin palmiste **German**: Palmenweber **Spanish**: Tejedor Palmero
Other common names: Palm Weaver

Taxonomy. *Hyphantornis bojeri* Cabanis, 1869, Mombasa, Kenya.
Monotypic.
Distribution. SE Somalia, coastal Kenya (extending inland along rivers) and coastal NE Tanzania.



Descriptive notes. 14 cm; 17–29 g. Male has most of head down to throat orange, bordered by chestnut-brown crescent on breast (better defined on some specimens than on others), nape olive-yellow becoming greenish-yellow on mantle and back, rump yellowish; tail greenish, rectrices with yellow fringes; upperwing olive-green, remiges with yellow outer margins and vivid yellow inner webs, wing-coverts with broad yellow edges, median coverts with yellow tips; entire underparts below brown breast-crescent golden-yellow; iris deep brown; bill black; legs pinkish-flesh. Female has forehead, crown, nape, cheek and ear-coverts greenish-yellow, yellow supercilium; mantle greenish with faint streaking, rump yellowish; tail greenish with yellow margins on rectrices, wings olive-green with yellow margins as on male; uniformly yellow below; dark brown upper mandible, lighter brown lower mandible. Juvenile resembles female, but with paler yellow underparts and more streaking on mantle. Voice. Song described as a series of creaking notes, "eee-urr-twa-twee-twu". Low-pitched chattering from birds in colonies; other calls include grating "jyip", liquid "ti-tye", hissing "tssss" and aggressive "kik! kik!".
Habitat. Palm savanna on coast, also riverine vegetation, extending into savanna in regions below 1200 m and with more than 500 mm annual rainfall.
Food and Feeding. Diet seeds and insects. Gregarious.
Breeding. Breeds in all months (peaks Oct and Jan) in Kenya, but May–Oct in Mombasa; May–Jul in Somalia, and Jun and Dec–Apr in Tanzania. Probably polygynous. Colonial; found in mixed colonies with *P. cucullatus* and alongside *P. subaureus*. Nest spherical, with no entrance tunnel, woven by male from strips of grass or palm frond, lined by female with leaf fragments and fine grass-heads, suspended low (less than 2 m) over water from tree branch, or attached 1·5–4 m above ground to tall grass or bush, often on underside of palm frond and then sometimes more than 10 m above ground; also built in bulrushes (*Typha*), bamboos and, less often, in *Phragmites* reeds. Clutch 2 eggs, sea-green with grey or reddish mottling, or white overlaid with fawn-brown, average size of twelve eggs 21·1 × 14·3 mm (Kenya); no information on incubation and nestling periods. Introduced House Crow (*Corvus splendens*) a major nest predator; one colony in Mombasa abandoned after repeated raids.
Movements. Presumed resident, with some local wandering away from breeding areas.
Status and Conservation. Not globally threatened. Locally common. Old records from upper R Jubba, in SE Ethiopia. Reported as damaging ripening crops in Somalia.
Bibliography. Ash & Miskell (1998), Bowen (1931a), Britton & Britton (1986), Brown & Britton (1980), Bruggers (1980a, 1980b), Collias, N.E. & Collias (1964), Fry & Keith (2004), Granvik (1923), Jeffrey (1930), Lewis & Pomeroy (1989), Moreau & Moreau (1937), Peters & Loveridge (1936), Ryall (1992), Schuster (1926), van Someren (1916), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

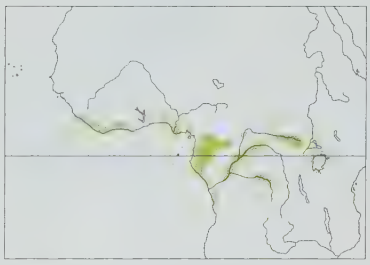
71. **Orange Weaver**

Ploceus aurantius

French: Tisserin orangé **German**: Königsweber **Spanish**: Tejedor Anaranjado

Taxonomy. *Malimbus aurantius* Vieillot, 1805, Malembo, Cabinda, Angola.
Relationships uncertain; has been thought to be closest to *P. princeps*. Two subspecies recognized.
Subspecies and Distribution.
P. a. aurantius (Vieillot, 1805) – SE Sierra Leone E along coast (including some offshore islets) to SE Ghana, S Togo and S & SE Nigeria, W & S Cameroon, Equatorial Guinea, Gabon (coast and Ivindo Basin), S Central African Republic, PRCongo (mainly coast and R Congo region), coast and rivers in DRCongo (E discontinuously to upper Uele and Semliki Valley, and middle R Sankuru), and coastal N Angola (Cabinda S to Luanda).
P. a. rex Neumann, 1908 – S Uganda, extreme W Kenya and NW Tanzania in L Victoria basin.
Descriptive notes. 14 cm; 21–29 g. Male nominate race has head to nape and breast orange, black loral line; mantle and back olive-green, rump orange-yellow, tail olive-brown; upperwing dark brown, feathers edged variably warm olivaceous-yellow, remiges with narrow edges, wing-coverts with broader edges and tips; uniformly orange-yellow to orange below, often deeper reddish on chin and throat; iris deep red to medium brownish-grey; bill blackish to grey-horn; legs grey-flesh to fleshy-pink. Female has forehead, crown and nape yellowish-green, mantle and back olive-green, rump yellowish, tail olive-brown; wings dark brown, narrow orange outer margins on remiges, broader edges on wing-coverts and orange tips on primary coverts; lores, cheek and ear-coverts dull yellow; chin to breast white with yellow wash, belly and undertail-coverts dull white, flanks and thighs grey; iris

On following pages: 72. Taveta Golden Weaver (*Ploceus castaneiceps*); 73. Kilombero Weaver (*Ploceus burnieri*); 74. Southern Brown-throated Weaver (*Ploceus xanthopterus*); 75. Nelicourvi Weaver (*Ploceus nelicourvi*); 76. Sakalava Weaver (*Ploceus sakalava*); 77. Sao Tome Weaver (*Ploceus sanctithomae*); 78. Speke's Weaver (*Ploceus spekei*); 79. Fox's Weaver (*Ploceus spekeoides*); 80. Principe Golden Weaver (*Ploceus princeps*).



deep brownish-red, upper mandible grey to brown, lower mandible paler. Juvenile is olive-green above, including cheek and ear-coverts, with prominent yellow supercilium, wings dark brown, remiges with greenish-yellow outer margins and yellow inner webs, white below, washed with yellow in throat region only, iris brown, bill horn-brown. Race *rex* is very like nominate, but male has larger black area in front of eye. Voice. Song a rambling series of notes, musical in quality, lacking harshness of many other weaver songs; both short song and long song recorded, long song used in nest advertisement. Call a loud "kew-kewp".

Habitat. Mangroves, thickets in coastal lagoons and estuaries in W Africa, inland along major rivers; papyrus (*Cyperus papyrus*) swamps around L Victoria. From sea-level to 1200 m.

Food and Feeding. Fruit (berries, fruit pulp and seeds in stomach contents); also insects, including adults and eggs of locusts (Acrididae), beetles (Coleoptera), caterpillars (Lepidoptera). Usually in pairs or small groups.

Breeding. Breeds in Oct–Apr in Liberia, Jun–Jul in Ghana and Togo, Feb, Jun, Sept and Nov–Dec in Nigeria, Oct–Mar in Gabon, Dec and Feb in PRCongo, possibly all months in DRCongo (Apr–Sept in Ituri, Jan in Itombwe), and Feb–May in Uganda. Presumably polygynous. Colonial, with several hundred nests at some sites, also isolated single nests; sometimes in palms and other trees with *P. nigerrimus* and *P. cucullatus*, in Uganda with *P. jacksoni* and *P. castanops*. Nest built by male, ovoid, no entrance tunnel in W Africa, short tunnel in Uganda, tightly woven from grass or palm strips, placed 1·5–3 m above water in reeds or similar, up to 5 m over land in tree or bush; on offshore islets, low down in shrub on leeward side. Clutch 2 eggs, pale blue, green, brown or sometimes reddish, with fine lilac and brown spotting, denser at thick end, average size 21 × 14·5 mm (Uganda); incubation by female, in captivity period 13–14 days; nestling period in captivity 13–16 days.

Movements. Presumed resident; individuals on offshore islets commute to mainland for foraging.

Status and Conservation. Not globally threatened. Locally common to not uncommon. Wide distribution, but often localized, and uncommon in many parts.

Bibliography. Bannerman (1949), Barlow *et al.* (1997), Borrow & Demey (2001), Brickell & Konigkramer (1997), Brosset & Erard (1986), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Crook (1969), Dean (2000), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry & Keith (2004), Gatter (1997), Gatter & Hodgson (1987), Germain *et al.* (1973), Grimes (1987), Lewis & Pomeroy (1989), Lippens & Wille (1976), Ortman (1967), Prigogine (1971), Rand *et al.* (1959), Reichenow (1894, 1903), Sassi (1925), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1985), Zimmerman *et al.* (1996).

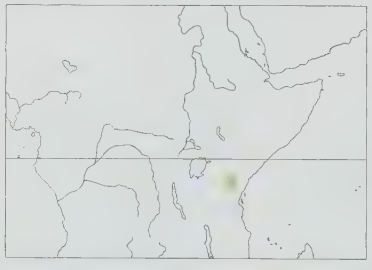
72. Taveta Golden Weaver

Ploceus castaneiceps

French: Tisserin de Taveta **German**: Genickbandweber **Spanish**: Tejedor Taveta
Other common names: Taveta Weaver

Taxonomy. *Hyphantornis castaneiceps* Sharpe, 1890, Taveta, Kenya.
Monotypic.

Distribution. SC Kenya and NE Tanzania.



Descriptive notes. 14 cm; 18–24 g. Male has forehead and most of crown yellow-orange, chestnut-orange collar on hindcrown linked to band around breast, nape golden-yellow; mantle and back olive-yellow, rump yellow, tail greenish-yellow; upperwing olive-green, remiges with narrow yellow margins, tertials and wing-coverts with broader yellow margins, median coverts tipped yellow; chin and throat golden-yellow, upper breast with band of chestnut-orange, rest of underparts golden-yellow; iris deep red-brown; bill black; legs fleshy-grey to pink-flesh. Female has forehead to nape greenish-yellow, yellow supercilium; mantle and back greenish with dark streaks, rump yellow, tail greenish-yellow; wings olive-green, narrow yellow margins on remiges, broader margins on wing-coverts, median coverts tipped yellow; lores, cheek and ear-coverts buffy yellow; chin to breast pale yellow, belly off-white with some yellow streaks, flanks buffy grey, upper thighs olivaceous, lower thighs and undertail-coverts dull white with yellow wash; bill dark grey above, flesh-coloured below. Juvenile resembles female, but browner on upperparts, buffy on breast and flanks, bill has yellowish-white lower mandible. Voice. Song a low-pitched twittering, "cree-er-curee-twee-twee", described as simple, harsh, and tuneless. Contact call a grating "jet" or "jick".

Habitat. Swampy lowland areas when breeding; otherwise found in adjacent drier bush country. Below 1500 m.

Food and Feeding. Seeds, including grass seeds and maize (*Zea mays*); also insects, including ants (Formicidae), in stomach contents. Gregarious.

Breeding. Breeds Oct–May in Kenya, and Sept–Jan and Apr–May in Tanzania. Presumed polygynous. Colonial. Nest spherical or ovoid, woven from strips of reed leaf blades, suspended over water in reeds, bulrushes (*Typha*) or overhanging tree. Clutch 3 eggs, olive-green with fine darker flecks, one measured 23 × 16 mm; in captivity, incubation period 13 days and nestling period 16 days.

Movements. Presumed resident, but breeding areas deserted for extended periods.

Status and Conservation. Not globally threatened. Locally common to very common. Very localized, but large numbers present at sites where it does occur.

Bibliography. Beesley (1973), Brickell & Konigkramer (1997), Brown & Britton (1980), Fry & Keith (2004), Lewis & Pomeroy (1989), Sclater & Moreau (1933), Sjöstedt (1910), Stevenson & Fanshawe (2002), Wilkinson & McLeod (1994), Zimmerman *et al.* (1996).

73. Kilombero Weaver

Ploceus burnieri

French: Tisserin de Burnier **German**: Kilomberoweber **Spanish**: Tejedor de Kilombero

Taxonomy. *Ploceus burnieri* N. E. Baker and E. M. Baker, 1990, Kilombero River, Tanzania.
Monotypic.

Distribution. SC Tanzania.



Descriptive notes. 13 cm; male 17–21 g, female 14–17 g. Male breeding has yellow head, washed tawny-orange on forehead and crown, lores, cheek, chin and throat black with chestnut-orange margin, forming bib on upper breast; mantle and back olive-green, rump yellow, tail olive-green; upperwings grey-brown, remiges with narrow yellow edges, wing-coverts with yellow tips (forming bars on closed wing); neck and underparts yellow, with orange wash on chest; iris deep brown; bill black; legs brownish-grey to pale pinkish-flesh. Male non-breeding apparently not described. Female breeding has forehead, crown and nape olive-brown with darker feather centres, narrow pale buff supercilium; mantle and back dull olive, more heavily streaked than crown, rump plain brown with greenish tinge and only faint streaking, tail olive-green; wings grey-brown, paler margins on wing-coverts; cheek, ear-coverts, chin and throat buffy yellow, breast rich buff, belly, flanks and undertail-coverts whitish-buff, thighs buff; upper mandible dark grey, lower mandible flesh-coloured. Female non-breeding undescribed. Juvenile undescribed. Voice. Song reported as rambling, including chips and squeaks. Contact call "chuk", harsher in alarm.

Habitat. Seasonally flooded grasslands in river floodplain, below 300 m; occurs in extensive riverside swamps with tall fringing beds of *Phragmites* reeds, generally away from trees.

Food and Feeding. Grass seeds recorded in stomach contents; dried fish and domestic refuse also taken. Forages in groups; seen to feed on the ground before flooding.

Breeding. Breeds Dec–Feb. Probably polygynous. Colonial, with up to 30 nests together, but solitary nests also noted. Nest oval, with downward-pointing entrance, woven by male from grass strips, attached by side to reed at point 2–3 m above ground (closer to water when habitat flooded); after accepting nest, female apparently adds further material. Clutch 1–2 eggs, olive-brown to turquoise with light brown markings, mean of three eggs 20 × 13·9 mm. No other information.

Movements. Presumed resident.

Status and Conservation. VULNERABLE. Restricted-range species: present in Kilombero Floodplain Secondary Area. Locally common. Has very small global range, limited to area of less than 1500 km² in seasonally flooded grasslands of R Kilombero floodplain, where distribution patchy. Habitat threatened by expanding agriculture, grazing and increase in cultivation, also by burning in order to clear fields and to promote new grass growth for livestock; plans for further large-scale sugar cane cultivation a potential threat, as is expansion of rice-growing in the area. Possible adverse effects of increased use of fertilizer and pesticides not studied, but could be significant. Because it has such a small total range, this species could suffer a drastic population decline; its numbers should be monitored.

Bibliography. Anon. (2009e), Baker & Baker (1990), Butchart & Stattersfield (2004), Fishpool & Evans (2001), Fry & Keith (2004), Hinkelmann (1991), Stattersfield & Capper (2000), Stevenson & Fanshawe (2002).

74. Southern Brown-throated Weaver

Ploceus xanthopterus

French: Tisserin à gorge brune **German**: Braunkehlweber **Spanish**: Tejedor Gorjipardo Sureño
Other common names: Brown-throated (Golden) Weaver

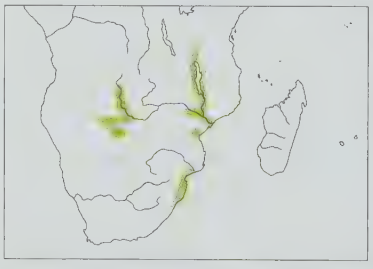
Taxonomy. *Hyphantornis xanthopterus* Hartlaub and Finsch, 1870, Shire Valley, Malawi.
Three subspecies recognized.

Subspecies and Distribution.

P. x. castaneigula (Cabanis, 1884) – W Zambia, NE Namibia (Caprivi region), N Botswana and extreme W Zimbabwe.

P. x. xanthopterus (Hartlaub & Finsch, 1870) – SW Tanzania, Malawi, N & C Mozambique and extreme NE Zimbabwe.

P. x. marleyi (Roberts, 1929) – S Mozambique (S of R Save) and coastal NE South Africa.



Descriptive notes. 15 cm; male 22–31 g, female 16–24 g. Male nominate race breeding has forehead, crown, cheek and ear-coverts golden-yellow becoming greenish-yellow on mantle and back, rump bright yellow, tail greenish with broad yellow inner webs on outer rectrices; upperwing olive-brown, remiges with narrow yellow outer margins and broad yellow inner webs (on males over 3 years old, brown restricted to tip and a band along feather rachis), wing-coverts with broad yellow margins; blackish-grey lores, cheek to chin and throat chestnut, this colour extending onto breast to variable extent; remainder of breast and underparts golden-yellow; iris deep brownish-red, orbital ring blackish-grey; bill black; legs pinkish. Male non-breeding has forehead, crown and nape olive-green with paler feather margins, mantle and back pale brown with blackish central streaks on feathers, rump buffy brown, tail olive-green with yellow outer margins and inner webs; wings as in breeding male, but narrower margins on wing-coverts; lores, cheek and ear-coverts olive-green, chin, throat and beast buffy, belly, flanks, thighs and undertail-coverts dull white, some buffish wash on flanks; bill brown, darker on upper mandible, legs brown to pinkish. Female breeding resembles non-breeding male, but yellow on inner webs of remiges restricted to base of feathers, has distinct yellow wash on throat and breast extending onto belly in mid-line; iris brown, upper mandible dark brown, lower mandible pale brown. Female non-breeding lacks yellow wash below. Juvenile resembles female, but with broad buffy margins on wing-coverts, dull white throat and underparts; legs grey in first year, thereafter brownish or pinkish; yellow on remiges and tail pale until first moult. Race *castaneigula* is larger than nominate, male breeding has orange-yellow crown, contrasting with green mantle; *marleyi* has bright yellow crown, throat patch tawny (rather than chestnut-brown). Voice. Song a jumbled sequence of nasal, buzzing, trilling and hissing notes, "zeep seep zzz swizzzrrr zeep swee". Calls include hissing notes, sharp "jick".

Habitat. Reedbeds and tall aquatic vegetation such as papyrus (*Cyperus papyrus*) in wetlands; riparian vegetation and forests in non-breeding season. To 1000 m.

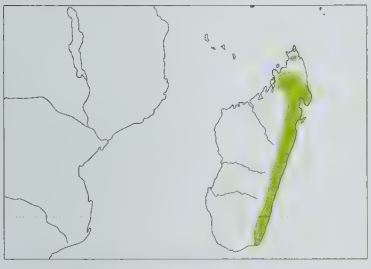
Food and Feeding. Diet includes seeds of grasses such as *Panicum maximum*, berries, flowers and nectar from *Combretum mozambicensis*, *Combretum microphyllum*, *Fernandoa magnificens*; also insects, including moths and caterpillars (Lepidoptera), beetles (Coleoptera), grasshoppers (Orthoptera). Also takes bread at birdfeeders. Forages in forest canopy for insects in non-breeding season; usually forages in vegetation, including branches and trunks of trees.
Breeding. Breeds Mar in Tanzania, Feb–Mar in Zambia, Oct–Apr in Malawi, Oct–Nov in Botswana, Nov–Mar (mainly Jan–Feb) in Zimbabwe and Dec in Mozambique; mainly Nov–Jan, with some earlier and later records, in South Africa; double-brooded in Malawi, at least. Polygynous, with two or three females per male. Colonial, with up to 300 nests together. Nest oval with simple entrance hole below, quite loosely woven by male from thin strips torn off reeds, grasses and bulrushes (*Typha*), lined by female with soft reed flowerheads and grass seedheads, placed chiefly in bed of *Phragmites* reeds, bulrushes or papyrus, occasionally in tree, c. 2·5 m above water or ground; new nest constructed for second brood; nests alongside those of *Euplectes orix* and *Amblyospiza albifrons* in S of range; old nests may be used by Brown Firefinch (*Lagonosticta nitidula*) and Bronze Mannikin (*Spermestes cucullata*). Clutch 2–3 eggs (average 2·4 in Malawi), usually plain dark chocolate-brown or olive-brown, sometimes blue-green and heavily marked with grey-brown specks, or greenish-white with heavy red-brown markings, average size of 45 eggs 21 × 14·5 mm (South Africa); incubation by female only, period 14–17 days; chicks fed by female alone, nestling period 14–19 days. Probably parasitized by Diederik Cuckoo (*Chrysococcyx caprius*). Sensitive to disturbance, and nests often abandoned after inspection. Male first breeds at 22–24 months of age. In ringing studies in Malawi, oldest individual recaptured 13 years after first ringed; estimated annual mortality rate of adults 49%, of first-years 55%; estimated annual survival rate of adults 70% after 17-year study.
Movements. Resident; in Malawi, no ringed individuals known to have moved farther than 8 km from ringing site.
Status and Conservation. Not globally threatened. Locally abundant. In Mozambique, estimated population more than 10,000 individuals in C region of country and 1000 in S. Numbers in Botswana and in S Mozambique appear to have declined in recent years. In NE South Africa, old inland record from Mpumalanga. Occurs locally in dense colonies, but vulnerable to disturbance of wetlands.
Bibliography. Bangs & Loveridge (1933), Belcher (1924), Benson & Benson (1977), Benson *et al.* (1971), Brooke (1953), Clancey (1959a), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Hanmer (1979, 1984, 1989), Hockey *et al.* (2005), Hustler (2001), Irwin (1981), Medland (1992b), Parker (1999, 2005), Peach *et al.* (2001), Penry (1994), Skinner (1995), Tarboton *et al.* (1987), Traylor (1965), Vincent (1936).

75. Nelicourvi Weaver

Ploceus nelicourvi

French: Tisserin nélicourvi **German**: Grünweber **Spanish**: Tejedor Malgache

Taxonomy. *Parvus [Parus] nelicourvi* Scopoli, 1786, Madagascar.
Thought to form a superspecies with *P. sakalava*, and has been considered conspecific. Monotypic.
Distribution. N & E Madagascar (Mt d'Ambre, and from Tsaratanana E to Sambava and S to Tolognaro).



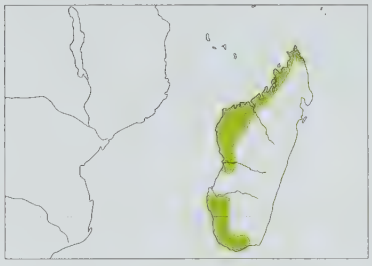
Descriptive notes. 15 cm; 20–28 g. Male has black forehead and crown down to ear-coverts, forming well-marked helmet; upperparts and upperwing plain olive-green, tail brownish-green; chin black, throat to chest yellow, extending as sharply defined yellow band around nape, where sometimes washed bright orange; narrow olive collar across upper breast, lower breast, belly, flanks and thighs grey, undertail-coverts rufous-chestnut; iris brown to dark reddish-brown; bill black; legs greyish. Female resembles male, but black on head mainly replaced with yellow, except for dark grey lores, and olive patch on crown extending down behind eye and onto darker ear-coverts; legs greyish to fleshy-pink. Juvenile has greenish head with some yellow above eye and on throat, generally duller than female, bill yellowish, often with black patches (probably uniformly pale in youngest birds). Voice. Swizzling call, and a nasal "tiang tiang".
Habitat. Rainforest and secondary forest, from sea-level to 1950 m; also in E littoral forest on sandy soils. Found also at forest edge, in secondary habitats a considerable distance from intact forest, and in gardens of villages close to forest.
Food and Feeding. Diet primarily insects and other arthropods; spiders (Araneae), beetles (Coleoptera), bugs (Hemiptera) and grasshoppers (Orthoptera) reported in stomach contents; probably take small fruits, too. Hangs below twigs and creepers while probing crevices, and moves through trees from canopy to lower levels. Usually encountered singly or in pairs. Regularly joins mixed-species flocks of insectivorous birds exploring branches and leaf tangles; then most often associated with Long-billed Tetrakas (*Bernieria madagascariensis*).
Breeding. Breeds Sept–Dec. Monogamous, probably with long-term pair-bond. Solitary, with nests widely separated; sometimes two nests at a site, only one occupied, perhaps built by same individual. Nest bulky, with entrance tunnel up to 20 cm long leading to oval nest-chamber, woven by male from grass and palm fibres, one nest mainly of pine (*Pinus*) needles, attached at base by a "stalk" 15–30 cm long, 2–7 m above ground, often suspended over stream, or over path or clearing; female may contribute lining material. Clutch 2–4 eggs, most often 3, pale greenish-blue, average size 21 × 15·5 mm; female seen while incubating, but roles of sexes in incubation and in tending of nestlings undescribed; fledglings fed by both parents; young at first form family party with parents. No other information.
Movements. No detailed information; adults likely to be resident.
Status and Conservation. Not globally threatened. Locally common to fairly common. May be vulnerable to habitat loss from forest clearing, but seems able to survive in secondary habitats and in some artifical habitats. Well represented in protected areas.
Bibliography. Benson & Pitman (1962), Benson *et al.* (1977), Craig (1999b), Eguchi *et al.* (1993), Goodman & Parrillo (1997), Goodman *et al.* (1997), Hawkins *et al.* (1998), Langrand (1990), Oschadleus (2008), Rand (1936).

76. Sakalava Weaver

Ploceus sakalava

French: Tisserin sakalave **German**: Sakalavaweber **Spanish**: Tejedor Sakalava
Other common names: Saka, Sakalava Fody

Taxonomy. *Ploceus sakalava* Hartlaub, 1861, Madagascar.
In the past was sometimes placed in genus *Foudia*. Thought to form a superspecies with *P. nelicourvi*, and has been considered conspecific. Two subspecies recognized.
Subspecies and Distribution.
P. s. sakalava Hartlaub, 1861 – N & W Madagascar.
P. s. minor (Delacour & Berlioz, 1931) – SW & S Madagascar.



Descriptive notes. 15 cm; 20–28 g. Male breeding has sharply demarcated yellow head to upper breast; feathers of mantle and scapulars grey-brown with ill-defined darker centres, fringed paler brown in fresh plumage, rump broadly grey; upperwing and tail dark brown, with narrow paler edges on remiges and rectrices, broader light cinnamon-buff to pale buff fringes on tertials and greater coverts, median coverts with buffy-white tips forming wingbar; lower breast, belly and flanks grey, undertail-coverts dull white; iris deep brown, bare reddish skin around eye; bill light blue-grey; legs flesh-coloured. Male non-breeding has head grey, bare skin around eye pale pink, bill pale grey. Female has grey head with lores paler greyish-buff, cheek and long supercilium rusty, and grey and rusty double stripe separating cheek from throat; in other respects resembles non-breeding male, but underparts paler, with whitish throat and undertail-coverts, some buff on sides. Juvenile resembles female, but paler, particularly on head, with pale horn-coloured bill. Races very similar to each other: *minor* separated from nominate primarily by its smaller size. Voice. Male has repetitive "chee-chee" song while fluttering wings. Flight call "treeyoo".
Habitat. Open country in drier lowlands, often in areas cleared for human settlement; also found in spiny-bush areas, and dry deciduous forest. Below 700 m, occasionally to 1000 m.
Food and Feeding. Primarily granivorous, diet including some rice (*Oryza*); also insects and spiders (Araneae) taken regularly, especially when feeding young; feeds also on flowers of *Alluaudia*. Gleans insects from tree branches; collects fallen or discarded rice on ground.
Breeding. Timing may be determined by local rainfall, Sept–Oct in N Madagascar and Nov–Apr in W; in more arid SW irregular, starting as early as Aug or as late as Dec. Apparently primarily monogamous, some males perhaps polygynous. Colonial, with 10–120 nests at a site, and up to 40 nests in single tree. Nest built by both sexes, retort-shaped, entrance extended into tunnel 17–40 cm long, woven from grass, leaf stems and strips of palm leaf, lined with soft plant fibres, placed 2–25 m above ground and usually in palm or tree, including boabab (*Adansonia*) and exotic *Gyrocarpus americanus*, either attached directly to twigs or suspended by short woven "rope"; sometimes below nest of Pied Crow (*Corvus albus*), Black Kite (*Milvus migrans*), Madagascar Buzzard (*Buteo brachypterus*) or Madagascar Fish-eagle (*Haliaeetus vociferoides*), or suspended from thatched roof of village house; males sleep in unoccupied nests during breeding season; nests may be used by Madagascar Bibfinch (*Lepidopygia nana*). Clutch 2–4 eggs, plain greenish-blue, average size 20·5 × 15·1 mm; incubation by female, chicks fed by both male and female feed, no information on duration of incubation and nestling periods. Nests often preyed on by Madagascar Harrier-hawk (*Polyboroides radiatus*), and record of eggs taken by common brown lemur (*Eulemur fulvus*) at colony on forest edge.
Movements. Leaves breeding colonies after nesting; presumably undertakes local movements.
Status and Conservation. Not globally threatened. Common in many parts of range. Closely associated with people; generally protected by local tradition, which deems that weavers nesting in villages are a sign of good fortune. Adults are regular prey of Common Barn-owl (*Tyto alba*) at one site in SW Madagascar.
Bibliography. Benson *et al.* (1977), Craig (1999b), Goodman & Benstead (2003), Goodman & Griffiths (2009), Goodman *et al.* (1997), Langrand (1990), Moreau (1960b), Nakamura (2004), Rand (1936), van Someren (1947b), Tingay & Gilbert (1999).

77. Sao Tome Weaver

Ploceus sanctithomae

French: Tisserin de Sao Tomé **German**: Sao-Tomé-Weber **Spanish**: Tejedor de Santo Tomé

Taxonomy. *Sycobius st. thomae* Hartlaub, 1848, São Tomé Island.
Sometimes placed in a monotypic genus *Thomasophantes*. Monotypic.
Distribution. São Tomé I, in Gulf of Guinea.



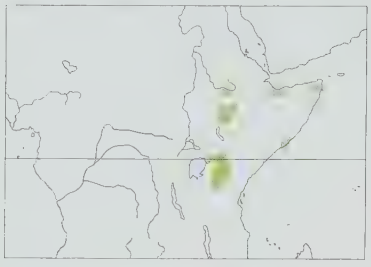
Descriptive notes. 14 cm; 20–24 g. Male has cinnamon-orange forehead and face down onto breast, black crown forming distinct cap and becoming dark chocolate-brown on mantle and back, rump buffy brown; upperwing and tail dark brown, remiges with narrow yellow edges, wing-coverts with brownish-buff or pale edges and pale tips (forming wingbars on median and greater coverts); lores and short, narrow line behind eye black, broken yellowish eyering; belly greyish buff with orange wash, flanks buff, belly dull white in centre, thighs and undertail-coverts buffy brown; iris dark reddish-brown; bill blackish above, horn-grey below; legs pinkish-flesh. Female resembles male in pattern, but with less black on crown, paler, browner upperparts, less richly coloured underparts; chin and throat dull white, broad buff band across breast; bill flesh-coloured, darker and duller on culmen. Juvenile resembles female, but forehead, crown and nape all dull brown, whitish supercilium, cheek and ear-coverts, bill light brown, paler on lower mandible. Voice. Song opens slowly with clear notes, then accelerates into chatter, "wait way-tseea tseea chatatatatrrrr-a". Common vocalization "tchim-tchim-tcholo", used in contact, and in chorus by birds foraging together; also a repeated "psink"; harsher "chuk" in alarm. Regular vocal interactions both within and between groups.
Habitat. Natural forest, abandoned and active coffee plantations, disturbed secondary habitats, also bushy and wooded areas in savanna; absent from areas of pure grassland. To 1600 m.
Food and Feeding. Seeds, also insects such as ants (Formicidae) and caterpillars (Lepidoptera); also spiders (Araneae), and nectar from *Erythrina* trees. Forages in groups of up to 20 individuals, also as pairs or family parties. Searches at all levels in trees, moving both up and down branches and trunks in manner of a nuthatch (Sittidae), removing lichen and moss, probing crevices and dead leaves; uses open-bill probing on occasion; may hang upside-down. Hawks insects in flight.

Breeding. Breeds Jul/Aug–Feb. Monogamous, but two or three pairs may nest in same tree. Nest retort-shaped, with entrance tunnel up to 10 cm long, constructed primarily by male, from tendrils of liane, lined with lichen, moss and leaf skeletons, suspended 5–15 m above ground from tip of branch; some nests collected appear to have second opening to nest-chamber, and even a second tunnel. Clutch 1–2 eggs, plain blue-green, size 23 × 15 mm; nestlings fed by both male and female, no information on duration of incubation and nestling periods. Parasitized by African Emerald Cuckoo (*Chrysococcyx cupreus*); of 23 nests investigated, four contained a cuckoo egg.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in São Tomé EBA. Common on the island. No immediate threats known.
Bibliography. Bannerman (1949), Borrow & Demey (2001), Christy & Clarke (1998), Fisher (2004), Fishpool & Evans (2001), Fry & Keith (2004), Jones & Tye (2006), Leventis & Olmos (2009), de Naurois (1979, 1994), Snow (1950).

78. Speke's Weaver
Ploceus spekei

French: Tisserin de Speke **German**: Somaliweber **Spanish**: Tejedor de Speke

Taxonomy. *Hyphantornis spekei* Heuglin, 1861, north Somalia.
Thought to form a superspecies with *P. spekeoides*. Monotypic.
Distribution. W Ethiopia, N & E Somalia, and SW & C Kenya S to NC Tanzania.



Descriptive notes. 15 cm; male 34–43 g, female 28–37 g. Male has forehead, crown and nape golden-yellow, passing into olive-green on nape; mantle and back feathers blackish with yellow fringes (mottled appearance), rump dull greenish-yellow, tail olive-green; upperwing dark brown, remiges with dull yellow margins, tertials and wing-coverts with broad yellow borders forming wingbars; lores, cheek, ear-coverts, chin and throat black, black extending as bib onto upper breast, where narrowly fringed with chestnut-brown; rest of breast, and flanks, belly, thighs and undertail-coverts golden yellow; iris yellowish-white; bill black; legs pinkish-flesh to grey-flesh. Female has forehead, crown and nape olive with faint streaking, mantle olive with dark central streaks on feathers, rump pale olive, tail olive; wings brown, pale olive-yellow edges on remiges, tertials and greater coverts, pale cream edges on median coverts forming wingbar; cheek and ear-coverts pale olive, no supercilium; chin and throat creamy white, breast and flanks buff, belly, thighs and undertail-coverts white; during breeding much yellower below (unclear if this is the result of plumage abrasion or moult); iris pale brown to pale grey; bill dull brownish above, paler flesh-colour below; legs greyish-flesh. Juvenile has forehead, crown and nape plain olive-brown, mantle and back brown with heavy streaking, rump plain brown, wings and tail olive-green, broad buffy margins on wing-coverts, yellow supercilium, chin and throat yellowish, underparts buff, whitish on belly, iris grey-brown, bill grey-brown. Voice. Song a series of repetitive notes leading into a chatter, "tz-z-z-z-z za za eee eh eh ch-ch-ch tzz-zzz-zzz-zzz-zzz-ip", described also as a nasal skirl, may include whistled notes. Contact call a sharp "tseep".
Habitat. Bushy and wooded country with available water; usually at 1200–2200 m. In Nairobi (Kenya), common in urban and suburban areas.
Food and Feeding. Seeds, including those of crops such as maize (*Zea mays*); also insects, including alate termites (Isoptera), especially when feeding young; also collects food discarded by people, and seen to feed at carcases hung in meat shed. Generally in small flocks.
Breeding. Breeds Apr–Sept in Ethiopia, May–Jun in Somalia, Feb–Jul and Oct–Dec (peak Mar–Apr) in Kenya, and Feb–May in Tanzania. Polygynous. Usually colonial, in Somalia small colonies of 4–6 males; in Kenya large colonies of 22–205 nests (all in single tree), often mixed with *P. intermedius*, also with *P. rubiginosus*. Male calls from perch near nest; long song used in nest advertisement, short song in courtship. Nest oval, bulky, with short spout around entrance, woven by male (often starting construction before first females appear) from grass stems, often with leaves attached (giving rough appearance), ceiling of grass-heads and some acacia (*Acacia*) leaves, lined by female with grass-heads and occasionally a few feathers, attached on upper surface to branch 2–7 m above ground, mostly in thorn tree, in Nairobi often near busy road or occupied building; unused or partly completed nests frequently demolished by male; newly built nests may be taken over by Common Grey-headed Sparrow (*Passer griseus*); abandoned nests occupied for breeding by African Silverbill (*Euodice cantans*), Cut-throat Finch (*Amadina fasciata*), Chestnut Sparrow (*Passer eminibey*), and once by Red-cheeked Cordon-bleu (*Uraeginthus bengalus*), and empty nests also used for roosting by Superb Starling (*Lamprotornis superbus*) and once by Willow Warbler (*Phylloscopus trochilus*). Clutch 1–4 eggs (average 2 in Kenya), bright blue with darker cap at blunt end, rarely a few black spots, average size of nine eggs 23·2 × 15·6 mm (Kenya); incubation by female only, period c. 11 days; chicks fed by both male and female, nestling period c. 16 days. In Nairobi (Kenya), urban colonies had average brood size of 1·8, nestling mortality 30–35%, with parasitic larvae of fly *Passeromyia heterochaeta* an important factor; avian predators include African Harrier-hawk (*Polyboroides typus*), Augur Buzzard (*Buteo augur*), Black Kite (*Milvus migrans*) and Gabar Goshawk (*Micronisus gabar*); nest in a wetland robbed by Black Crake (*Amaurornis flavirostris*).
Movements. Presumed resident; most move away from breeding colonies when not nesting.
Status and Conservation. Not globally threatened. Locally common. Regarded as a significant crop pest in some areas.
Bibliography. Archer & Godman (1961), Ash & Miskell (1998), Beesley (1973), Benson (1947a), Brown & Britton (1980), Collias, N.E. & Collias (1964), Crook (1969), Cunningham-van Someren (1980), Fishpool & Evans (2001), Friedmann & Loveridge (1937), Fry & Keith (2004), Gichuki (1988), Lewis & Pomeroy (1989), Lönnberg (1911), Loveridge (1923), Moreau & Sclater (1938), Serle (1943a), Short & Horne (2005), Sjöstedt (1910), Smith (1974), van Someren (1916), van Someren & Cunningham-van Someren (1945), Stevenson & Fanshawe (2002), Wooton (1990), Zimmerman *et al.* (1996).

79. Fox's Weaver
Ploceus spekeoides

French: Tisserin de Fox **German**: Foxweber **Spanish**: Tejedor de Fox

Taxonomy. *Ploceus spekeoides* C. H. B. Grant and Mackworth-Praed, 1947, Nariam, Teso, Uganda.
Thought to form a superspecies with *P. spekei*. Monotypic.
Distribution. C Uganda.

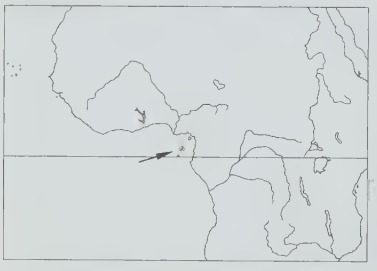


Descriptive notes. 14 cm. Male has forehead, crown and nape golden-yellow; mantle and back black, outer feathers with narrow yellow fringes, rump yellow, tail light brown; upperwing brown, remiges with narrow yellow edges, wing-coverts and tertials with broad yellow tips (forming wingbars on coverts); chin, lores, cheek, ear-coverts and throat black, black extending in point onto upper breast, where narrowly fringed with chestnut-brown; rest of breast and underparts golden-yellow; iris orange-red; bill black; legs brown. Female has forehead, crown and nape to back olive-green with dark central streaks on feathers, rump greenish-yellow, tail olive-green; wings brown, pale yellow margins on remiges, broader pale margins on wing-coverts; cheek and ear-coverts olive-green, chin and throat pale yellow, breast with buffy wash, flanks, belly, thighs and undertail-coverts whitish with yellow wash; iris brown, bill blackish-brown. Juvenile resembles female, but with upperparts less heavily marked, bill brown. Voice. Undescribed.
Habitat. Bushed and wooded grassland in swampy areas; associated particularly with papyrus (*Cyperus papyrus*) swamps.
Food and Feeding. Little information. Seeds identified in stomach contents; probably takes insects, too.
Breeding. Breeds May–Aug. Mating system unknown; apparently colonial. Nest described as oval, roughly woven and lacking entrance tunnel. No other information.
Movements. Presumed resident; appears to leave breeding areas in dry season.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in North Ugandan Swamps Secondary Area. Very poorly known species. Has very limited range, limited to area of probably less than 10,000 km². No recent data, and no estimates of current population size or presence in protected areas. Has been recorded at L Bisina and L Opeta (both Important Bird Areas), and occurs also in marshland between these lakes; recorded also from Rhino Camp (in Arua) and from area around L Kyoga (near Nakasongola). In 1996, 47 nests counted around L Bisina; no subsequent breeding records. Nariam Swamp, where the species was first collected, has been drained; current status on L Bisina and L Opeta unclear. Each year, in Oct–Feb dry season, large numbers of domestic cattle (more than 20,000) move to Opeta region for grazing, which results in considerable degrading of wooded grassland on which this weaver depends for breeding.
Bibliography. Anon. (2009e), Butchart & Stattersfield (2004), Carswell *et al.* (2005), Collar & Stuart (1985), Collias, N.E. & Collias (1964), Fishpool & Evans (2001), Fry & Keith (2004), Mann (1976), Owiunzi & Arinaitwe (2001).

80. Principe Golden Weaver
Ploceus princeps

French: Prinzenweber **German**: Tisserin de Principé **Spanish**: Tejedor de Príncipe
Other common names: Principe Weaver

Taxonomy. *Symplectes princeps* Bonaparte, 1850, Príncipe Island.
Affinities uncertain; has been thought to be closest to *P. aurantius*. Monotypic.
Distribution. Príncipe I, in Gulf of Guinea.



Descriptive notes. 18 cm; c. 30 g. Male has forehead, crown and nape chestnut-brown to orange, upperparts yellowish-green, tail olive-green; upperwing dark brown, yellow margins on remiges, broad yellowish edges on wing-coverts; lores, cheek and ear-coverts chestnut-brown; chin and throat yellow, breast and flanks yellow with chestnut wash, belly, thighs and undertail-coverts yellow; iris white to yellowish; bill black; legs brown. Female has forehead, crown and nape yellowish-green, yellow supercilium; upperparts olive-green, mantle and back with faint central streaks on feathers, tail olive-green; wings dark brown, narrow yellow margins on remiges, pale edges on wing-coverts; lores and cheek yellow, some chestnut-brown wash on ear-coverts; chin, throat and breast yellow, flanks and thighs greyish, belly and undertail-coverts white; iris pale greyish-yellow, bill brown. Juvenile resembles female, but more yellowish on upperparts and underparts, iris brown. Voice. Song a series of introductory notes followed by drawn-out wheeze, "pzeep-pzeep-pzzzzzzzzrrrr"; also a three-part song, opening with loud whistles, then softer whistles and final phrase of scratchy notes, "wee-wee-wee-wee werdi-werdi chuckju-jerji-chickwajjer". Contact call a loud "zeet"; also "ksuit" and "ksuip" calls.
Habitat. Well-timbered areas, including natural forest, secondary forest, plantations, villages and gardens; encountered also in more open grassland sectors.
Food and Feeding. Diet includes seeds (stomach contents); also fruit of bananas (*Musa*), chilis (*Capsicum*) and oil palm (*Elaeis guineensis*), and nectar from *Erythrina* trees; also insects, such as beetles (Coleoptera). Probes bark and flowers, gleans insects from branches; also hawks flying insects. Often forages in groups of up to 30 individuals, and may join mixed-species flocks with Principe Flycatcher-babbler (*Horizorhinus dohrni*) and Principe Glossy Starling (*Lamprotornis ornatus*); associates also with sunbirds (Nectariniidae) and *Speirops* white-eyes.
Breeding. Breeds May–Jun and Aug–Sept. Monogamous. Solitary, sometimes colonial; several pairs may nest in same tree, nests well spaced. Displaying male sings while hanging below nest, beating wings vigorously. Nest globular or oval, entrance below without tunnel, woven by male from strips torn from leaves of palms or bananas, sometimes living leaves incorporated into structure, lined with fine grass and fluffy grass-heads, suspended usually more than 10 m above ground from tip of branch or palm frond. Clutch 1–2 eggs, plain blue; male assists in feeding large nestlings; no information on incubation and nestling periods. Nests sometimes robbed by Blue-breasted Kingfisher (*Halcyon malimbica*) and by Principe Glossy Starling.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Príncipe EBA. Common to abundant; considered one of commonest birds on the island. Occurs in many degraded habitats.
Bibliography. Borrow & Demey (2001), Christy & Clarke (1998), Fishpool & Evans (2001), Fry & Keith (2004), Jones & Tye (2006), Leventis & Olmos (2009), de Naurois (1994), Snow (1950).

PLATE 9 ➤



PLATE 9

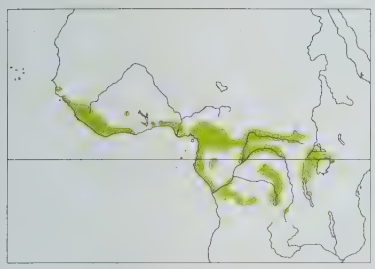
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81. Vieillot's Black Weaver

Ploceus nigerrimus

French: Tisserin noir **German**: Mohrenweber **Spanish**: Tejedor de Vieillot
Other common names: Vieillot's/Black Weaver; Chestnut-and-black/Chestnut-backed Weaver (*castaneofuscus*)

Taxonomy. *Ploceus nigerrimus* Vieillot, 1819, "Kingdom of Congo".
Races interbreed in S Nigeria. Two subspecies recognized.
Subspecies and Distribution.
P. n. castaneofuscus Lesson, 1840 – Gambia, Guinea-Bissau, W Guinea, Sierra Leone and Liberia E, discontinuously, to S Nigeria.
P. n. nigerrimus Vieillot, 1819 – S Nigeria, S Cameroon, S Central African Republic, Equatorial Guinea, W Gabon, N & W PRCongo, DRCongo, extreme S Sudan, N Angola (including Cabinda), also S Uganda, extreme W Kenya, Rwanda, Burundi and NW & W Tanzania.



Descriptive notes. 17 cm; 25–42 g. Male nominate race has completely black plumage; iris yellow; bill black; legs greyish to pinkish-brown. Female dull greenish on upperparts, with narrow, weak dark streaks on crown and nape, ill-defined but much broader dark streaks on mantle and back, rump unstreaked; tail and upperwing dark brown-grey, remiges with narrow olive-green margins, wing-coverts with pale buffy edges; lores greyish, cheek and indistinct superciliary buffy, rest of face and sides of neck dull greenish; chin and throat pale yellow, broad buffy band across breast (sometimes with a more olive tone), flanks, thighs and undertail-coverts buff, sometimes washed olive on flanks, belly dull yellow to olive; iris pale brown, bill dark greyish, often more horn-coloured below; legs brown. Juvenile resembles female, but with unstreaked forehead and crown, buff margins on wing-coverts, buffier underparts; iris initially dark grey, then brown, before becoming yellow. Race *castaneofuscus* male has upperparts, belly and undertail-coverts rich chestnut-brown, female has upperparts brownish, rather than olive-green, rump rufous, and underparts buffy yellow with rufous wash on flanks. Voice. Song a sputtering and chattering phrase; short song "chrrr-szee-zuit", given during territorial encounters and in courtship away from nest, also when female enters nest. Aggressive "chak" in defence, similar call in alarm.
Habitat. Forest clearings, often in villages, wooded regions and tall-grass savanna; closely associated with forest belt, although not found in intact forest. To 1300 m in Cameroon and 2000 m in DRCongo; in Kenya, in high-rainfall areas at 1000–2000 m. In Nigeria, wet-season roosts generally in broadleaf trees which offered some protection from rain, dry-season roosts in patches of tall grass in marshes.
Food and Feeding. Diet mainly insects, including grasshoppers (Orthoptera), winged ants (Formicidae), alate termites (Isoptera), caterpillars and butterflies (Lepidoptera), and mantises (Mantodea); also seeds, including rice (*Oryza*), maize (*Zea mays*), and *Sterculia trigacantha*, berries of *Rauwolfia*, oil palm fruits (*Elaeis guineensis*), figs (*Ficus*), soft pericarp of *Cola millensis* fruits, and nectar from flowering trees. Diet in W Africa overlaps with that of *P. cucullatus*. Often utilizes prying actions of the bill. Aerial insects may be caught on the wing. Probes in flowers, leaving plumage coloured by pollen. Collects oil palm nuts where squirrels (Sciuridae) and other species have been feeding. Gregarious; regularly joins mixed-species flocks of insectivores foraging in more open areas, and in coffee plantations often associated with *P. bicolor*. Forms mixed roosts with *P. cucullatus* and other ploceids; also with Amethyst Starling (*Cinnyricinclus leucogaster*) during dry season in SW Nigeria.
Breeding. Breeds Jan in Gambia, Feb in Guinea, Feb–Apr and Aug–Nov in Liberia, Jan–Jul in Ghana, Feb and Sept–Oct in Togo, May–Aug in Nigeria, in all months except Aug in Cameroon, Dec–Feb, Apr and Jul in Gabon, Jul–Aug in Central African Republic, Nov–Feb and Sept in PRCongo; in DRCongo, Nov in S, Apr and Aug–Sept in savanna, Jul–Feb in Lukolela, and probably all year (confirmed in Feb, Jul–Aug and Nov) in Itombwe; Aug and Nov in Sudan, throughout year (peaks Feb–May and Sept–Oct) in Uganda, Jul–Sept in Kenya and Oct–Mar in Angola; may be double-brooded. Polygynous, with up to five females in one male territory. Colonial, similar number of nests (maximum three) per territory in colonies of different densities, but mean distance between nests variable, 27–52 cm; commonly in mixed colonies with *P. cucullatus* (nesting at same height in trees), and in Gabon joined colony established earlier by latter species; also mixed colonies with *P. aurantius* in Nigeria. Territory defended by male in aggressive dance, in threat posture with head feathers ruffled and bill slightly open. Male gives burst of song when females visit colony; in nest-advertisement display, male hangs below nest entrance, quivering (rather than flapping) wings, with tail raised away from nest. Nest oval, with rough exterior, entrance below without tunnel, woven by male from strips of palm leaves or grass, work taking c. 9 hours, lined with grass seedheads by female, placed in bulrushes (*Typha*), tall elephant grass, palm, bamboo or tree, 1–2 m above water or, when in tree, 6–8 m above ground; mixed colony with *P. cucullatus* in Sierra Leone surrounded occupied nest of African Harrier-hawk (*Polyboroides typus*), and colonies often associated with human habitation; at mixed colony in Nigeria, males took over and modified nests built by Red-headed Queleas (*Quelea erythrops*); unoccupied nests regularly demolished by male; old nests used for roosting by Bronze Mannikin (*Spermestes cucullata*). Clutch 2 eggs, pale blue, rarely with a few purple spots at thick end, average size of 40 eggs 23·9 × 16·1 mm (Cameroon); incubation by female only; chicks fed primarily by female, male may contribute late in season as breeding activity declines; no information on duration of incubation and nestling periods. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) in Ghana, Nigeria, and probably elsewhere. Nests robbed by Pied Crow (*Corvus alba*), African Harrier-hawk and Senegal Coucal (*Centropus senegalensis*), also by boomslang (*Dispholidus typus*) and egg-eating snakes (*Dasypeltis*); colony in Uganda destroyed by Grey-cheeked Hornbills (*Bycanistes subcylindricus*) and site then abandoned.
Movements. Presumed resident; may move far from colonies to forage.
Status and Conservation. Not globally threatened. Abundant through most of range; rare in Gambia. Often closely associated with people. After *P. cucullatus*, this is the most common ploceid species on sale at markets for traditional medicines in Benin and Nigeria; like that species, it is used in blessing ceremonies in Nigeria.

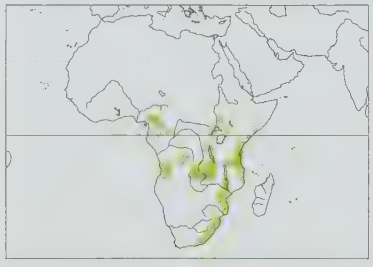
Bibliography. Adjakpa *et al.* (2002), Bannerman (1949), Barlow *et al.* (1997), Bates (1909, 1911), Borrow & Demey (2001), Bowden (2001), Brosset (1974), Brosset & Érard (1986), Brown & Britton (1980), Button (1967), Carroll (1988), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1932, 1954), Chapman (1995), Cheke & Walsh (1996), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Colston & Curry-Lindahl (1986), Crook (1963c, 1969), Dean (1974, 2000), Dean *et al.* (1988), Demey (1995), Diesselhorst (1971), Din (1991, 1992a, 1992b, 1992c, 1992d, 1994), Dowsett-Lemaire (1997), Dowsett-Lemaire & Dowsett (1989, 2008a), Eaglesfield (1969), Eisentraut (1963), Elgood & Ward (1963), Elgood *et al.* (1994), Fishpool & Evans (2001), Friedmann & Williams (1971), Fry & Keith (2004), Gatter (1997), Germain & Cornet (1994), Germain *et al.* (1973), Granvik (1934), Grimes (1987), Günther & Feiler (1986), Hall (1968, 1970a, 1970b, 1970c), Halleux (1994), Heinrich (1958), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1938), Macdonald (1980b), Mann (1985), Marchant (1942), McCarthy (2006), Morel & Morel (1988), Nikolaus (1987, 2001), Pettet (1969), Pitman (1958), Prigogine (1971), Rand (1951), Rand *et al.* (1959), Reichenow (1873, 1894), Reichenow & Lühder (1873), Schifter & Cunningham-van Someren (1998), Serle (1950, 1957, 1965, 1981), Seth-Smith (1913), Simmons (1961), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1985), Verheyen (1955), Waltert & Mühlenberg (1999), Waltert *et al.* (1999), Zimmerman *et al.* (1996).

82. Dark-backed Weaver

Ploceus bicolor

French: Tisserin bicolore **German**: Waldweber **Spanish**: Tejedor Bicolor
Other common names: Forest Weaver; Grey-backed Weaver (*amaurocephalus*); Black-backed Weaver, Eastern Forest Weaver (*kersteni*); Spot-headed Weaver (*stictifrons*)

Taxonomy. *Ploceus bicolor* Vieillot, 1819, Senegal; error = South Africa.
Race *stictifrons* intergrades with nominate in S Mozambique–NE South Africa. Numerous races have been described, based chiefly on minor differences in coloration: thus, proposed race *analogus* (described from Jele, in Cameroon) is synonymized with *tephronotus*, *albidigularis* (from N Angola) with *amaurocephalus*, and *sylvanus* (from E Zimbabwe highlands) with *stictifrons*; and in South Africa *lebomboensis* (from extreme N KwaZulu-Natal) and *sclateri* (from R Mkuze E of Ubombo, in NE KwaZulu-Natal) are likewise treated as synonyms of *stictifrons*, and race *pondoensis* (from St John's, in NE Eastern Cape) is regarded as a synonym of nominate. Critical assessment of these apparently fragmented populations is required. Seven subspecies currently recognized.
Subspecies and Distribution.
P. b. tephronotus (Reichenow, 1892) – SE Nigeria (Obudu Plateau), Cameroon, Bioko I (Fernando Póo), Gabon and W PRCongo.
P. b. amaurocephalus (Cabanis, 1880) – W & NE Angola and S DRCongo (Kasai region).
P. b. mentalis (Hartlaub, 1891) – S Sudan, NE DRCongo, Uganda and W Kenya.
P. b. kigomaensis (C. H. B. Grant & Mackworth-Praed, 1956) – W Rwanda, Burundi, E & SE DRCongo, Zambia and extreme SW Tanzania.
P. b. kersteni (Hartlaub & Finsch, 1870) – S Somalia, coastal Kenya, E Tanzania (S to to R Rufiji) and Zanzibar.
P. b. stictifrons (G. A. Fischer & Reichenow, 1885) – coastal Tanzania (S from Kilwa), S Malawi, E Zimbabwe and Mozambique S to NE South Africa (N KwaZulu-Natal).
P. b. bicolor Vieillot, 1819 – S Mozambique S to S South Africa (Eastern Cape).



Descriptive notes. 14–15 cm; 28–47 g. Nominate race has forehead, crown and nape to back dark purplish-brown, rump dark brown with yellow fringes on some feathers; upperwing and tail dark purplish-brown, with narrow grey margins on primaries; lores, cheek and ear-coverts blackish-brown; chin and throat feathers brown at base, tips whitish-yellow (producing speckled effect, varying individually); breast, flanks, belly, thighs and undertail-coverts golden-yellow, with orange wash on breast; iris deep brown; bill blackish to blue-grey with pale cutting edges (often appearing pale to whitish at a distance); legs flesh-coloured to pinkish. Sexes alike; differences ascribed to sexual dimorphism are result of individual variation, or age-related. Juvenile resembles adult, but duller above, paler yellow below, chin and throat grey, flecked with yellow, bill horn-brown to yellowish; hand-reared nestling moulted into adult plumage at 190 days. Race *tephronotus* has crown and nape brownish-black, mantle and back slate-grey, throat brownish-black with grey flecks, iris red-brown to brown; *amaurocephalus* has crown and cheek brownish-black, back and throat grey; *kigomaensis* is more blackish on throat than previous, with throat feathers yellow-tipped, iris red; *mentalis* has black crown and cheek, dark grey back, throat black, sometimes flecked with yellow, iris red (dark spot on breast seems typical of population of Kakamega Forest, in W Kenya, but noted also on displaying *tephronotus* in Cameroon); *kersteni* has wholly black upperparts and throat, underparts often lightly washed orange, iris red (varying between brick-red and brown in Somali birds); *stictifrons* slightly paler above than nominate, has dark slaty-brown upperparts, feathers of forehead and chin sometimes white-tipped, iris brown. Voice. Song, by both sexes, throughout year, comprises several musical notes, punctuated with creaking sounds, clicks, wheezes and whistles, "wer-pee-po-wee-bo bzzzzn", "wer-chee-widdly wer-chee-widdly", "ronh roonh rank rernh reenh"; sexes sing in simultaneous duet, which apparently functions in pair-bonding, as well as for territorial advertisement. Regional comparisons of song clearly separate W & E African birds from S races; within South Africa, local dialects stable over years, young apparently learn song from parents and other adults, with song type stabilized within first two years and not changing thereafter. Calls include "wheet-wheet" or sibilant "sssit" for contact, harsh "chak" in alarm. Hand-reared individual first gave subsong at 14 days, alarm calls at 46 days; tutored with whistles, which it copied accurately.
Habitat. Forested areas with evergreen or deciduous vegetation, including montane forest patches, riverine and gallery forests in open country, secondary-forest regrowth in cleared areas, coffee plantations, and dense baobab (*Adansonia*) and other woodland; dry subtropical thicket in valleys dominated by *Euphorbia* in E South Africa. Occurs up to 1200 m on Mt Cameroon, to 1800 m in E DRCongo, Zambia, Malawi and South Africa, and as high as 2500 m in Tanzania and Rwanda.
Food and Feeding. Diet mainly arthropods; stomach contents included spiders (Araneae), grasshoppers (Orthoptera), cockroaches (Blattodea), beetles (Coleoptera), caterpillars (Lepidoptera),

On following pages: 83. Black-necked Weaver (*Ploceus nigricollis*); 84. Spectacled Weaver (*Ploceus ocularis*); 85. Slender-billed Weaver (*Ploceus pelzelni*); 86. Strange Weaver (*Ploceus alienus*); 87. Weyns's Weaver (*Ploceus weynsi*); 88. Holub's Golden Weaver (*Ploceus xanthops*); 89. Yellow-mantled Weaver (*Ploceus tricolor*); 90. Golden-naped Weaver (*Ploceus aureonucha*).

bugs (Hemiptera), flies (Diptera). Feeds also on berries, and fruit of figs (*Ficus*) and *Coccinia palmata*; eats flowers of *Tecoma capensis* and *Erythrina*, and takes nectar from aloes (*Aloe*) and *Erythrina*. Forages in canopy and at leafy ends of branches, 5–20 m above forest floor; hops along branches, also hangs below them. Probes in clusters of dead leaves and other tangled vegetation, using prying action of bill, tears off bark strips and lichens; opens large acacia (*Acacia*) thorns in search of insect larvae. Hawks flying insects, but also takes others, such as cockroaches, on ground. Usually in pairs, associating with conspecifics only in family parties after breeding. Regularly joins mixed-species flocks, primarily in dry season in Angola, Malawi and South Africa, also recorded in bird parties in Cameroon, DRCongo, Zambia, Zimbabwe, Mozambique and Kenya. Member of flocks with bulbuls (Pycnonotidae) and Old World flycatchers (Muscicapidae) in Mozambique; in Kenya (Sokoke Forest) mixed-species flocks on different occasions included barbets (Capitonidae), woodpeckers (Picidae), cuckoo-shrikes (Campephagidae), greenbuls (Pycnonotidae), helmet-shrikes (*Prionops*), batises (*Batis*), monarch-flycatchers (Monarchidae), an apalis (*Apalis*) and sunbirds (Nectariniidae); in South Africa, core flock-members were white-eyes (Zosteropidae), batises, sunbirds, Old World warblers (Sylviidae) and puffbacks (*Dryoscopus*).

Breeding. Breeds Nov–Dec on Bioko, Dec–Jan in Cameroon; in DRCongo, Feb–May and Sept–Dec in S and Jan–Feb in Itombwe; Aug–Sept in Somalia; Apr and Aug in Kenya (but Mar–May and Jul–Aug at Kakamega Forest); Dec–Jan in Tanzania; Aug, Oct–Nov and Feb in Angola, Sept–Dec in Zambia, Oct–Mar in Malawi, Sept–Feb in Zimbabwe, Sept–Dec in Mozambique, and Oct–Jan in South Africa. Monogamous, pair-bond lasting for several years. Solitary nester; pair usually in same area each year, so that two or three nests may be found close together. Courtship with song observed away from nest-site; captive male sang while hanging from nest-tunnel. Both partners may build nest, usually one member of pair, presumed to be male, does most building while partner perches nearby; nest retort-shaped, entrance below, extended into tunnel generally less than 30 cm long (rarely, up to 60 cm), of stiff material such as tendrils of vines and creepers, appears rough, old and dry (never with fresh green appearance of other weaver nests), on Zanzibar sometimes built from grass; initial ring of dry and green material, then strips c. 50 cm long bent to form bowl, this lined with soft material such as *Usnea* lichen; suspended 2·5–15 m (most often 4·5–6 m) above ground from tip of branch or creeper, often in thorny tree, on Zanzibar also suspended from telephone line; at one site, ring and bowl took 4 days to complete, front of bowl and tunnel a further 3 days, and another nest took 9 days to construct; both partners strip leaves from branches near nest; one pair in Malawi took over and modified old *P. ocularis* nest; on Bioko, two nests close to active wasp (Hymenoptera) nests; old nests may be used for breeding by Green Twinspot (*Mandingoa nitidula*) and Black-tailed Waxbill (*Estrilda perreini*). Clutch 2–4 eggs (average 3 in South Africa), pure white, pale blue, pink or greenish-white, sparsely spotted with brown, red and lilac, average size of 54 eggs 22·7 × 15·4 mm (South Africa); in captivity, incubation by both sexes, estimated period 15–17 days, chicks fed by both male and female, nestling period 22 days; fledglings fed occasionally until 6 weeks old. Nests sometimes preyed on by snakes (even though placed at tips of pendulous branches).

Movements. Considered resident. Eight ringed birds recaptured at ringing site up to 4 years after ringing. Records thought to involve coastal races far inland along Zambezi Valley may indicate extensive dispersal by some individuals.

Status and Conservation. Not globally threatened. Widespread and locally common to fairly common. Population in C & S Mozambique estimated to number more than 20,000 individuals. Not common in Swaziland, where estimate total of 400 birds, and no recent records from Kruger National Park, in extreme NE South Africa. Dependent on adequate tree cover.

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83. Black-necked Weaver

Ploceus nigricollis

French: Tisserin à cou noir **German**: Kurzflügelweber **Spanish**: Tejedor Cuellinegro
Other common names: Spectacled Weaver(!); Swainson's Weaver (*brachypterus*)

Taxonomy. *Malimbus nigricollis* Vieillot, 1805, Malembo, Angola.

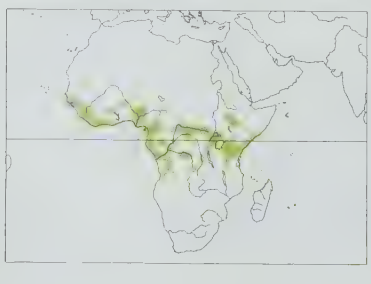
Often grouped with *P. ocularis* and *P. melanogaster* in a "spectacled weaver" superspecies. Nominate race intergrades with *brachypterus* in Cameroon. Birds from Bioko I described as additional race (*po*) on basis of longer and heavier bill; possibly worthy of recognition, but further study required. Three subspecies currently recognized.

Subspecies and Distribution.

P. n. brachypterus Swainson, 1837 – Gambia and S Senegal E to Cameroon, also Bioko I (Fernando Póo).

P. n. nigricollis (Vieillot, 1805) – Cameroon E to S Sudan, Uganda, W Kenya and NW Tanzania, and S to Angola and S DRCongo.

P. n. melanoxanthus (Cabanis, 1878) – S Ethiopia, S Somalia, C & E Kenya and NE Tanzania.



Descriptive notes. 15–17 cm; 21–30 g. Male nominate race has forehead, crown and nape tawny-orange, mantle, back and upperwing grey-black, rump black with olive-green wash; tail black, rectrices with olive-green edgings; black mask from lores to short postocular stripe; cheek and ear-coverts tawny-orange; chin black, extending into oval bib on throat and breast, surrounded by tawny-orange fringe; lower breast, belly, flanks, thighs and undertail-coverts yellow; iris yellow, creamy white or deep brown (apparently brown in Uganda); bill black; legs greyish. Female is like male in pattern, but forehead, crown and nape black, prominent yellow supercilium, line through eye joining black of nape; chin and throat yellow with orange-buff wash, often extending onto ear-coverts, cheek and chest; iris dark brown; legs grey-brown. Juvenile is like female, but with dull olive-brown upperparts, tail feathers edged yellowish, iris brown to grey, bill horn-brown. Race *brachypterus* male has yellow forehead and crown washed with golden-orange, broader, elliptical mask, deeper orange-chestnut wash on cheek and ear-coverts, upperparts (including wings and tail) olive-green to golden-olive, iris pale blue-grey to pale brownish-grey, legs pale greyish-blue to fleshy-grey, female has olive forehead and crown, yellow supercilium, buffy wash on cheek and breast, iris yellow in both sexes; *melanoxanthus* male has golden-yellow forehead and crown, black upperparts including nape, female also has black upperparts, otherwise like nominate, iris red to deep reddish-brown in both sexes. Voice. Song short and loud, "wriou wriouu wizzz"; songs of a single male showed considerable variation. Contact calls metallic, musical double notes, "treeng trreeng"; sharp, twangy alarm call.

Habitat. Wooded country, ranging from savanna woodland to gallery forest, forest clearings and edges, gardens, oil palm (*Elaeis guineensis*), cocoa and coffee plantations, and mangroves; occasional in eucalypt (*Eucalyptus*) plantations. Apparently quick to occupy suitable habitat, e.g. when tree density increases with reforestation. To 1650 m on Mt Nimba, in Liberia, and at 1800 m in Rwenzoris, in Uganda. In Kenya, nominate race occurs in highland thickets and moist forest, with *melanoxanthus* at lower altitudes and in much drier habitats.

Food and Feeding. Diet mainly insects, including grasshoppers (Orthoptera), caterpillars (Lepidoptera), beetles (Coleoptera), ants and winged ants (Formicidae), alate termites (Isoptera), bugs (Hemiptera); also spiders (Araneae). Plant food taken includes seeds, fruit of *Commiphora* and *Salvadora persica*, and pods of acacia (*Acacia*). Of 46 individuals from Nigeria and Cameroon, stomachs of 43 contained insects, one also held seeds, and three contained fragments of oil palm nuts. Diet in Ivory Coast savanna estimated at 60% arthropods, 20% fruit and 10% seeds (based on stomach contents of collected specimens). Gleans vegetation for insects, generally within 2 m of ground, occasionally in tree canopy. Forages in pairs throughout year; may join mixed-species flocks of insectivores in forest clearings and fringes, and in dry season will forage in small groups with conspecifics. Roosting in groups noted in Sierra Leone, Ghana, Nigeria and Gabon; subadults in Gabon joined mixed roosts with *P. cucullatus* and *P. nigerrimus*.

Breeding. Breeds Jul–Nov in Senegambia, Sept–Oct in Liberia, Jan–Mar in Ghana, Jul in Burkina Faso, Jun–Sept in Nigeria, mainly Mar–Apr and Aug–Sept in Cameroon, in most months except main dry season (most breeding Nov–Apr) in Gabon, Nov in PRCongo; in DRCongo, Feb–Mar and Jun–Oct in Kivu, Mar–Oct in NE and Nov–Dec in Itombwe; in most months (peaks Apr–May and Sept) in Uganda, Jan–Jul (mainly Mar–May) in Kenya, and Sept–Oct and Jan in Rwanda. Monogamous, probably with long-term pair-bond; occasionally polygynous, e.g. at two sites in Kenya male acquired two females. Old reports of colonial nesting in W Africa, and colonies of up to six nests noted in Liberia, also group of 30 nests in oil palms in Gabon (nesting on fringes of mixed colonies of *P. cucullatus* and *P. nigerrimus* may account for some of these observations), and two pairs in Gabon nested within 5 m of each other; elsewhere a solitary nester, or, where several nests present, only one occupied (single male may build up to four nests at a site). Male defends only immediate vicinity of nest. Nest retort-shaped, with entrance tunnel up to 20 cm long but narrow (less than 5 cm in diameter), built by male, female sometimes contributing, woven from grass or wiry *Agrostis* in open areas, in wooded habitats vine stems or tendrils of creepers used, often not tightly woven nor thickly lined (eggs visible from outside), but generally well hidden (in contrast to more exposed nests of *P. ocularis*); suspended from tree in savanna steppe or attached to elephant grass in E Africa, in W Africa up to 2 m above ground in low tree, even in villages in Cameroon; on Bioko, in oil palm close to nest of the wasp *Polibioides tabida*; old nests used by Dusky-blue Flycatcher (*Muscicapa comitata*) in both Cameroon and Gabon, and occasionally by Bronze Mannikin (*Spermestes cucullata*). Clutch usually 2 eggs, blue to whitish with fine red speckles, average size of 29 eggs 21 × 14 mm (Cameroon); incubation at one nest reported as done by both male and female, at another by female only; chicks fed by both sexes; no information on duration of incubation and nestling periods. Estimated annual survival of a small sample of adults in Nigeria c. 50%.

Movements. Presumed sedentary; of 51 individuals ringed in DRCongo, nine recaptured or found dead at same site over ensuing 14 months, but one female had moved 22 km.

Status and Conservation. Not globally threatened. Common through W part of range; less numerous in E. Widespread. Estimated densities of 1 bird/ha in Gabon woodland and 1 bird/50 ha in Ivory Coast savanna. Present in many protected areas within its range.

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84. Spectacled Weaver

Ploceus ocularis

French: Tisserin à lunettes **German**: Brillenweber **Spanish**: Tejedor de Anteojos
Other common names: Bottle Weaver

Taxonomy. *Ploceus ocularis* A. Smith, 1828, Eastern Cape (= Durban), South Africa.

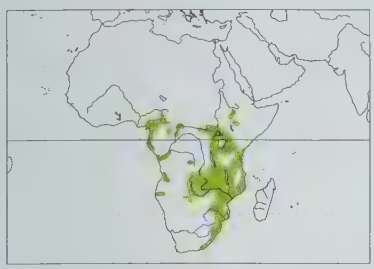
Species name sometimes given as "*ocularius*", but this later spelling by the same describer is an incorrect subsequent spelling and is not available. Often grouped with *P. nigricollis* and *P. melanogaster* in a "spectacled weaver" superspecies. Proposed race *tenuirostris* (described from from Okavango region of NW Botswana) is synonymized with *crocatus*, and *brevior* (from NE South Africa) with nominate. Three subspecies recognized.

Subspecies and Distribution.

P. o. crocatus (Hartlaub, 1881) – SE Nigeria and Cameroon E, discontinuously, to S Sudan, SW Ethiopia, Uganda, Kenya and Tanzania (W of Rift Valley), S to S Angola (R Cunene), NE Namibia (Caprivi region), Botswana (Okavango Basin), Zambia (W of Muchinga Mts) and NW Zimbabwe (Zambezi Valley).

P. o. suahelicus Neumann, 1905 – Kenya E of Rift Valley, E Tanzania, Malawi, E Zambia, E Zimbabwe and Mozambique (N of R Limpopo).

P. o. ocularis A. Smith, 1828 – Mozambique (S of R Limpopo), E South Africa and Swaziland.



Descriptive notes. 15–17 cm; 22–32 g. Male nominate race has buffish-brown forehead and crown, yellow nape grading into golden-olive on mantle and back; rump and tail olive-green; upperwing dull brown, remiges with greenish-yellow edges; lores and line through eye black, tapering to a point on ear-coverts; cheek and ear-coverts golden-yellow with some chestnut wash; chin and throat black, extending into oval bib on breast, fringed with chestnut-brown; flanks greenish, lower breast, belly, thighs and undertail-coverts yellow; iris creamy yellow; bill black; legs grey. Female resembles male, but lacks black bib, chestnut-brown wash may extend from chin and throat onto breast. Juvenile is like female, but lacks chestnut wash on throat, line through eye dull greenish, iris dark brown; bill yellow, becoming brown at c. 3 months. Race *suahelicus* is like nominate, but clearly smaller; *crocatus* has less chestnut on head in both sexes. Voice. Song of male a short, twanging phrase, directed to female at nest, also when pair-members meet after brief separation, "cheereereeroo kakachwirrwirrwirra". Typical call during foraging a descending series of whistles, "tee-tee-tee-tee", up to ten in sequence at rate of c. 4 per second; also brief "choo" contact call, harsh "chaak" alarm call.

Habitat. Woodland, from savanna with sparse trees to bushy thickets and wooded valleys, also forest margins and well-vegetated gardens. Absent from lowland and montane forest. To 2000 m on Nyika Plateau in Zambia and Malawi, and to 2200 m in E Africa; seldom below 900 m in Ethiopia.

Food and Feeding. Diet chiefly insects, including grasshoppers and crickets (Orthoptera), caterpillars (Lepidoptera), beetles and their larvae (Coleoptera), ants (Formicidae), alate termites (Isoptera); other animal food includes spiders (Araneae), centipedes (Chilopoda), small crabs (Crustacea), and geckos (Gekkonidae) up to 3 cm long. Plant food taken includes berries of *Morus alba*, *Lantana camara*, *Hoslundia opposita*; whole flowers of *Syzygium cordatum*, nectar from *Tecoma capensis*, *Schotia* and aloes (*Aloe*). Takes bread and chicken feed in gardens. Stomach contents primarily insects and spiders; one of twelve stomachs examined contained seeds also. Very agile when gleaning in trees, may probe for several minutes, hanging upside-down; uses prying action of bill, and prises off loose bark from trees such as paperbark acacia (*Acacia sieberana*). Hawks flying termites, returning to perch to eat them. Usually singly or in pairs, also family groups of five individuals noted after breeding season in South Africa, and occasional parties of twelve in E DRCongo (Itombwe). Regularly joins mixed-species flocks in woodland, both in South Africa and in Zimbabwe, associating with woodpeckers (Picidae), bulbuls (Pycnonotidae), scrub-robins (Turdidae), Old World warblers (Sylviidae), bush-shrikes (Malaconotidae) and starlings (Sturnidae); occasionally feeds on ground alongside granivorous ploceids, waxbills (Estrildidae) and buntings (Emberizidae).

Breeding. Breeds in Dec in Cameroon, Oct in Ethiopia; in DRCongo, Apr–May and Aug–Sept in NE, Sept–Feb in S, Jan–Mar in Katanga; Dec–Apr in Rwanda, Feb–Sept (peaks Apr–May and Aug) in Uganda, Aug in Kenya; Jan, Mar, Apr, Jun–Jul and Oct–Nov in Tanzania; Mar and Aug–Sept in Angola, Sept–Mar in Zambia and Malawi, Sept–Nov in N Mozambique and Oct–Apr in S, Sept–Mar in Zimbabwe and Oct–Jan in South Africa; often more than one brood in a season. Monogamous, with long-term pair-bond. Usually solitary, but often builds at same site in successive seasons, with old nests still present; constructs up to four nests close together in one season. Male sings to female throughout year, adopting "song stretch" posture, reaching forwards while ruffling head and throat feathers. Nest built by male, watched by female until she adds lining prior to egg-laying, occasionally building shared, or female participates irregularly, construction takes 1–3 weeks, nest may be completed long before egg-laying; nest retort-shaped, with entrance tunnel usually 10 cm long (and wide enough for birds to pass each other inside), one occupied nest in Zimbabwe lacked tunnel, some others had tunnel directed horizontally (rather than downwards), very finely woven from thin strips of plant material, often collected some distance away, one nest in South Africa constructed entirely from horsehair, another included nylon fishing line, one built from pine (*Pinus*) needles; typically suspended from tip of pendulous vegetation, including exotic plants such as *Bougainvillea* in gardens, 1–7 m (usually 3–4·5 m) above ground, in Okavango Delta (Botswana) attached to side of reed stem, elsewhere suspended from tops of elephant grass, papyrus (*Cyperus papyrus*) or *Phragmites* reeds, both sexes strip leaves from supporting stem, leaving tuft of leaves at point of attachment; in palms, may be displaced by larger competitors such as *P. baglafecht*; of eight nests in a Cameroon mango (*Mangifera*) plantation, five were in the very few trees (nine out of 203) which housed nests of the wasp *Polybioides tabidus*, positioned within 30 cm of wasp nests; nest reused for second brood or a new nest built; old nests used for breeding by White-collared Oliveback (*Nesocharis ansorgei*), Black-tailed Waxbill (*Estrilda perreini*) and Brown Firefinch (*Lagonosticta nitidula*). Clutch 1–4 eggs, average 2·6 (South Africa), white or bluish-green with dull grey or reddish-brown spots, sometimes concentrated at thick end (in South Africa, pinkish ground colour common), average size of 113 eggs 21·9 × 14·8 mm (South Africa); incubation by both sexes, sitting very tight (can be captured on nest), nest seldom left unattended, period 13–14 days; for first 1–2 days chicks brooded by female and male brings food, thereafter both adults provision young, initially faecal sacs removed by adults, later young defecate down nest-tunnel, nestling period 15–19 days. Nests occasionally parasitized by Diederik Cuckoo (*Chrysosoccyx caprius*). In ringing studies, oldest bird recaptured after 10 years.

Movements. Apparently sedentary; of 298 ringed individuals recaptured or found dead in S Africa, only one was more than 10 km from ringing site.

Status and Conservation. Not globally threatened. Widespread and often common in modified habitats; scarce to not uncommon in NW part of range. Estimated population in Kruger National Park, in NE South Africa, at least 4000 individuals, whereas estimate for Swaziland more than 20,000, and for C & S Mozambique in excess of 100,000 individuals.

Bibliography. Archer (1992), Backhurst (1974), Bates (1911), Beesley (1973), Belcher (1924, 1930b), Benson (1947a), Benson & Benson (1977), Benson *et al.* (1971), Bowden (2001), Bowen (1931a, 1931b), Braun (1930), Britton (1980), Britton & Britton (1986), Brooke (1965a, 1966a, 1968, 1970, 1971), Brooke *et al.* (1972), Brown & Britton (1980), Carswell *et al.* (2005), Chalton (1976, 1991), Chapin (1932, 1954), Collias, N.E. & Collias (1964), Craig, A.J.F.K. (1984), Crook (1969), Dean (2000), Dean & Milton (2005), Dejean & Fotso (1995), Desfayes (1975), Diesselhorst (1971), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Eisentraut (1963), Fisher (1998), Fry & Keith (2004), Germain & Cornet (1994), Granvik (1934), Hanmer (1989), Hockey *et al.* (2005), Irwin (1981), Jackson & Sclater (1938), Jensen & Vernon (1970), Kemp *et al.* (2001), de Klerk (1942), Kothe (1911), Kunkel (1974), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1938), Madge (1972), Moreau & Sclater (1938), Nikolaus (1987), Oatley & Skead (1972), Ogilvie-Grant (1910a), Olson (1976), Oschadleus & Underhill (2006b), Parker, V. (1994, 1999, 2005), Penry (1994), Prigogine (1971), Rand *et al.* (1959), Reichenow (1903), Ruwet (1964a), Sclater & Moreau (1933), Seth-Smith (1913), Sjöstedt (1910), Skead (1953, 1995), van Someren (1916, 1956), Stevenson & Fanshawe (2002), Swynnerton (1908), Tarboton (2001), Traylor (1963a), Urban & Brown (1971), Vande weghe (1973), Verheyen (1953), Vernon (1980b), Vincent, A.W. (1949a), Vincent, J. (1936), Zimmerman *et al.* (1996).

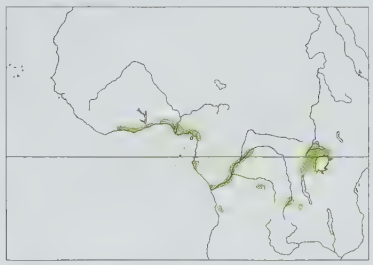
85. Slender-billed Weaver

Ploceus pelzelni

French: Tisserin de Pelzeln **German**: Mönchsweber **Spanish**: Tejedor de Pelzeln
Other common names: Common Slender-billed Weaver, Little Weaver(!)

Taxonomy. *Sitagra pelzelni* Hartlaub, 1887, Magungo, Uganda.
Proposed race *tuta* (described from near Mwanza, in Tanzania) synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.
P. p. monacha (Sharpe, 1890) – S Ivory Coast E along coast to W Cameroon, also riverine Gabon, PRCongo and W & S DRCongo, NW Angola and NW Zambia.
P. p. pelzelni (Hartlaub, 1887) – NE DRCongo, Uganda, SW Kenya, NW Tanzania, Rwanda and Burundi.



Descriptive notes. 11 cm; 10–16 g. Very small weaver. Male nominate race has black forehead, crown to just behind eye, lores, cheek, ear-coverts, chin and throat, black extending onto upper chest as a pointed bib; hindcrown and nape golden-yellow, mantle and back golden-olive with faint central streaks on feathers, rump olive-yellow; tail olive-green, rectrices with yellow margins; upperwing olive-brown, yellow margins on remiges, broader on wing-coverts; side of breast, flanks, belly, thighs and undertail-coverts golden-yellow; iris brown to yellowish; bill black; legs blue-grey. Female lacks black on head, has forehead to nape, cheek and ear-coverts yellowish-green with clear yellow supercilium, upperparts olive-green, mantle and back with faint streaking, rump washed with yellow; tail olive-green, yellow margins on rectrices, wings olive-brown, yellow margins on remiges and wing-coverts; chin to undertail-coverts golden-yellow, duller on flanks, greenish wash on thighs; iris brown. Juvenile resembles female, but browner above, duller yellow below, brown wash on throat and breast, white belly, upper mandible pale horn-coloured, lower mandible yellowish with darker tip. Race *monacha* is like nominate, but has shorter, less slender bill. Voice. Song of chattering and swizzling calls, with whistled "si-si-si" interspersed between phrases; buzzing "bzzzzt" also recorded.

Habitat. Papyrus (*Cyperus papyrus*) and other tall waterside vegetation near lakes and other wetland areas, foraging in trees and bushes, ambatch (*Aeschynomene elaphroxylon*) thickets, adjoining lagoons, marshes, rice fields and mangroves; visits gardens and hedges in urban areas. Mainly below 1700 m; to 2350 m in Rwenzoris, in E DRCongo.

Food and Feeding. Diet primarily insects, with caterpillars (Lepidoptera) and ants (Formicidae) noted in stomach contents; in Cameroon, 32 stomachs all contained insects. Forages at all levels in trees, gleaning and prying, showing great agility; foot structure exhibits adaptations typical of papyrus specialists. Singly, in pairs or in flocks; groups move through vegetation in manner reminiscent of white-eyes (*Zosterops*).

Breeding. Breeds in Jul–Aug in Ghana, Jun–Sept in Togo, May–Oct in Nigeria, Jan–Feb, Apr–Jun and Aug–Nov in Cameroon, May in Gabon; in DRCongo, Aug–Sept in NE, Jun–Jul in C region, Nov–Jan in S, possibly in both rainy seasons in Upemba, Oct–Nov and again Jan–Mar, while urban colony at Kisangani nesting all year, with Sept peak; Mar–Oct (mainly Apr–May) in Uganda, Mar–Apr in Angola and Feb in Zambia. Monogamous, but unclear if long-term pair-bond. Colonial nester, usually fewer than 20 nests in colony, rarely up to 50; also single nests c. 12 m apart; in Congo Basin may nest alongside *P. melanocephalus*, and on fringes of mixed *P. cucullatus* and *P. nigerrimus* colonies. Nest built by male, female sometimes assisting, ball-shaped, usually lacks entrance tunnel (or has very short one), outer shell roughly woven from strips of grass or papyrus leaf, lined with fine grass strips, also some seedheads and feathers (which may be added during incubation), sited 1·5–9 m (usually c. 3 m) above ground or over water and attached to papyrus heads, palm frond or pendulous thorny branch; sometimes two nests on same support, but then only one occupied; old nests used by Dusky-blue Flycatcher (*Muscicapa comitata*). Clutch 2–3 eggs, pure white, sometimes pinkish, rarely with fine dark spots, average size 17·5 × 13·5 mm (locality not stated); incubation either by female alone or by both sexes, period c. 15 days; chicks fed by both male and female, no information on duration of nestling period. Nests sometimes parasitized by cuckoo, probably Diederik Cuckoo (*Chrysococcyx caprius*), both in Ghana and in DRCongo. Nests in Ghana preyed on by Pied Crows (*Corvus alba*) and Senegal Coucals (*Centropus senegalensis*).

Movements. Resident.

Status and Conservation. Not globally threatened. Locally common to not uncommon; very common in parts of E Africa. Has been recorded in Sierra Leone and possibly Liberia.

Bibliography. Aspinwall & Beel (1998), Benson *et al.* (1964), Borrow & Demey (2001), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Collias, N.E. & Collias (1964), Danadu *et al.* (2001), David & Gosselin (2002a), Dean (2000), Dean *et al.* (1988), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Elgood *et al.* (1994), Friedmann & Loveridge (1937), Friedmann & Williams (1971), Fry & Keith (2004), Gatter (1997), Grimes (1987), Günther & Feiler (1986), Leisler & Winkler (2001), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1938), Macdonald (1979b, 1980b), Musil (1972), Rand *et al.* (1959), Reichenow (1887a), Serle (1950, 1954, 1965, 1981), Seth-Smith (1913), van Someren (1916), Stevenson & Fanshawe (2002), Verheyen (1953), Vincent (1949a), Zimmerman *et al.* (1996).

86. Strange Weaver

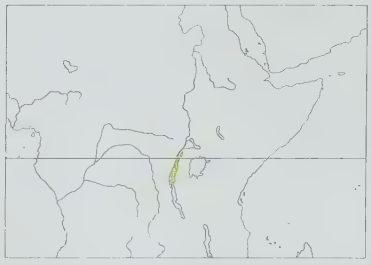
Ploceus alienus

French: Tisserin de montagne **German**: Meisenweber **Spanish**: Tejedor Extraño

Taxonomy. *Sitagra aliena* Sharpe, 1902, Rwenzori, Uganda.
Relationships uncertain; often considered closest to *P. ocularis*, but affinity with *P. batesi* has been suggested. Monotypic.

Distribution. E DRCongo, SW Uganda, Rwanda and Burundi.

Descriptive notes. 14 cm; 19–24 g. Male has black head and neck to throat, black extending onto breast as teardrop-shaped bib bordered below with chestnut-brown; upperparts plain olive-green, rump with slight yellowish wash, tail olive-green; upperwing dull brown, greenish margins on remiges, olive-green fringes on wing-coverts; flanks, belly and undertail-coverts golden-yellow, thighs olive-green; iris red; bill black; legs slate-grey. Female is like male in pattern, except that black ends sharply on throat, with chestnut-brown bib on breast; flanks olive-green, rather than yellow. Juvenile is olive-green above, chin to breast yellowish olive-green,



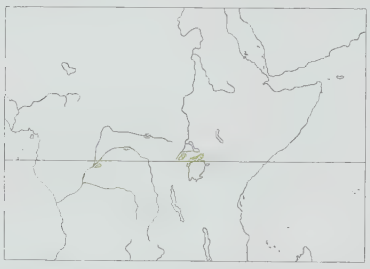
washed with golden-brown on chin and throat, belly yellow to whitish, flanks olive-green, iris brown, bill horn-brown. Voice. Song a rhythmic "wee chow-chow-chow". Calls include descending series of whistles like those of *P. ocularis*, and single-note contact call.
Habitat. Montane evergreen forest at 1500–3000 m; encountered in clearings, secondary growth, bamboos and understorey vegetation.
Food and Feeding. Insects, berries and seeds reported in stomach contents; seven stomachs held only arthropod remains, including a caterpillar (Lepidoptera) and millipede (Diplopoda), and two contained seeds and berries. Gleans branches and creepers, probes clusters of dry dead leaves at middle levels in forest, generally below 5 m. Forages in pairs; also joins mixed-species flocks, associating particularly with *P. bicolor*.
Breeding. Breeds in Jan–May, possibly throughout year, in DRCongo, and in Jan–Feb, Jun and Oct in Uganda. Monogamous, probably with long-term pair-bond. Solitary nester, although one pair may have two nests close together. Nest built by both sexes, retort-shaped, with short entrance tube (6 cm) pointing outwards, rather than straight down (building starts with vertical ring, then egg-chamber constructed, finally entrance and tunnel), built mainly from short, interlocking, thin tendrils of creepers with some grass strips, lined with fine grass-heads, suspended 3–10 m above ground from tip of branch; branches near nest stripped of leaves by nesting pair; old nests may be used for breeding by White-collared Oliveback (*Nesocharis ansorgei*). Clutch 2 eggs, creamy white with some grey shading, irregularly spotted with reddish-brown, average size of eight eggs 22·3 × 15 mm. No other information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Albertine Rift Mountains EBA. Has very limited distribution in a vulnerable forest habitat, recently an area of civil war and political unrest which has threatened the status of all protected reserves in the region. This species occurs in Virunga National Park and possibly Kakuzi-Biega National Park, in DRCongo; Mgahinga Gorilla National Park, Bwindi Impenetrable National Park, Rwenzori Mountains National Park and Echuja Forest Reserve, in Uganda; Volcanoes National Park and Cyamudongo and Nyungwe Forest Reserves, in Rwanda; and Kibira National Park and Bururi Forest Reserve, in Burundi.
Bibliography. Britton (1980), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1954), Collias, N.E. & Collias (1964), Dowsett-Lemaire (1990), Fishpool & Evans (2001), Fry & Keith (2004), Kunkel (1974), Lippens & Wille (1976), Ogilvie-Grant (1910a), Prigogine (1971), Sassi (1925), Stevenson & Fanshawe (2002).

87. Weyns's Weaver

Ploceus weynsi

French: Tisserin de Weyns **German**: Weynsweber **Spanish**: Tejedor de Weyns

Taxonomy. *Melanopteryx weynsi* A. J. C. Dubois, 1900, Bumba, DRCongo.
Has been thought to form a superspecies with *P. golandi*. Monotypic.
Distribution. E PRCongo, W & N DRCongo, S Uganda and NW Tanzania.



Descriptive notes. 15 cm; male 24–36 g, female 23–34 g. Male has head to back and down to upper breast black, rump olive-green with some black flecking or barring; tail olive-brown, upperwing dull blackish-brown, narrow yellow edges on remiges, broader margins on tertials and wing-coverts and yellow tips to median coverts (forming distinct wingbar); flanks and sides of belly chestnut, variable area of yellow in centre of belly, thighs yellow with olive-green flecks, undertail-coverts yellow; iris pale yellow; bill black; legs brown. Female has forehead, crown, nape and side of head plain olive-green (no obvious supercilium), upperparts olive-green, mantle and back with faint darker streaks, rump unstreaked but with some dark feather tips; tail and wings dark olive-green, narrow greenish-yellow edges on remiges, broader greenish-yellow tips on wing-coverts (forming wingbar); chin, throat and breast pale yellow, passing into white on belly, with flanks dull olive-green, thighs olive-green on outer surface, inner surface yellow-tinged white, undertail-coverts white; iris pale yellow, bill dark brown. Juvenile resembles female, but with brown iris and brown bill. Voice. Song described as a very high-pitched sizzling. Contact calls a high-pitched "chip", from perch and in flight.
Habitat. Tall trees in forest and near lakes; also secondary growth and forest clearings. To 1500 m.
Food and Feeding. Fruit, including wild figs (*Ficus*); stomachs of three individuals held fruit of *Beilschmiedia discolor* and *Alchornea cordifolia*. Seen mainly in forest canopy. Forages in pairs and in flocks; feeding flocks commonly of up to c. 20 individuals, occasionally up to 200 or more. Roosts in flocks, sometimes with other weavers.
Breeding. Young found in Uganda in Nov, and begging juvenile seen Apr; adults with enlarged gonads in Apr–Jun in DRCongo and Jun–Jul in Uganda; in moult Sept–Nov, likely to be after breeding period. No other information.
Movements. Appears to wander erratically; absent from lakeshore area around Kampala (Uganda) during Jun–Sept, implying some seasonal regularity in movements.
Status and Conservation. Not globally threatened. Locally common; presence often unpredictable. Encountered in reasonable numbers, with no evidence of a population decline. In PRCongo, huge flocks estimated to contain more than 10,000 birds seen in Jul, and other large flocks in Jan–Mar and Sept–Oct; status unclear. Lack of information on breeding habits and breeding biology perhaps a cause for concern; fieldwork required.
Bibliography. Carswell (1986), Carswell *et al.* (2005), Chapin (1954), Demey *et al.* (2000), Friedmann & Williams (1969), Fry & Keith (2004), Rainey *et al.* (2009), Seth-Smith (1913), van Someren (1916), Stevenson & Fanshawe (2002).

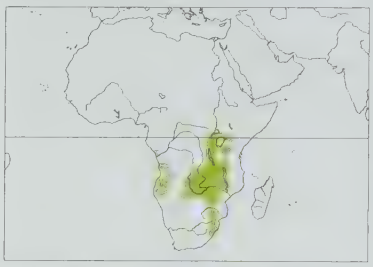
88. Holub's Golden Weaver

Ploceus xanthops

French: Tisserin safran **German**: Safranweber **Spanish**: Tejedor Azafranado

Other common names: Large(r)/Monteiro's Golden Weaver

Taxonomy. *Hyphantornis xanthops* Hartlaub, 1862, lower Cuanza River, Angola.
Formerly thought to form a superspecies with *P. subaureus*, but the two differ in breeding behaviour and ecology, and ranges overlap. Monotypic.
Distribution. SW PRCongo S to W Angola, and S Uganda, SW Kenya, E & S DRCongo, Rwanda, Burundi and W Tanzania S to NE Namibia (Caprivi region), N Botswana (Okavango Basin), C Zimbabwe, WC Mozambique, N & E South Africa (locally Limpopo S to KwaZulu-Natal) and W Swaziland.



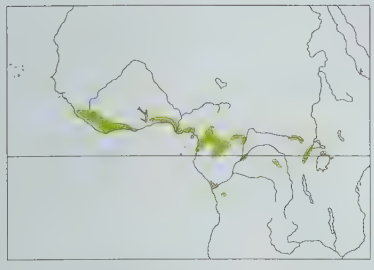
Descriptive notes. 17–18 cm; male 40–50 g, female 35–40 g. Male has golden-yellow head; upperparts and tail greenish-yellow to golden-olive, rectrices with yellow edges; upperwing dull brown with dull yellow margins; golden-yellow below, some tawny to orange wash on chin to upper breast; iris pale yellow; bill black; legs pinkish-flesh. Female resembles male, but head has only forehead yellow, and yellow below is duller, often with no chestnut wash on chin and throat (one aberrant female from Zimbabwe had grey plumage with olive wash on upperparts, tinge of buff below, grey edgings on remiges and rectrices). Juvenile has upperparts dull olive-green, tail with yellowish margins, wings dark brown with greenish-buff margins, chin and throat yellowish, breast buffy brown, belly paler buff, iris dark brown, bill pale brown with darker base. Voice. Song a short chattering phrase followed by trill and squeaky notes, "chichi-chichi-chi-squirr ski-wee"; variations noted in different regions. Contact call a short "chirp".
Habitat. Bushy areas with tall grass, on forest margins and along streamsides; generally at 1200–2300 m, but coastal in E South Africa and in W in Angola and PRCongo.
Food and Feeding. Diet invertebrates, fruit, seeds and nectar. Insects include beetle larvae (Coleoptera) and termites (Isoptera); fruit includes guavas (*Psidium*), figs (*Ficus*) and *Rhus pyroides*; grass seeds (*Panicum maximum*), seeds of exotic pine (*Pinus patula*); nectar of *Ruttya* and *Erythrina*; flower petals also eaten. Nestlings fed with grasshoppers (Orthoptera), praying mantis (Mantidae), tabanid fly (Tabanidae) and spiders (Araneae). Forages in forest canopy; extracts beetle larvae from pods of *Burkea africana*; catches termite alates both on ground and on the wing. Visits garden birdfeeders; dominated *P. velatus* at feeder in Botswana. Generally singly and in pairs.
Breeding. Breeds Jan–Apr over much of range; as early as Sept in S Africa, Zambia and Malawi, and recorded in most months in E Africa, peak season Aug–Oct in Uganda; may be double-brooded. Monogamous. Often loose colony of two or three territorial males. Male, perched beside female, leans forward, with head and throat feathers ruffled, and sings; directs this "song stretch" display to female also elsewhere when the two meet again after separation. Nest built by male, female contributing lining, bulky kidney-shaped structure, with entrance below, often with seedheads protruding, woven from broad-bladed grass, lined with grass-heads, grass stems, sometimes pad of plant down and a few feathers, usually suspended by roof 2–2·5 m up from tall bush or reeds, often over water, rarely slung between reeds or supported at one side only; leaves stripped from vegetation surrounding nests; several nests built in territory, but only one occupied; old nests used for breeding by Brown Firefinch (*Lagonosticta nitidula*), White-collared Oliveback (*Nesocharis ansorgei*) and Zebra Waxbill (*Amandava subflava*). Clutch 1–3 eggs, most often 2 (Malawi), plain blue, white or pinkish, or evenly freckled with red and lilac, average size of 55 eggs 24·1 × 16·2 mm (S Africa); incubation 14–15 days, 14 days in captivity; chicks fed by both sexes, nestling period 19–22 days. Nest parasitism by Diederik Cuckoo (*Chrysococcyx caprius*) reported. In ringing studies in S Africa, individuals recaptured after 6 years.
Movements. Probably sedentary. In S Africa, greatest distance moved was 10 km.
Status and Conservation. Not globally threatened. Considered to be common to locally common in much of range; rare to scarce and local in PRCongo. Much less abundant than colonial species. Estimated population in Swaziland 4000 individuals; in Kruger National Park, in South Africa, only 150 birds. Very widespread in S half of Africa, and present in protected areas throughout its range.
Bibliography. Bannerman (1949), Belcher (1930b), Benson & Benson (1977), Benson, Brooke, Dowsett & Irwin (1971), Benson, Brooke & Vernon (1964), Braun (1934), Britton (1980), Brooke (1954, 1965a, 1966a, 1970, 1971), Brown & Britton (1980), Chapin (1954), Collias, N.E. & Collias (1964), Cooper (1970b), Craig, A.J.F.K. (1982a, 1984), Cunningham-van Someren (1974b, 1996), Dean (2000), Fry & Keith (2004), Günther & Feiler (1986), Hall (1960), Hanmer (2002a), Harwin (1983), Hockey *et al.* (2005), Kemp *et al.* (2001), Lewis & Pomeroy (1989), Lorber (1982), Lynes (1938), Manson (1982), Mattocks (1971), Medland (1992b), Meise (1937), Parker, V. (1994, 1999, 2005), Penry (1994), Prigogine (1971), da Rosa Pinto (1965), Ruwet (1964a, 1965b), Savalli (1989), Schifter & Cunningham-van Someren (1998), Serle (1943a), Short & Horne (1978), Skinner (1995), Tarboton *et al.* (1987), Vande weghe (1973), Verheyen (1953), Vincent, A.W. (1949a), Vincent, J. (1936), White (1946), Zimmerman *et al.* (1996).

89. Yellow-mantled Weaver

Ploceus tricolor

French: Tisserin tricolore **German**: Dreifarbenweber **Spanish**: Tejedor Tricolor

Taxonomy. *Hyphantornis tricolor* Hartlaub, 1854, Sierra Leone.
Two subspecies recognized.
Subspecies and Distribution.
P. t. tricolor (Hartlaub, 1854) – Sierra Leone, SE Guinea, Liberia, S Ivory Coast, S Ghana and S Togo E to W & S Cameroon and extreme SW Central African Republic, S to Equatorial Guinea, Gabon, N & W PRCongo, extreme N Angola (Cabinda) and extreme SW DRCongo (mouth of R Congo).
P. t. interscapularis Reichenow, 1893 – locally in N, C & NE DRCongo and SW & S Uganda, also NW Angola (Cuanza Norte).
Descriptive notes. 17 cm; 32–44 g. Male nominate race has head and upperparts, including upperwing and tail, glossy black, except for narrow golden-yellow collar (variable in width) extending from side of neck across upper mantle; chin and throat black; breast, flanks and belly rich chestnut-brown, thighs and undertail-coverts black; iris dark red or brown; bill black; legs dark brown. Female is like male, but somewhat duller, breast and belly dull chestnut-brown, iris brown. Juvenile has dull forehead, crown, nape and mantle chestnut-brown, back, rump, wings and tail glossy black, side of head mixed black and chestnut, sooty grey below, washed with buff on chin, throat and breast (sometimes wash extending to belly and flanks), iris brown, bill pale brown, legs brown; on young male, yellow collar appears first, then black head plumage, and finally chestnut-



brown of underparts. Race *interscapularis* male is like nominate, female also very similar but has breast and belly duller, more blackish-brown, and red, not brown, iris. Voice. Song is a series of chattering notes, followed by a musical 2-note whistle, "tsssui-tssui tsssuii tsssuii tsuui tssuii tsii-iuup"; several song types opening with whistled notes followed by a swizzle and ending in whistles, e.g. "pit-way tu-woow zizzzzzz tsee-yee". Male sings a short song during courtship of female away from nest. Rasping alarm call, like that of a drongo (*Dicrurus*).

Habitat. Lowland forest, particularly along rivers or near swamps; also secondary forest and old plantations, as well as undisturbed forest; occasionally in small forest patches. Tends to nest in undisturbed forest, away from human habitation. To 1300 m in E DRCongo; at lower altitudes elsewhere.

Food and Feeding. Diet primarily insects, including grasshoppers and crickets (Orthoptera), ants (Formicidae), butterflies and caterpillars (Lepidoptera), alate termites (Isoptera); also small fruits and berries. Forages typically in middle levels or canopy of forest interior, in foliage usually above 25 m, not descending to undergrowth. Gleans thinner twigs, sallies above canopy to hawk insects; searches bark of dead trees, moving up trunk in spiral route, in upright posture like that of a woodpecker (Picidae); probes clusters of dead leaves. Often in groups of 4–6 individuals; joins mixed-species flocks of insectivores, and may gather with other birds at fruiting trees.

Breeding. Breeds in Mar in Guinea, Oct in Liberia, Aug–Oct in Ghana, Oct–Mar in Nigeria, Sept–Mar in Gabon, Feb in Angola; in DRCongo, Jun–Oct in N, Jan–Jun in Kivu, Jun–Jul in C forest and Jan–Feb in Itombwe; May–Oct in Uganda. Monogamous. Colonial, with up to 50 nests together (52 colonies in Liberia held average of 11 nests); one colony of 500 nests reported from Ghana. Male defends small territory within colony by supplant chases; in primary forest in Liberia, 12 of 31 colonies close to Palm-nut Vulture (*Gypohierax angolensis*) nests. Nest retort-shaped, with short, wide entrance tunnel, coarsely woven from rootlets, vine tendrils and fibres, lined with soft plant material, suspended 20–50 m above ground (in Nigeria mean 16 m) at end of thin branch; in Gabon, nests in same trees, often introduced cabbage-palm (*Livistona australis*) as those used by *Malimbus erythrogaster*, and in Nigeria in mixed colonies with *M. rubricollis* but segregated within tree. Clutch 2 eggs, white or plain blue, size 23 × 16 mm; no information on incubation and nestling periods. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*). Colony in Ghana destroyed by crows (Corvidae) and raptors; African Harrier-hawk (*Polyboroides typus*) a major nest predator in W Africa.

Movements. Presumed resident, with local movements while foraging.

Status and Conservation. Not globally threatened. Widespread, but range fragmented and not uncommon in W range, and locally common in C forested regions and in E range; rare in SW Central African Republic. Race *interscapularis* formerly occurred in Kakamega area of SW Kenya, but not recorded there for more than 30 years and presumed extinct in region.

Bibliography. Bannerman (1949), Borrow & Demey (2001), Brosset & Érard (1986), Brown & Britton (1980), Button (1967), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Colston & Curry-Lindahl (1986), Crook (1964b, 1969), Dean (2000), Demey & Fishpool (1994), Din (1991), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry & Keith (2004), Gatter (1997), Germain *et al.* (1973), Grimes (1987), Halleux (1994), Heinrich (1958), Lewis & Pomeroy (1989), Nikolaus (1987), Ogilvie-Grant (1910a), Péron & Crochet (2009), Prigogine (1971), Serle (1954, 1957), Seth-Smith (1913), van Someren (1913, 1916), Stevenson & Fanshawe (2002), Waltert & Mühlenberg (1999), Waltert *et al.* (1999), Zimmerman *et al.* (1996).

90. Golden-naped Weaver

Ploceus aureonucha

French: Tisserin à nuque d'or **German**: Goldnackenweber **Spanish**: Tejedor Nuquigualdo

Taxonomy. *Ploceus aureonucha* Sassi, 1920, Mawambi, DRCongo.

Taxonomic status uncertain; possibly not a valid species but, instead, a hybrid between e.g. *P. nigerrimus* and *P. tricolor*, or, perhaps more likely, specimens represent subadult of *P. tricolor*; further research required, but very few specimens available. Monotypic.

Distribution. Ituri region, in NE DRCongo.



Descriptive notes. 12 cm. Male has black forehead and crown, orange-brown hindcrown, orange-yellow band and golden-yellow collar on nape; upperparts, including upperwing and tail, black, mantle with yellow streaks in midline; chin and throat black, broad chestnut-brown band across breast; belly, flanks and thighs charcoal-grey, undertail-coverts grey-white; iris dark brown; bill black; legs brown. Female has brown forehead and crown (appearing as rounded cap), nuchal area blackish-grey, dull yellow collar on lower nape; upperparts, including wings and tail, black; chin and throat charcoal-grey, paling to ashy grey on belly, flanks and thighs, with undertail-coverts dull white; bare parts as for male. Juvenile specimen is dull black above, with some brown areas on head, grey to olive-green below, paler on belly and undertail-coverts, iris brownish, bill and legs brown. Voice. Call in flock described as a weak chatter.

Habitat. Lowland evergreen forest, also forest edge, and in tall emergent trees above secondary forest.

Food and Feeding. Insects and fruit found in stomach contents. Observed in forest canopy.

Breeding. One specimen had enlarged gonads in Sept, and reports of fledged young being fed in Jun. No other information.

Movements. No information.

Status and Conservation. ENDANGERED. Restricted-range species: present in Eastern Zaïre lowlands EBA. Very poorly known, with very few records. Rare. After 1926, was not recorded again for 60 years, until, in 1986, a flock of up to 60 individuals was reported (seen poorly in forest canopy, see page 80) at Epulu; at this site, pair feeding two fledglings reported in 1993; finally, in 2006, a sighting of two individuals was reported in Semliki National Park, in W Uganda, 80 km E of localities where previously recorded. The very few records of this weaver, from an area threatened by forest clearance, accelerated by recent fighting in this region, give cause for concern. Moreover, its taxonomic status needs to be resolved. Sight records from Okapi Faunal Reserve.

Bibliography. Anon. (2009e), Butchart & Stattersfield (2004), Chapin (1954), Collar *et al.* (1994), Craig (2005), Fishpool & Evans (2001), Fry & Keith (2004), Gyldenstolpe (1924), Sassi (1925), Stattersfield & Capper (2000), Wilson *et al.* (2007).



PLATE 10

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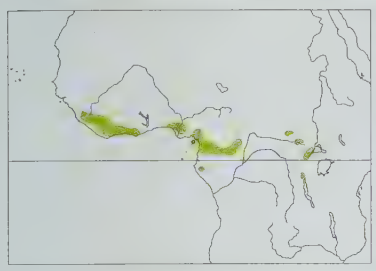
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91. **Maxwell's Black Weaver**

Ploceus albinucha

French: Tisserin de Maxwell **German**: Trauerweber **Spanish**: Tejedor de Maxwell
Other common names: White-naped Black Weaver/Widow, White-eyed Weaver/Widow

Taxonomy. *Sycobius albinucha* Bocage, 1876, Quanza, Angola; error = West Africa.
Three subspecies recognized.
Subspecies and Distribution.
P. a. albinucha (Bocage, 1876) – Sierra Leone, SE Guinea, Liberia, S Ivory Coast and SW Ghana.
P. a. holomelas Sassi, 1920 – S Nigeria, W & S Cameroon, Equatorial Guinea, NE & SW Gabon, NW PRCongo, SW & SE Central African Republic, NE DRCongo and W Uganda.
P. a. maxwelli (Alexander, 1903) – Bioko I (Fernando Póo).



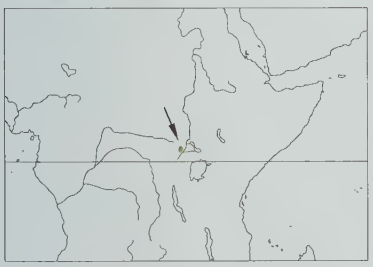
Descriptive notes. 13–15 cm; 25–30 g. Nominate race has plumage black, with glossy upperparts, nape feathers with white bases, showing as pale patch (especially when plumage worn); iris white to greenish-white; bill black; legs brown. Sexes alike. Juvenile is dark brown to blackish above, lacking gloss, dull charcoal-grey below, iris brown, bill brown. Race *maxwelli* has completely black nape feathers, immature is washed with yellow below; *holomelas* adult is like previous, juvenile grey below as in nominate. Voice. Soft swizzling call may represent song. Contact call when in flocks "chick chick".
Habitat. Lowland evergreen forest, also near villages surrounded by secondary forest, and often in vicinity of rivers and creeks. Mainly lowlands; to 850 m in Cameroon.
Food and Feeding. Diet insects, including grasshoppers (Orthoptera) and caterpillars (Lepidoptera); also berries, and nectar from flowering trees. Of 13 stomach samples, twelve contained insect remains, two also fruit. Forages at various levels. Hawks insects in canopy, then foraging mostly singly; at lower levels in small parties, usually fewer than twelve individuals together, but up to 20 in PRCongo. Also joins mixed-species flocks. Assembles at large, noisy roosts in evening.
Breeding. In W Africa, active nests in Feb in Sierra Leone, fledglings seen Nov–Dec in Liberia and Ghana, and birds with enlarged gonads in Mar in Cameroon; breeds Feb and Jun–Aug in DRCongo. Probably polygynous. Colonial, with 20–500 nests in colony; sometimes in mixed colonies with *P. nigerrimus* and *P. cucullatus*, less often with *P. aurantius*; in Nigeria, not found in association with *P. cucullatus*. Nest a rough ball, entrance below and almost no tunnel, constructed from thin creepers or woven from strips of banana (*Musa*) leaves, placed at tip of pendulous branch generally high in crown of tree, more than 10 m above ground; colony of 20 nests in Sierra Leone was directly below nest of Crowned Hawk-eagle (*Stephanoetus coronatus*). No other information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common; rare in Uganda. Possibly vulnerable to destruction of forest habitat. In villages, young in nesting colony sometimes harvested for food.
Bibliography. Bannerman (1949), Basilio (1963), Borrow & Demey (2001), Bowden (2001), Button (1967), Carswell *et al.* (2005), Chapin (1932, 1954), Colston & Curry-Lindahl (1986), Demey & Fishpool (1994), Dowsett *et al.* (1999), Dowsett-Lemaire & Dowsett (2008a), Eisentraut (1963), Elgood *et al.* (1994), Friedmann & Williams (1971), Fry & Keith (2004), Gatter (1997), Grimes (1987), Halleux (1994), Lippens & Wille (1976), Pérez del Val *et al.* (1994), Sargeant (1993), Thiollay (1985), Waltert *et al.* (1999).

92. **Yellow-legged Weaver**

Ploceus flavipes

French: Tisserin à pieds jaunes **German**: Gelbfußweber **Spanish**: Tejedor Patigualdo
Other common names: Yellow-legged/Yellow-fronted Malimbe

Taxonomy. *Malimbus flavipes* Chapin, 1916, Avakubi, DRCongo.
Has been placed in genus *Malimbus*; in the past was sometimes placed in a monotypic genus, *Rhinoploceus*. Validity of this taxon has been questioned, and suggested by some authors that it could represent occasional hybrids between all-black species such as *P. nigerrimus* and *P. albinucha*; further research required. Monotypic.
Distribution. Ituri Forest, in NE DRCongo.



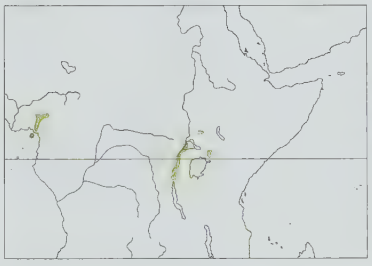
Descriptive notes. 12 cm. Male is wholly black, except for blackish-brown belly and undertail-coverts; some gloss on crown, nape and mantle; iris whitish; bill black; legs dull yellow. Female is like male but less glossy, with undertail-coverts duller, iris yellow. Presumed juvenile is blackish-green above, greenish-grey below. One specimen has chocolate-brown upperparts, brown throat and belly; variation in plumage of specimens could represent non-breeding plumage, but considered unlikely. Voice. No information.
Habitat. Canopy of lowland forest.
Food and Feeding. Presumably insects; caterpillars (Lepidoptera) in stomach of one specimen.
Breeding. Two specimens in breeding condition in Sept. No other information.
Movements. Presumed resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Eastern Zaïre lowlands EBA. Rare and very poorly known. Has very small global range within which warfare and deforestation continue; population small and declining as a result of ongoing destruction and fragmentation of lowland forest. Fewer than ten specimens of this weaver are known to exist, the last dated 1959; two sight records from Okapi Faunal Reserve, one in 1990 and other in 1994.
Bibliography. Anon. (2009e), Chapin (1916, 1954), Collar & Stuart (1985), Collar *et al.* (1994), Craig (2005), Fishpool & Evans (2001), Fry & Keith (2004), Gyldenstolpe (1924), Louette (1988a), Prigogine (1960), Stattersfield & Capper (2000), Stresemann (1925).

93. **Black-billed Weaver**

Ploceus melanogaster

French: Tisserin à tête jaune **German**: Schwarzbauchweber **Spanish**: Tejedor Piquinegro

Taxonomy. *Ploceus melanogaster* Shelley, 1887, Mount Cameroon, 8000 feet [c. 2440 m], Cameroon.
Often grouped with *P. nigricollis* and *P. ocularis* in a "spectacled weaver" superspecies. Two subspecies recognized.
Subspecies and Distribution.
P. m. melanogaster Shelley, 1887 – SE Nigeria, SW Cameroon and Bioko I (Fernando Póo).
P. m. stephanophorus (Sharpe, 1891) – S highlands of Sudan (Imatong, Dongotoma, Didinga, Acholi); E DRCongo and adjacent W Uganda, Rwanda and Burundi; and E Uganda and adjoining areas of WC Kenya.



Descriptive notes. 14 cm; 20–28 g. Male nominate race has most of head golden-yellow, cheek and ear-coverts washed with orange-brown, sometimes extending to chin and throat, lores black with "spectacle" line extending past eye and ending in point on ear-coverts; chin and throat black, bordered below by narrow yellow band across upper breast (meeting yellow of head); rest of plumage black; iris red to red-brown; bill and legs black. Female resembles male in plumage, except that hindcrown is black, ear-coverts to chin and throat orange-brown; iris red-brown. Juvenile is uniformly dark olive-brown above, chin and throat buff, underparts dull buffy green, iris brown, bill brown, legs grey. Race *stephanophorus* male has rear half of crown black, lacks yellow breastband, female has crown like male, strong cinnamon tinge on chin and throat. Voice. Song of clear ringing notes followed by drawn-out snoring sound, "da du da du dzirr", described as similar to that of a sunbird (Nectariniidae). Contact call a harsh, rapid "zhink-zhink-zhink".
Habitat. Montane forest, from 550 m to 2450 m (mainly 1000–2200 m) in Cameroon and at 1500–3000 m in E Africa. Once encountered in exotic eucalypt (*Eucalyptus*) plantation.
Food and Feeding. Diet primarily insects, including ants (Formicidae), alate termites (Isoptera), beetles (Coleoptera), cicadas (Cicadidae); stomach contents insect fragments, fruits, seeds, and once a small frog. Forages in undergrowth and at middle levels of dense secondary bush; searches low in dense foliage, hanging upside-down to probe clusters of dead leaves; sometimes descends to the ground, where it moves by hopping. Usually singly or in pairs, but at times five or six individuals together, gathering to feed on fruit; sometimes joins mixed-species flocks in Cameroon and DRCongo.
Breeding. Breeds in Dec in Nigeria, Oct–Jan (mainly Dec) in Cameroon, Jan on Bioko I, Nov–Mar and Aug in Sudan, Dec–Jan, Oct–Nov and May–Jun in Uganda; Jan–Apr, Jun and Sept in Kenya, Jan–Apr and Sept in DRCongo, and Nov in Rwanda. Monogamous. Solitary nester. Nest retort-shaped, opening below with internal ledge, but no tunnel (one nest on Bioko had tunnel), woven from tough grass stems, lined with finer material, suspended 3–6 m above ground (sometimes over a stream) from tip of branch, tendril of creeper or tree-fern frond, and easily visible; old nests used by Dusky-blue Flycatcher (*Muscicapa comitata*) and occasionally by *Nesocharis shelleyi*. Clutch 2 eggs, white with very fine, evenly scattered pinkish-brown spots, 21 × 15 mm (Sudan); incubation by female only, chicks brooded and fed by both sexes; no information on duration of incubation and nestling periods.
Movements. Presumed resident; seasonal altitudinal movements possible on some mountains.
Status and Conservation. Not globally threatened. Reasonably common in Cameroon Highlands; fairly common to uncommon elsewhere, but reportedly shy and difficult to observe. Old records of race *stephanophorus* from N Uganda and W Tanzania.
Bibliography. Bannerman (1949), Basilio (1963), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brown & Britton (1980), Cave & Macdonald (1955), Chapin (1954), Dowsett-Lemaire (1990), Eisentraut (1963, 1973), Elgood *et al.* (1994), Fishpool & Evans (2001), Friedmann & Williams (1970), Fry & Keith (2004), Granvik (1923, 1934), Lewis & Pomeroy (1989), Lippens & Wille (1976), Mann (1985), Nikolaus (1987), Prigogine (1971), Schifter & Cunningham-van Someren (1998), Serle (1950, 1954, 1981), Stevenson & Fanshawe (2002), Stuart (1986), Tye (1992), Urban *et al.* (1997), Vande weghe (1973), Weekes (1948), Zimmerman *et al.* (1996).

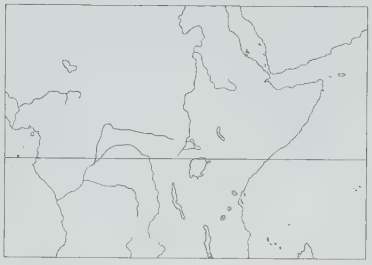
94. **Usambara Weaver**

Ploceus nicolli

French: Tisserin des Usambara **German**: Usambaraweber **Spanish**: Tejedor de los Usambara
Other common names: Tanzanian Mountain Weaver, Nicoll's Weaver

Taxonomy. *Ploceus* (*Symplectes*) *nicolli* W. L. Sclater, 1931, Amani, East Usambara Mountains, Tanzania.
May form a superspecies with *P. olivaceiceps*, and formerly treated as conspecific. Birds in S of range sometimes recognized as race *anderseni*, separated by minor plumage details from birds in rest of species' range, but differences considered too trivial to warrant naming of geographical races. Treated as monotypic.
Distribution. East and West Usambara, Uluguru and Udzungwa Mts, in E Tanzania.
Descriptive notes. 14 cm; 26–33 g. Male has forehead and crown buffy brown, blending into olive on nape, which is sharply demarcated from black of mantle and back; rump feathers black with yellow fringes; upperwing and tail black; chin, throat, lores and ear-coverts dark brown; breast

On following pages: 95. Black-chinned Weaver (*Ploceus nigrimentus*); 96. Olive-headed Weaver (*Ploceus olivaceiceps*); 97. Preuss's Weaver (*Ploceus preussi*); 98. Brown-capped Weaver (*Ploceus insignis*); 99. Yellow-capped Weaver (*Ploceus dorsomaculatus*); 100. Loango Weaver (*Ploceus subpersonatus*); 101. Bertram's Weaver (*Ploceus bertrandi*); 102. Baglafecht Weaver (*Ploceus baglafecht*); 103. Bannerman's Weaver (*Ploceus bannermani*); 104. Bates's Weaver (*Ploceus batesi*).



with large rich chestnut bib surrounded by chrome-yellow, flanks, belly, thighs and undertail-coverts chrome-yellow; iris red; bill black; legs dark brown. Female has entire head dark brown, lacking paler cap; plumage otherwise like that of male. Juvenile resembles female, but with forehead and crown dull olive-brown, throat speckled with yellow, buffy wash on breast (but no chestnut patch); iris grey-brown, later becoming yellowish; bill horn-brown. Voice. Song a rhythmic series of repeated notes, rising in pitch, "swi-iri t'swi-i t'swi-i t'swi-i"; "swi-swee-ee" may represent a song whistle. Calls include a hard "chip" or "chak", in series "cheek-chop-chop-chikikikik".

Habitat. Evergreen montane forest, including forest edge and disturbed areas; occasionally in plantations and cultivated areas where mature forest trees still present. At 900–2200 m, but uncommon above 1850 m.

Food and Feeding. Insects found in stomach contents. Gleans from trees covered in epiphytes; often hangs upside-down while feeding, and may tear off pieces of bark. Forages singly, in pairs or in mixed-species flocks, often associating with *P. bicolor*.

Breeding. Nest described as resembling that of *P. bicolor* (made from dry tendrils and creepers), with shorter entrance tunnel and more flared opening. No other information.

Movements. Presumed resident.

Status and Conservation. ENDANGERED. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Rare. Occurs at low densities in montane forests in Eastern Arc Mts of Tanzania, where it appears to have a very small and severely fragmented population. Global population currently estimated to number fewer than 2500 individuals, and declining. Forest habitats in this region already fragmented, and threat of further clearance and degradation of habitat constantly present. A possible record from Rubeho Mts, N of the Udzungwas, requires corroboration. Present in Udzungwa Mountains National Park, and in forest reserves in East and West Usambaras. Effective protection of this species' remaining habitat and extension of existing protected areas of forest would seem essential for its future survival.

Bibliography. Anon. (2009e), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Dinesen *et al.* (1993), Fishpool & Evans (2001), Franzmann (1983), Fry & Keith (2004), Sclater & Moreau (1933), Stattersfield & Capper (2000), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

95. Black-chinned Weaver

Ploceus nigrimentus

French: Tisserin à menton noir **German**: Schwarzkinnweber **Spanish**: Tejedor Gorjinegro

Taxonomy. *Ploceus nigrimentus* Reichenow, 1904, Galanga, Huambo [sic], Angola.
Has been thought to form a superspecies with *P. bertrandi* and *P. baglafecht*, with *P. bannermani* and *P. batesi* regarded as part of same species group. Monotypic.

Distribution. SE Gabon, SC PRCongo and adjacent SW DRCongo (Batéké Plateau).



Descriptive notes. 17 cm. Male has forehead and crown yellow, washed with orange-rufous, nape golden-yellow, lores, cheek, ear-coverts, chin and throat black; mantle and upper back black, lower back and rump yellow, tail olive-green; upperwing black, wing-coverts broadly edged with yellow; upper breast washed with orange-rufous, remainder of underparts golden-yellow; iris creamy white; bill black; legs brown. Female is like male, but has forehead, crown and nape black (continuous with mantle), rump a duller yellow. Juvenile resembles female, but black areas are dull greenish-grey, iris brown, bill brown. Voice. Song described as a distinctive short phrase, "whit-pu pui trrr pui". Harsh "chi-chi-cheep" and "jijiji" calls reported.

Habitat. Open savanna with bushes and trees (e.g. *Hymenocardia acida*) up to 8 m tall; mostly at 500–700 m, but in some areas to 1500 m.

Food and Feeding. Stomach contents of museum specimens were grass seeds and insects. Noted in pairs or small groups, often in canopy of low trees.

Breeding. Breeding reported as being "semi-colonial"; season not recorded. No other information available.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Locally not uncommon. Global range relatively small, but no indication that this species is at any risk. Recent surveys in PRCongo suggest at least 10,000 pairs in relatively undisturbed habitat. Occurs in Bakéké National Park, in SE Gabon. Old specimens from W Angola (Cuanza Sul and Huambo, latter including type locality), but no records in this country since 1960.

Bibliography. Borrow & Demey (2001), Chapin (1954), Collar *et al.* (1994), David & Gosselin (2002a), Dean (2000), Demey *et al.* (2000), Fishpool & Evans (2001), Fry & Keith (2004), Stattersfield & Capper (2000).

96. Olive-headed Weaver

Ploceus olivaceiceps

French: Tisserin à tête olive **German**: Olivkopfweber **Spanish**: Tejedor Cabeciverde
Other common names: Olive-headed Golden Weaver

Taxonomy. *Symplectes olivaceiceps* Reichenow, 1899, Songea, Tanzania.
May form a superspecies with *P. nicolli*, and formerly treated as conspecific. Isolated population in S Mozambique sometimes separated as race *vicarius*, defined as shorter-winged and paler in coloration than birds farther N, but original description based on an inadequate comparative sample. Treated as monotypic.

Distribution. N, W & S Tanzania, E Zambia, C & S Malawi and NW & S Mozambique.

Descriptive notes. 14 cm; 17–24 g. Male has forehead golden-yellow with buff wash, crown golden-yellow, passing into olive-yellow on nape; upperparts olive, rump with yellow wash; upperwing and tail blackish, remiges with paler edges, wing-coverts with olive-green fringes; lores, cheek, ear-coverts, chin and throat olive-green, more golden-olive on face, some black flecking on chin and throat; underparts chrome-yellow, breast with prominent rusty central patch (variable in extent); iris bright red to maroon; bill black; legs brown. Female differs from male in having forehead, crown and nape uniformly golden-olive, throat paler, patch on breast more orange and much less conspicuous. Juvenile resembles female, but with paler head, broader pale margins on wing-coverts, pale yellow chin and throat, faint buff wash on breast, iris grey-brown, bill pinkish-white, legs pale. Voice. Song a short phrase with last 4 notes in a descending cadence, "tzee-twa-twa-twa". Contact calls soft "tsssp tsssp", also 3-note call "twee-wheep-wheep" with high-pitched, descending first note; rarely, chattering calls from group of individuals.



Habitat. Mature miombo (*Brachystegia*) woodland, where *Usnea* lichen abundant; to 1700 m.

Food and Feeding. Diet primarily insects, including butterflies and moths (Lepidoptera), beetles (Coleoptera), bugs (Hemiptera) and small wasps (Hymenoptera). Forages on tree trunks and branches, mainly in lichen-covered parts of tree, moving up and down trunk; often hangs below branches while probing bark. Usually singly or pairs, often in mixed bird parties; in Zambia, foraging association with Miombo Tit (*Parus griseiventris*) and *Anaplectes rubriceps*; in Mozambique one flock included crombecs (*Sylvietta*), hyliotas (*Hyliota*) and Spotted Creepers (*Salpornis spilonotus*), and recorded also with Green Woodhoopoe (*Phoeniculus purpureus*), Cardinal (*Dendropicos fuscescens*) and Bearded Woodpeckers (*Dendropicos namaquus*), White-breasted Cuckoo-shrike (*Coracina pectoralis*), Eastern Black-headed Oriole (*Oriolus larvatus*) and Black-backed Puffback (*Dryoscopus cubla*).

Breeding. Breeds in Oct in Zambia, Sept–Oct in Malawi and Aug–Oct in Mozambique. Monogamous, pair-members remaining together throughout year. Solitary nester. Nest built by both sexes, a bag-like structure constructed entirely from *Usnea* lichen, generally with short spout of 10–15 cm, placed in thick clump of lichen, living strands attached to branch being utilized as a base, on underside of thick branches (not outer twigs), up to 18 m above ground and mostly near crown of tree. Clutch 2–3 eggs, plain turquoise-blue or white, average size of three eggs 20 × 15 mm (Malawi); incubation by both sexes, but male only occasionally sitting; chicks fed by both sexes, female contributing more than male; no information on duration of incubation and nestling periods.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon. Total population estimated at 20,000 pairs in 1998. Thought to be suffering a population decline throughout its range as a result of destruction and degradation of its miombo habitat. S population has suffered dramatic loss of habitat in recent years; in Panda region of S Mozambique, where formerly numerous, only 100 pairs remain. If population decline is shown to be rapid or increasing, this species may become threatened.

Bibliography. Anon. (2009e), Aspinwall (1979), Aspinwall & Beel (1998), Benson (1952), Benson & Benson (1977), Benson *et al.* (1971), Britton (1980), Butchart & Stattersfield (2004), Clancey & Lawson (1961, 1966), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Grobbelaar (2003), Hockey *et al.* (2005), McCarthy (2006), Medland (1989a, 1992a), Nuttall (1998), Nuttall & Parker (2001), Parker (1999, 2005), Sinclair & Ryan (2003), Stattersfield & Capper (2000), Stevenson & Fanshawe (2002), Vincent (1936).

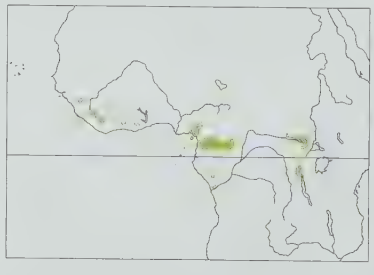
97. Preuss's Weaver

Ploceus preussi

French: Tisserin de Preuss **German**: Preussweber **Spanish**: Tejedor de Preuss
Other common names: Western/Preuss's Golden-backed Weaver, Golden-backed Weaver(!)

Taxonomy. *Symplectes preussi* Reichenow, 1892, Victoria, Cameroon.
Monotypic.

Distribution. SC & SE Guinea, E Sierra Leone, N Liberia, SE Ivory Coast, S Ghana, E Nigeria (Obudu Plateau), W & S Cameroon, N Equatorial Guinea, N Gabon, W PRCongo, S Central African Republic, and SW, NE & E DRCongo.



Descriptive notes. 14 cm; c. 31 g. Male has forehead and crown down to eye orange-brown, hindcrown and nape orange-brown with black filoplumes protruding; mantle and back golden-yellow, some black feathers in centre, rump yellow, some feathers black-tipped; upperwing and tail black; lores, cheek, ear-coverts, chin and throat black; breast golden-yellow with central patch of orange-brown, belly, flanks, thighs and undertail-coverts golden-yellow; iris brown or dark brownish-red; bill black; legs brown. Female is like male, differing in having forehead black and crown orange-brown to yellow, and yellow breast lacking orange-brown patch. Juvenile resembles female, but lacks black on head, has forehead and crown yellow with olive-green wash, chin and side of head brownish-yellow, wings and tail dark brown, bill pale brown. Voice. No song described; harsh "chwep" call reported.

Habitat. Primary and secondary evergreen forests, generally above 1000 m. In Gabon found in regenerating secondary forest, apparently avoiding closed-canopy areas.

Food and Feeding. Diet mainly insects, including their eggs and larvae, with grasshoppers (Orthoptera) and caterpillars (Lepidoptera) noted; also spiders (Araneae) and other bark-living arthropods. Seeds, perhaps from berries, in one of six stomachs; an earthworm (Lumbricidae) also recorded. Rarely forages below 10 m. Gleans on bark and boles of forest trees, even dead ones, and gleans branches covered in epiphytes. Usually in pairs; groups up to four individuals may represent family parties. Occurs alongside *Malimbus rubricollis* in Liberia and *P. dorsomaculatus* in Cameroon; in Congo Basin, noted in mixed-species flocks which included Golden-crowned Woodpecker (*Dendropicos xantholophus*), Dusky Tit (*Parus funereus*), Slender-billed Greenbul (*Andropadus gracilirostris*), Western Black-headed Oriole (*Oriolus brachyrhynchus*) and Straight-billed Green Sunbird (*Anthreptes rectirostris*).

Breeding. Specimens with enlarged gonads and sightings of dependent juveniles indicate breeding in Nov in Liberia, Aug in Cameroon, and Mar, Jun, Aug and Dec in DRCongo. Monogamous.

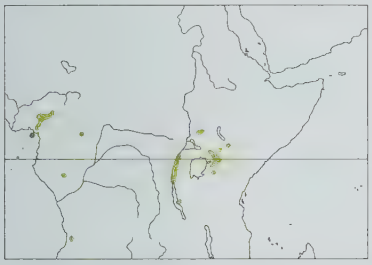
Solitary nester. Only one nest described, ball-shaped, with entrance below, lacking tunnel, woven chiefly from greyish *Usnea* lichen with strips from palm leaves, fastened securely to small branches 11 m above ground in canopy of small tree. Nestlings fed by both sexes. No other information.
Movements. Presumed sedentary.
Status and Conservation. Not globally threatened. Scarce to locally uncommon. Distribution very patchy, as forest habitat throughout its range is fragmented and reduced.
Bibliography. Bannerman (1949), Bates (1909, 1911), Borrow & Demey (2001), Brosset & Érard (1986), Carroll (1988), Chapin (1932, 1954), Christy & Clarke (1994), Demey & Fishpool (1991, 1995), Elgood *et al.* (1994), Fry & Keith (2004), Halleux (1994), Lippens & Wille (1976), Sassi (1925), Serle (1950), Thiollay (1985), Waltert *et al.* (1999).

98. Brown-capped Weaver

Ploceus insignis

French: Tisserin à cape brune **German**: Braunkappenweber **Spanish**: Tejedor Insigne

Taxonomy. *Sycobrotus insignis* Sharpe, 1891, Mount Elgon, Uganda.
Birds from Bioko I described as race *unicus*, but appear inseparable from those on mainland; similarly, proposed differences between W African and E African populations not supported in examination of museum material. Treated as monotypic.
Distribution. SE Nigeria, SW Cameroon, Bioko I (Fernando Póo), SW Central African Republic and SW highlands of PRCongo; S Sudan (Imatong Mts and Dongatona Mts), E DRCongo, W Rwanda, W Burundi, SW & E Uganda, W Kenya and N & W Tanzania; W Angola (Gabela, in Cuanza Sul).



Descriptive notes. 14 cm; 26–30 g. Male has forehead, crown and nape chestnut-brown, lores, cheek, ear-coverts, chin and throat black; upperparts yellow, mantle with narrow black feather bases showing through; upperwing and tail black, tertials and wing-coverts with narrow yellow fringes; breast golden-yellow, some orange along border with throat; belly, flanks and undertail-coverts golden-yellow, thighs yellow with greenish wash; iris red; bill black; legs brown. Female has entire head to chin and throat black, upperparts yellow with some black feathers (producing mottled effect), wings and tail black, underparts golden-yellow, sometimes some chestnut wash on breast; bare parts as for male. Juvenile male has head and nape black with paler feather tips (tips reddish-brown on crown, yellow elsewhere), wing-coverts with broad pale margins, throat and underparts yellow, some black feathers on throat, reddish-brown band on upper breast, green wash on flanks, both iris and bill brown; young female has black head feathers tipped olive-green, entirely yellow below. Voice. Song reported as having several cadences, with descending whistles followed by a swizzle, "chi-bo-hu-zwizzzz-zha", reminiscent of that of *P. bicolor*; other forms rendered as "twit chirrrr chirrrrchirrrr chirrr twitchirrr" and "zair twit zair zair zair zair twit". Contact call, both from perch and in flight, is a piercing "siip siip".
Habitat. Tall montane forest and bamboo forest, also secondary forests, gallery forest and coffee plantations; mainly at 1700–2800 m, sometimes as low as 850 m. Often in areas with open canopy and dense understorey vegetation.
Food and Feeding. Details of diet primarily from stomach contents; includes insects, such as caterpillars (Lepidoptera), and fruit. Moves at all levels in forest, hopping along boles and thicker lateral branches in canopy, probing exposed bark and epiphytes, using prying actions with bill; foraging actions like those of a tit (Paridae). Feeds solitarily or in pairs, and in family parties of three or four individuals, often in mixed-species flocks. In Gabon, once encountered in lowland forest alongside *P. preussi* and *P. dorsomaculatus*.
Breeding. Recorded in Mar and Dec in Cameroon, Mar and Oct in Sudan, Jan in E DRCongo (Itombwe), Aug–Sept and Dec in Uganda, and Jan–Apr and Nov in Kenya. Presumably monogamous. Solitary nester. Male uses short song in courtship away from nest, also sings when female enters nest. Nest retort-shaped, with long spout, one woven from tendrils of convolvulus creeper, 4–6·5 m above ground and fixed to underside of branch or at tip of branch, often above forest track or clearing. Clutch 2 eggs, pale blue with sparse brown spots, average size of four eggs 22·4 × 15·5 mm (Cameroon). No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Fairly common to locally not uncommon in much of range; uncommon in Angola (recorded only from Gabela). One record from NE Gabon. Restricted to vulnerable habitat of montane forest, and hence distribution very patchy, but currently still widely distributed.
Bibliography. Bannerman (1949), Basilio (1963), Borrow & Demey (2001), Britton (1980), Brosset & Érard (1986), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Chapin (1954), Clancey (1982), Crook (1969), Dean (2000), Dowsett-Lemaire (1990), Eisentraut (1963, 1973), Elgood *et al.* (1994), Friedmann & Williams (1970), Fry & Keith (2004), Granvik (1923, 1934), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Macdonald (1947), Mann (1985), Nikolaus (1987), Prigogine (1971), Schifter & Cunningham-van Someren (1998), Serle (1950, 1965, 1981), Stevenson & Fanshawe (2002), Tomlinson (1947–1948), Tye (1992), Zimmerman *et al.* (1996).

99. Yellow-capped Weaver

Ploceus dorsomaculatus

French: Tisserin à cape jaune **German**: Gelbkappenweber **Spanish**: Tejedor Dorsipinto

Taxonomy. *Symplectes dorsomaculatus* Reichenow, 1893, Jaunde, Cameroon.
Monotypic.
Distribution. Two widely separated populations: S Cameroon, N Gabon, NW PRCongo and SW Central African Republic; and E DRCongo (on highland fringe).
Descriptive notes. 14 cm. Male has forehead, crown and nape golden-yellow (in DRCongo some have golden-brown forehead and crown), lores, cheek, ear-covers and chin black; upperparts, including upperwing and tail, black, mantle flecked with yellow; throat and entire underparts golden-yellow; iris brown; bill black; legs brown. Female resembles male, but with less yellow on head; has forehead and crown black, nape yellow, and entire underside, including chin, yellow. Juvenile is matt blackish-brown above, this gradually replaced by yellow and black, olive-green to dull yellow below, bill brown. Voice. No published description; apparently usually silent.



Habitat. Evergreen forest, in primary forest often near clearings; enters secondary forest. Mainly in submontane forest types at 1200–1800 m.
Food and Feeding. Only recorded items are insects and other arthropods, including butterflies and caterpillars (Lepidoptera), larvae of mantids (Mantidae), alate termites (Isoptera); stomach contents caterpillar, spider (Araneae) and insect fragments. Forages in foliage along branches and in canopy and middle storey, above 15 m. Often in small flocks of 6–8 individuals. Joins mixed-species flocks; e.g. in Cameroon was part of a flock which included Zenker's Honeyguide (*Melignomon zenkeri*), Slender-billed Greenbul (*Andropadus gracilirostris*), Fork-tailed Drongo (*Dicrurus adsimilis*) and Little Green Sunbird (*Anthreptes seimundi*).
Breeding. Recorded in Aug, Gabon; specimen with enlarged gonads in Jun, DRCongo. Presumed monogamous. Solitary nester. Nest ball-shaped, with short, loosely woven entrance tunnel directed downwards, woven around fork of hanging branch more than 30 m above ground. No other information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Very poorly known species. Appears to be scarce, at least in W range. Distribution patchy and very localized.
Bibliography. Bates (1909), Borrow & Demey (2001), Brosset & Érard (1986), Chapin (1932, 1954), Dowsett-Lemaire (2005), Fry & Keith (2004), Germain *et al.* (1973), Prigogine (1966, 1971).

100. Loango Weaver

Ploceus subpersonatus

French: Tisserin à bec grêle **German**: Loangoweber **Spanish**: Tejedor de Loango
Other common names: Loango Slender-billed Weaver

Taxonomy. *Hyphantornis subpersonata* Cabanis, 1876, Chinchoxo, Cabinda, Angola.
Monotypic.
Distribution. Gabon S patchily along narrow belt of coast to N Angola (Cabinda).



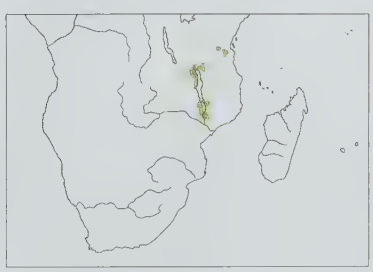
Descriptive notes. 15 cm. Male has forehead, crown, lores and cheek black, ending in sharp line behind eye, black extending as rounded bib onto breast; nape yellow-orange; mantle and back olive with darker central streaks on some feathers, rump olive with some buffy feathers; tail olive-green, upperwing olive with faint yellow-olive margins on coverts; below, yellow-orange around the black bib, otherwise creamy-yellow, undertail-coverts with some orange wash; iris dark brown; bill black; legs pinkish or light brown. Female lacks black on head, is entirely olivaceous-yellow above, yellower on forehead and supercilium, cream-yellow below with mild orange wash on breast and undertail-coverts. Juvenile is duller than female, with brown bill. Voice. Song described as a quiet jumble of typical weaver notes, "chuckolo to-chuka-chuka-chuka-chuka-chuka-chak"; also a more melodious subsong. Shrill grating "chreep" and "dzeerp" calls.
Habitat. Swamp-forest, mangroves and savanna margins, palm savanna and clearings in secondary forest; also thick spiny palms and beach scrub. All within 3 km of coast.
Food and Feeding. No data; bill shape suggests predominantly insectivorous. Skulks in vegetation.
Breeding. Reported as nesting in *Phoenix reclinata* and *Caesalpinia bonduc*, but no details. No other information.
Movements. Likely to be sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Gabon–Cabinda Coast Secondary Area. Poorly known species. Uncommon to rare; occurs in low densities throughout its small global range. This species' habitat requirements are very specific; distribution likely to be fragmented and numbers declining, at least locally, as a result of habitat loss. Recent surveys suggest that its range may possibly be more extensive, and its numbers larger; further fieldwork required.
Bibliography. Anon. (2009e), Bannerman (1949), Borrow & Demey (2001), Bulens & Dowsett (2001), Butchart & Stattersfield (2004), Chapin (1954), Collar *et al.* (1994), Dean (2000), Fishpool & Evans (2001), Fry & Keith (2004), Sargeant (1993), Stattersfield & Capper (2000).

101. Bertram's Weaver

Ploceus bertrandi

French: Tisserin de Bertram **German**: Malawiweber **Spanish**: Tejedor de Malawi
Other common names: Bertrand's/Bartam's Weaver

Taxonomy. *Hyphantornis bertrandi* Shelley, 1893, Zomba, Malawi.
Has been thought to form a superspecies with *P. nigrimentus* and *P. baglafecht*, with *P. bannermani* and *P. batesi* regarded as part of same species group. Monotypic.
Distribution. SW & E Tanzania, NE Zambia, Malawi and NW Mozambique.



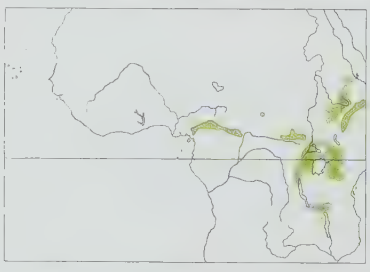
Descriptive notes. 15 cm; 35–43 g. Male has golden yellow on forehead to upper nape, with strong orange-tawny wash on forecrown, black nuchal patch, the yellow becoming golden green on nape and rest of upperparts, wing and tail olive, narrow yellow band across hindcrown, nape golden-yellow with sickle-shaped central black patch; broad black facial mask from supercilium to ear-coverts, and down onto chin and throat; upperparts, including upperwing and tail, olive-green, narrow yellow edges on remiges, broader yellow fringes on wing-coverts; breast yellow with some orange wash, belly, thighs and undertail-coverts yellow,

flanks washed olive; iris yellow to white; bill black; legs dark brown. Female has completely black head, narrow yellow band on nape; otherwise like male. Juvenile is olive-green above except for dull yellow nape, yellow below, paling to white in centre of belly, iris grey, bill horn-coloured, legs brown. Voice. Song starts with a squeaky phrase, followed by several swizzles, clicking notes, a modulated swizzle, and a final swizzle which peters out, "p'tsi-chu swizzzzzz swerzzzzz swizzzzzz tititititi dzerrr-ti-dzerrr swizzzzz...". Contact call "chirp", like that of a sparrow (*Passer*).
Habitat. Open woodland and thickets along rivers, miombo (*Brachystegia*) woodland, forest edge and cultivated areas in hilly country. At 900–1800 m in Tanzania; above 1000 m and up to 2000 m in Zambia and Malawi.
Food and Feeding. Insects and nectar recorded in diet. Forages in pairs and in small groups of five or six individuals. Gleans insects from vegetation.
Breeding. Breeds in Apr in Tanzania, Nov–Dec in Zambia, and Aug–Apr (also record of fledged young fed by adults in May) in Malawi. Monogamous. Solitary nester. Nest a ball (no entrance tunnel) woven from broad grass strips, lined with grass seedheads, usually placed at tip of branch of thorny acacia (*Acacia*) or in evergreen tree, often near a stream. Clutch 2 eggs, deep green, heavily marked with red-brown spots and blotches, size 22·5 × 16 mm (Malawi); young fed by both sexes. No other information.
Movements. Presumed resident. Ringed individuals in Malawi recaptured 25–52 months later.
Status and Conservation. Not globally threatened. Fairly common to locally common. Occurs in more open types of habitat, including cultivated and disturbed areas; not restricted to montane forest.
Bibliography. Aspinwall & Beel (1998), Belcher (1924), Benson & Benson (1977), Britton (1980), Dowsett & Jobling (2003), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Johnston-Stewart (1982), Lane (1995), Meise (1937), Stevenson & Fanshawe (2002), Vincent (1936).

102. **Baglafecht Weaver**
Ploceus baglafecht

French: Tisserin baglafecht **German**: Baglafechtweber **Spanish**: Tejedor Baglafecht
Other common names: Emin's Weaver (*emini*); Reichenow's Weaver (*reichenowi*); Stuhlmann's Weaver ("*stuhlmanni* group")

Taxonomy. *Loxia baglafecht* Daudin, 1802, Ethiopia.
Has been thought to form a superspecies with *P. nigrimentus* and *P. bertrandi*, with *P. bannermani* and *P. batesi* regarded as part of same species group. Races sometimes separated into four groups: "nominate group" (also with *neumanni* and *eremobius*) and "*stuhlmanni* group" (also with *sharpii* and *nyikae*), and two single-species groups represented by *emini* and *reichenowi*, respectively; these groups are sometimes treated as four distinct species, but the groups intergrade wherever they meet. Races show some striking plumage differences, and this has been used by some authors as primary criterion for separating populations at species level; also some degree of isolation where restricted to montane habitats, but no regional variations in song described. Several intermediates between populations have been proposed as additional races: *fricki* (described from Sidamo, in Ethiopia) is currently synonymized with nominate, *budongoensis* (from Busindi, near Budongo, in W Uganda) with *emini*, and *nigrotemporalis* (from Mt Elgon, in E Uganda) with *reichenowi*. Eight subspecies recognized.
Subspecies and Distribution.
P. b. neumanni (Bannerman, 1923) – E Nigeria, C Cameroon and W & NE Central African Republic.
P. b. baglafecht (Daudin, 1802) – W Eritrea and Ethiopian Highlands.
P. b. eremobius (Hartlaub, 1887) – SW Sudan and NE DRCongo.
P. b. emini (Hartlaub, 1882) – SE Sudan, SW Ethiopia and N Uganda.
P. b. stuhlmanni (Reichenow, 1893) – E DRCongo, SW Uganda, Rwanda, Burundi and W Tanzania.
P. b. reichenowi (G. A. Fischer, 1884) – E Uganda, Kenya and NE Tanzania.
P. b. sharpii (Shelley, 1898) – SW Tanzania.
P. b. nyikae (Benson, 1938) – Nyika Plateau in NE Zambia and N Malawi.

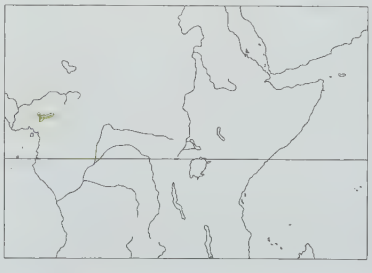


Descriptive notes. 15 cm; 24–37 g. Male nominate race breeding has forehead and crown to level of eye golden-yellow, lores, cheek and ear-coverts black, hindcrown and nape greenish; upperparts olive-green, mantle and back with narrow central streaks on feathers; tail olive-green; upperwing dark brown, remiges with yellow margins, wing-coverts with broad greenish margins; chin to undertail-coverts golden-yellow; iris yellow; bill black; legs brown. Male non-breeding is ashy grey above, with buffy wash on side of head, no differentiated mask, dusky streaks on mantle and back; tail and wings as in breeding plumage; chin, throat and breast buffy, belly, flanks, thighs and undertail-coverts whitish; bare parts as for breeding. Female breeding resembles male breeding, but with forehead and crown greenish, mask around eyes dull black with green wash. Female non-breeding is like non-breeding male. Juvenile has plain grey-brown head and nape with black lores, brown upperparts, mantle and back with central streaks on feathers, throat and underparts uniformly dull white, iris brown, bill and legs brown; in Kenya (race *reichenowi*) adult plumage acquired at 13 months. Races differ mainly in colour of male head and upperparts, also in existence of seasonal plumage change: *neumanni* has brighter green upperparts than nominate, paler yellow forehead, more clearly defined white area on belly, both sexes have non-breeding plumage; *eremobius* is smaller than nominate, with lower breast to undertail-coverts white, both sexes have non-breeding plumage; *emini* male breeding has yellow crown and black face mask, but nape to back black, some mantle and back feathers with greyish or greenish edges, grey rump, golden-yellow chin and breast, white belly to undertail-coverts, female breeding has black forehead and crown, both sexes have non-breeding plumage; *reichenowi* male has golden-yellow forehead and crown, yellow also behind ear-coverts (leaving black patch around eye), female has black crown and forehead continuous with face mask, both have nape and upperparts black, some yellow flecking on rump, iris creamy white to yellow, no seasonal plumage change; *stuhlmanni* has black crown and forehead blending into face mask, female has duller cap, both have nape and upperparts yellowish-green, underparts ochre-yellow, apparently no seasonal change in plumage; *sharpii* resembles previous, but breeding male has greener upperparts and paler yellow underparts, no seasonal change in plumage; *nyikae* is dark-capped like preceding two races, but flanks, thighs, belly and undertail-coverts greyish, apparently both sexes have a non-breeding plumage. Voice. Song a chattering mixed with musical notes, including high-pitched glissando and swizzling sounds, usually a two-part or three-part series. Common call in Kenya a chatter, "swii chee chee cheechit", and pair-members exchange regular "pseet" or "shreeep" contact calls, and give "swii chit" alarm call; contact call in W Africa a repeated "zwenk".
Habitat. Trees and shrubs, in forested areas in clearings and on forest fringes; also scrub on road verges, cultivated lands, gardens in cities such as Kampala (Uganda) and Nairobi (Kenya), also marshes and montane heathland. Primarily in highland areas: in Cameroon at 1400–2300 m on mountain slopes with scattered shrubs, around rural villages and clearings; in Ethiopia on margins of montane forest above 1200 m; in Kenya and Uganda at 800–3000 m; in Zambia and Malawi apparently not below 1800 m.
Food and Feeding. Mainly insectivorous; fruit, seeds and nectar also taken. Food brought to nest spiders (Araneae), moth larvae (Lepidoptera), crickets and grasshopper nymphs (Orthoptera), mantids (Mantodea), beetles (Coleoptera), alate termites (Isoptera) and winged *Crematogaster* ants (Formicidae). In Kenya, fed regularly on carcases in meat shed. Fruit, including mango (*Mangifera*), banana (*Musa*) and papaya, taken at garden feeders; may damage seedlings and growing peas. Seeds, including those of *Cassia* and *Leonotis repetifolia*, found in stomach contents. Feeds on nectar from *Prunus*, *Agave*, *Ruttya fruticosa*, *Grevillia robusta*, *Acrocarpus fraxinifolius*, *Loranthus* and *Leonotis nepetifolia* by dipping bill into open flowers and swallowing droplets; also visits nectar feeders in gardens. In Kenya, foraged lower in trees (4·5 m up) during dry season than in wet season (6·5 m). Gleans leaves and branches, using prying action of the bill in crevices and clusters of dead leaves; In Tanzania, one followed a driver-ant column, picking insects off stems c. 1 m above ground. Usually forages singly or in pairs; forms small parties of 8–10 individuals (adults and juveniles) after breeding, and occasionally joins mixed-species flocks. Noted as aggressive towards other species at birdbaths and feeders.
Breeding. Breeds Aug–Nov in Cameroon; in DRCongo, Mar–Jun in Kivu, May in Ituri and Aug–Oct in Uele; Jul and Nov in Sudan, Mar–Oct (possibly also Jan–Feb) in Ethiopia, Dec in Rwanda; in Uganda, Oct–May in Kampala area and reports in Aug and Jun–Jul on Mt Elgon; peak Apr–Jun (and in Nairobi area all months except Aug) in Kenya, and all months except Aug–Sept at Arusha, in Tanzania; Oct–Dec in Zambia and Oct–Feb in Malawi; ringed pair in a Kenya garden laid five clutches in one calendar-year (three in Jan–Jun and a further two in Sept–Oct). Monogamous. Solitary nester, usually highly territorial, but sometimes two pairs nest in same area; will build several nests at one site, some used for roosting. Male uses both long and short songs in courtship away from nest (often sings also at nest-site); upright wing-beating display to female near nest. Nest oval, lacking spout, slightly flattened below, with entrance to one side (internal ledge prevents eggs from rolling out), thick-walled and rather coarsely woven by male from green grass stems or broad strips from grass blades, female may accompany male and help to select nest-site, but does not contribute to building (although captive female did assist male at this stage); later, nest lined by both male and female with plant down and a few feathers in bowl, and grass seedheads in both ceiling and bowl; 1·8–10 m (mostly 3–6 m) above ground, suspended by grass stems looped around branch, or attached to banana leaves with supporting loops threaded through leaf blades, often in acacia (*Acacia*), sometimes in palm or even in exotic pine (*Pinus*) or eucalypt (*Eucalyptus*); does not strip leaves from branches around nest, which may be concealed in dense foliage; in Kenya, aggressively usurped nests of both *Anaplectes rubriceps* and *P. spekei*; old nests occasionally used by White-collared Oliveback (*Nesocharis ansorgei*). Clutch 1–3 eggs, of two types, blue-green and either plain or blotched with dark brown (especially at thicker end), or white to pinkish, evenly covered with reddish-brown spots and blotches, average size of twelve eggs 21·2 × 15·1 mm (Ethiopia); incubation by female only, male often perched nearby, period 11–12 days, in captivity estimated at 15 days; chicks initially fed by female alone, from fourth day also by male, nestling period 15–17 days, in captivity 17–19 days; in captivity, young fed for 2–3 weeks after fledging, and when new clutch laid male took over care of fledglings. Record of brood parasitism by African Emerald Cuckoo (*Chrysococcyx cupreus*) in Kenya (Nairobi).
Movements. Presumed resident. Ringed individuals in gardens and in Kenyan woodland remained in same area over several years.
Status and Conservation. Not globally threatened. Generally common and widespread in N & E of range; scarce to uncommon in W of range. Seems to be reasonably adaptable; occurs commonly in gardens and other disturbed habitats.
Bibliography. Aspinwall & Beel (1998), Bannerman (1949), Beesley (1973), Benson (1947a), Benson & Benson (1977), Benson *et al.* (1971), Borghesio & Laiolo (2004), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Carroll (1988), Carswell (1986), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1954), Cheesman & Sclater (1936), Collias, N.E. (1978), Collias, N.E. & Collias (1964), Crook (1964b, 1969), Cunningham-van Someren (1974b), Desfayes (1975), Dittami (1986), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett-Lemaire (1990), Dowsett-Lemaire & Dowsett (2006), Elgood *et al.* (1994), van den Elzen & König (1983), Ezra (1937), Fishpool & Evans (2001), Fry & Keith (2004), Germain & Cornet (1994), Granvik (1923, 1934), Guichard (1947–1948), Hartert (1907), Heuglin (1870–1871), Jackson, C. (2001), Jackson, F.J. (1899), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Loveridge (1923), Moreau & Sclater (1938), Nikolaus (1987, 1989), Prigogine (1971), Rost & Siebenrock (1992), Schifter & Cunningham-van Someren (1998), Serle (1943a, 1950), Short & Horne (1978, 2005), Sjöstedt (1910), Smith (1974), van Someren (1916, 1956), Stevenson & Fanshawe (2002), Sudhaus (1976), Tomlinson (1947–1948), Urban (1975), Urban & Brown (1971), Vande weghe (1973), Weekes (1948), Willis (1986b), Zimmerman *et al.* (1996).

103. **Bannerman's Weaver**
Ploceus bannermani

French: Tisserin de Bannerman **German**: Bannermanweber **Spanish**: Tejedor de Bannerman

Taxonomy. *Ploceus bannermani* Chapin, 1932, Djang district, 4500 feet [c. 1370 m], Cameroon.
This species and *P. batesi* are sometimes regarded as part of a species group that includes also *P. nigrimentus*, *P. bertrandi* and *P. baglafecht*. Monotypic.
Distribution. E Nigeria and W Cameroon.



Descriptive notes. 12–14 cm; 29–33 g. Adult has golden-yellow forehead and crown, greenish nape, and olive-green upperparts and tail; upperwing dull brown, olive-green edges on remiges and coverts; chin, lores, side of head and ear-coverts black, forming facial mask extending just above eye and onto throat; breast golden-yellow, flanks, belly and thighs yellow with greenish wash, undertail-coverts golden-yellow; iris cream; bill black; legs flesh-coloured to dark brown. Sexes alike. Juvenile undescribed. Voice. Song delivered by male is high-pitched, ending in drawn-out wheeze, more musical than those of many weavers, "chi-chi-chi-chi-chirr-chirr"; territorial song opens with separate notes, and then accel-

erates into multi-syllable elements, "chop kik kik ko ko chokwydo kwideekwo chip". Contact call is a sharp "prit".
Habitat. Inhabits montane forest at 1100–2900 m; at forest edge and in clearings, including more open, scrubby habitats. May be tolerant of degraded forest; apparently absent from areas of highest rainfall.
Food and Feeding. No details of diet; presumably insects and fruit. Usually forages in pairs, sometimes in small parties.
Breeding. Breeds in Nov in Nigeria and Dec–Feb in Cameroon. Apparently monogamous. Solitary nester. Nest retort-shaped, entrance below, no tunnel, outer wall compactly woven with grass stems and grass blades, lined with grass husks and soft plant down, 2–3 m above ground and attached to outer branch of thorny bush. Clutch 2 eggs, pale blue with evenly distributed fine brown speckles, 23·9 × 15·4 mm. No other information.
Movements. No information; presumed resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Cameroon Mountains EBA. Locally not uncommon within its small global range. In Nigeria occurs on Obudu and Mambilla Plateaux, where 12–40 observed daily in 1988. In Cameroon mainly in Bamenda Highlands, particularly at Mt Oku, but also on Adamawa Plateau (at Mt Tchabal Mbabo); in 1999, found to be common in suitable habitat on Mt Manenguba (S of Bamenda Highlands), and in previous year was located at Kodmin, in nearby Bakossi Mts, which extended its known range slightly to the SW. Current total population estimated at between 10,000 and 20,000 individuals. Although more common than previously believed, this species is at risk from habitat loss through clearance for subsistence agriculture. Occurs in several protected areas, such as Gashaka-Gumti National Park and Ngel-Nyaki Forest Reserve, in Nigeria, and Mbi Crater Reserve, in Cameroon. In Cameroon, a specific conservation programme for this ploceid has been established on Mt Oku.
Bibliography. Anon. (2009e), Borrow & Demey (2001), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Eisentraut (1973), Fishpool & Evans (2001), Fry & Keith (2004), Serle (1950), Stattersfield & Capper (2000), Stuart (1986).

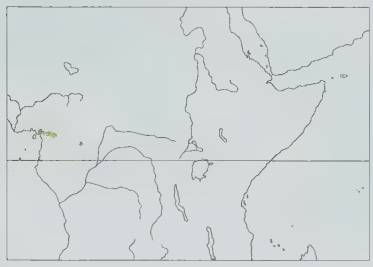
104. **Bates's Weaver**

Ploceus batesi

French: Tisserin de Bates **German**: Braunwangenweber **Spanish**: Tejedor de Bates

Taxonomy. *Othyphantes batesi* Sharpe, 1908, Dja River, Cameroon.

This species and *P. bannermani* are sometimes regarded as part of a species group that includes also *P. nigrimentus*, *P. bertrandi* and *P. baglafecht*. Affinity with *P. alienus* has also been suggested. Monotypic.
Distribution. S Cameroon.



Descriptive notes. 13–14 cm. Male has most of head bright chestnut-brown, lores black; sharp line of yellow-fringed feathers on nape (narrow hindcollar); olive-green lower nape, upperparts and tail; upperwing olive-green, paler edges on primaries; chin with chestnut central patch, rest of chin and throat black, sharply demarcated from bright yellow breast, belly, thighs and undertail-coverts; flanks yellow with greenish wash; iris dark brown; bill black; legs blue-grey. Female is like male, except that forehead, crown, cheek and ear-coverts are black (not chestnut), and chin and throat yellow like breast (not black). Juvenile resembles female, but head pale olive-green, not black, bill pale horn-brown. VOICE. No published information; appears to be usually silent.
Habitat. Lowland rainforest; recorded up to 900 m.
Food and Feeding. Insects recorded. Forages singly, in pairs, and once in mixed-species flock of insectivorous birds. Moves in zigzag manner on tree trunks; reminiscent of *Notiospiza angolensis*.
Breeding. Juvenile in Mar. No other information.
Movements. No information; presumed resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Cameroon and Gabon Lowlands EBA. Rare. Estimated global population fewer than 1000 individuals; probably declining owing to loss and/or modification of habitat. Known from only nine sites in a narrow belt from Limbe (at foot of Mt Cameroon) E to Moloundou (near border with PRCongo), and recorded irregularly. Very few records in recent years. Observed twice near Dja Game Reserve (at Somalomo, on NW boundary, in 1995; at Shwani, 12 km from Somalomo, in 1996); two records from Mt Kupe in 1990 but none since, despite intensive searches; not located at all during surveys undertaken in 1998–2001 in W & SE Cameroon. Reasons for this species' apparent rarity are unclear.
Bibliography. Anon. (2009e), Borrow & Demey (2001), Butchart & Stattersfield (2004), Collar & Stuart (1985), Demey (2007), Fishpool & Evans (2001), Fry & Keith (2004), Ogilvie-Grant (1910b), Stattersfield & Capper (2000), Taylor (1981).


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cm 5
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115
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ssp crassirostris
ssp malimbicus
variants
ssp jubaensis
ssp scutatus
ssp leuconotos
ssp rubriceps
ssp scutopartitus

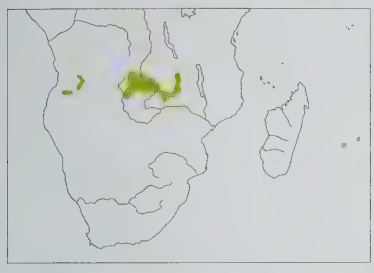
Genus *NOTIOSPIZA* Oberholser, 1905

105. **Bar-winged Weaver**

Notiospiza angolensis

French: Tisserin malimbe **German**: Miomboweber **Spanish**: Tejedor Alibarrado

Taxonomy. *Sharpia angolensis* Bocage, 1878, Caconda, Angola.
Often placed in genus *Ploceus*, but differs significantly in morphology and plumage. Monotypic.
Distribution. C Angola, SE DRCongo and N Zambia.



Descriptive notes. 13 cm. Small slender-billed weaver, dark above and white below, more like a flycatcher (Muscicapidae) than like a typical weaver. Male has forehead, crown and nape blackish-brown, extending on side of head to level of bill; mantle and back blackish-brown with yellow feather tips in mid-line, rump yellow; upperwing and tail dark brown, remiges with white edges, greater wing-coverts with broad white tips and lesser coverts with narrow white tips (forming conspicuous wingbars); chin and throat white, underparts white with yellow wash; iris red; bill black; legs brown. Female resembles male, but tips of mantle feathers whiter, much less yellow wash on underparts. Juvenile has crown dull olive-grey, cheek and narrow superciliary stripe white, upper mandible greenish-grey, lower mandible pinkish. Voice. Song composed of several fast, tuneful notes in crescendo, leading up to loud swizzle; sometimes followed by more tuneful notes in decrescendo. Squeaky contact call of pure descending note followed by several lower-pitched notes, "tyoo-vo-vo-vo-vo", also higher-pitched "tzee-zi-zee-zi-zee-zi".
Habitat. Miombo (*Brachystegia*) woodland; also enters *Cryptosepalum* forest. At 100–1600 m.
Food and Feeding. Insectivorous; stomach contents included mantid (Mantodea), beetles (Coleoptera) and chironomid larvae (Diptera). Forages in tree canopy. Gleans on trunk and main branches, moving like a nuthatch (Sittidae), also probes in *Usnea* lichen. Often in pairs or family parties. Frequently joins mixed-species flocks with White-winged Black (*Parus leucomelas*), Miombo (*Parus griseiventris*) and Rufous-bellied Tits (*Parus rufiventris*), hyliotas (*Hyliota*) and eremomelas (*Eremomela*); sometimes with *Anaplectes rubriceps*.
Breeding. Breeds Aug–Nov in Zambia. Monogamous. Solitary nester. Nest built by both members of pair, a ball of *Usnea* lichen with framework of fine grass stems and leaf midribs, entrance funnel extending 3–20 cm below nest-chamber, suspended c. 10 m above ground below lichen-covered branches in *Julbernardia globiflora* or *Brachystegia boehmii* tree; one nest had apparent false entrance to empty chamber. Clutch 2–3 eggs, turquoise-blue, flecked and clouded with darker markings, mostly at thicker end, 20·5 × 15·3 mm (Zambia). No other information.
Movements. Apparently resident. In Zambia, recorded throughout year at same localities.
Status and Conservation. Not globally threatened. Poorly known species. Reported as uncommon within its relatively limited range. Occurs in some protected areas in Zambia.
Bibliography. Aspinwall (1973), Aspinwall & Beel (1998), Benson (1959), Benson *et al.* (1971), Chapin (1932, 1954), Dean (2000), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Fry & Keith (2004), Hartert (1907), Lippens & Wille (1976), Stjernstedt & Aspinwall (1979), White (1946).

Genus *MALIMBUS* Vieillot, 1805

106. **Gola Malimbe**

Malimbus ballmanni

French: Malimbe de Ballmann **German**: Ballmannweber **Spanish**: Malimbo de Gola
Other common names: Ballman's/Tai Malimbe

Taxonomy. *Malimbus ballmanni* Wolters, 1974, between Cavally and Keibli Rivers, north-west of Tai, south-western Ivory Coast.
Sometimes referred to as *M. golensis*, but this is a *nomen nudum*. Has been thought to form a superspecies with *M. racheliae*. Monotypic.
Distribution. Extreme E Sierra Leone (Gola Forest) and adjacent W Liberia; E Liberia and adjacent W Ivory Coast, and recently located in extreme SE Guinea.



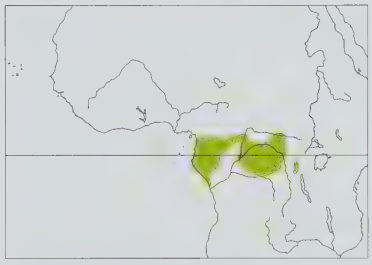
Descriptive notes. 15–17 cm. Male has most of plumage black; golden-yellow patch on nape washed with tawny-orange at margins, large yellow breast patch with some tawny-orange wash, separated from nape by narrow black area; yellow undertail-coverts; iris dark red; bill black; legs grey. Female is wholly black above, black below except for clear yellow breast patch (lower part divided by black central line), yellow undertail-coverts; bare parts as for male. Juvenile has forehead, crown and throat dull orange-yellow, nape patch smaller and paler than on adult, breast patch orange-yellow, black areas of plumage sooty, iris brown, bill pale horn-coloured, legs dark brown. Voice. Both sexes sing throughout year. Male song "cheg chig cheg cheg chega zzzzzzzz", very like that of *Ploceus cucullatus* (including terminal wheeze), unlike songs of most other malimbes; female song lacks terminal wheeze, "cheg cheg chig chag chaaag cheg chiiig". Contact call during foraging "chch chchchch".
Habitat. Lowland evergreen forest, and recorded also in logged high forest and very old secondary forest; below 400 m. Undisturbed primary forest perhaps its only breeding habitat.
Food and Feeding. Diet primarily insects, probably including mantids (Mantodea) and grasshoppers (Orthoptera); most prey items less than 3 cm in length. Forages between 8 m and 20 m, sometimes in canopy. Gleans leaves and thin twigs in manner of a tit (Paridae); also in tangles of lianes, but rarely probes dead leaves. Singly, in pairs or in trios. Regularly encountered in mixed-species flocks, when up to eight malimbes together; in Sierra Leone, noted in association with *M. nitens* and *M. malimbicus*.
Breeding. Nest-building activity suggest breeding probably in Jun–Jul and Sept–Nov; dependent young noted Oct–Mar. Presumed monogamous. Some level of co-operation among group-members. Solitary nester. Nest-building appears to occur at intervals, when group of 2–8 malimbes passes through nesting area; nest shaped like inverted sock, with pendent anchoring structure of 25–70 cm, tunnel 25 cm, always suspended 8–21 m above ground (six nests at 10–15 m, five at 16–20 m) from ends of vertical hanging vines; up to five individuals work at nest simultaneously, males working mainly outside and more often on anchoring structure, females working inside and on entrance spout. No information on clutch size and eggs, and on incubation and nestling periods; three or more individuals may feed young when a foraging flock passes near an occupied nest; one or two fledglings seen in company of single adult or paired adults.
Movements. Apparently resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Upper Guinea Forests EBA. Rare to locally common. Has small total range within which its habitat is highly threatened, and numbers probably declining rapidly. Found in two or three discrete populations. In W, originally discovered in 1971 in Gola Forest, Sierra Leone, where seen for several years, then, following 30-year absence of records, rediscovered (in Gola North) in Feb 2007; recorded in adjacent W Liberia, where thought to occupy an area of c. 200–300 km². In E Liberia, population survives in Grand Gedeh–Sinoe Counties, extending across border into W Goin Débé and Cavally Forest Reserves, in W Ivory Coast; in this area, covering at least 18,000 km², the species is locally common and its population is estimated at c. 20,000–50,000 individuals. Although present near Taï Forest National Park (Ivory Coast), it does not occur within this protected area. In addition, this ploceid has recently been reported from extreme SE Guinea, where four groups (totalling nine individuals) have apparently been observed in Diecke Forest Reserve and nearby Ziama Forest Reserve, adjoining the N Liberia border; additional surveys are required in order to establish this threatened species' current status in the region. Logging, mining activities and agricultural encroachment have already led to fragmentation of this malimbe's range, and are becoming an increasingly serious problem. Furthermore, protected areas have been compromised during civil wars in the region.
Bibliography. Anon. (2009e), Borrow & Demey (2001), Collar *et al.* (1994), Dowsett-Lemaire & Dowsett (2008a), Field (1979), Fry & Keith (2004), Gatter & Gardner (1993), Halleux (1994), Stattersfield & Capper (2000), Wolters (1974).

107. **Cassin's Malimbe**

Malimbus cassini

French: Malimbe de Cassin **German**: Cassinweber **Spanish**: Malimbo de Cassin
Other common names: Black-throated Malimbe

Taxonomy. *Sycobius cassini* Elliot, 1859, Gabon.
Has been thought to form a superspecies with *M. scutatus*. Monotypic.
Distribution. S Cameroon, SW Central African Republic, Equatorial Guinea, Gabon, N & SW PRCongo, and N DRCongo along major rivers E to Itombwe.



Descriptive notes. 17 cm; 35 g. Male has scarlet-red forehead, crown and nape, joined by narrow red collar to a broad red patch on breast; lores, cheek, ear-coverts, chin and throat black, as are rest of upperparts, including upperwing and tail, and underparts from belly to vent; iris dark brown; bill black; legs blackish. Female has entire plumage black; bare parts as for male. Juvenile has duller black plumage, especially on ventral surface, forehead dull orange, crown, nape and upperparts black, chin, throat and broad patch on breast pale orange, rest of underparts black, some reddish fringes on undertail-coverts; iris brown, bill light brown, legs brown. Voice. Song a series of harsh notes followed by nasal sizzling, "tuk tuk tuk szszszzuiiiiin"; group song during nest-building, and at nest-relief incoming bird uses "approach song" to call out sitting bird. Contact calls during foraging group "teuc teuc" or "tsip tsip".
Habitat. Dense, tall primary forest, often in swampy areas or in sectors prone to flooding near watercourses; associated with wine palms (*Raphia hookeri*), oil palms (*Elaeis guineensis*) and climbing rattan palms. Generally in lowlands, but to 1350 m in Itombwe region (E DRCongo).
Food and Feeding. Diet mainly insects, including crickets and grasshoppers (Orthoptera), mantids (Mantodea) and moths (Lepidoptera); also fruit of the strangler fig *Ficus pseudomangifera*. Characterized as a sallying insectivore in Congo Basin. Forages in pairs or small groups at middle levels and in canopy (above 20 m), usually not below 6–8 m above ground, although may venture into more open areas; groups of 4–7 individuals seen while feeding on fruits of oil palm in PRCongo. Regularly joins mixed-species flocks, then often associating with Sabine's (*Dryoscopus sabini*) and Red-eyed Puffbacks (*Dryoscopus senegalensis*), Rufous-bellied Helmet-shrike (*Prionops rufiventris*) and Bates's Paradise-flycatcher (*Terpsiphone batesi*).
Breeding. Season Nov–Mar in Gabon and Sept and Nov in PRCongo; in DRCongo, Nov in N but Sept–Feb in E (Itombwe region). Apparently monogamous. Initial co-operative nest-building; dominant male then displaces others, and remains with female. Nest construction evidently regularly involves one female and several males; more than one individual working simultaneously, in Gabon five nests built by a pair, 13 nests by two males with a female, and three by three males and a single female, work taking up to 15 days; female appears to take the lead, calling and adopting

On following pages: 108. Red-crowned Malimbe (*Malimbus coronatus*); 109. Red-bellied Malimbe (*Malimbus erythrogaster*); 110. Ibadan Malimbe (*Malimbus ibadanensis*); 111. Crested Malimbe (*Malimbus malimbicus*); 112. Blue-billed Malimbe (*Malimbus nitens*); 113. Rachel's Malimbe (*Malimbus racheliae*); 114. Red-headed Malimbe (*Malimbus rubricollis*); 115. Red-vented Malimbe (*Malimbus scutatus*); 116. Red-headed Weaver (*Anaplectes rubriceps*).

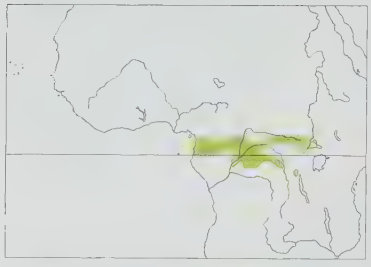
solicitation posture to induce males to start building; nest highly distinctive, perhaps the most elaborate of nests of all true ploceids, a small bowl from which a very long (up to 1 m), transparent tunnel hangs vertically downwards, finely woven from stiff material, egg-chamber lined with green palm strips, woven in several discrete layers of short, broad strips of material, whereas tunnel composed of single layer of fine, long strips from palm fronds, with fibres projecting loosely at end; attached 10–25 m above ground to spiny petioles of climbing palm, female seen to defoliate area around nest; nest may persist for several seasons, and often several attached successively at same site, although only newly built ones appear to be used for breeding; old nests may be used for roosting. Clutch 2 eggs, pure white, 21·8 × 16·3 mm (DRCongo); incubation by both sexes, stints of nearly 60 minutes recorded, incoming bird calling partner out; chicks fed by both male and female; no information on duration of incubation and nestling periods. In PRCongo, fledgling Black Cuckoo (*Cuculus clamosus*) seen with group of present species and fed by one male, but no indication that it had been raised by this species; possibly fed because of its resemblance to a juvenile malimbe. At Gabon study site, most nests were robbed by chimpanzees (*Pan troglodytes*).
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common within undisturbed forest zone. Reports of this species from Ghana now considered to be referable to *M. malimbicus*; early records from Nigeria regarded as erroneous.
Bibliography. Bannerman (1949), Bates (1909), Borrow & Demey (2001), Brosset (1974, 1978), Brosset & Érard (1986), Carroll (1988), Chapin (1954), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Dowsett, Dowsett-Lemaire & Hester (2008), Dowsett-Lemaire (1996a, 1996b, 1997), Dowsett-Lemaire & Dowsett (1989), Field (1979), Fry & Keith (2004), Germain & Cornet (1994), Herroelen (1955), Lippens & Wille (1976), Moreau (1958), Péron & Crochet (2009), Prigogine (1971).

108. Red-crowned Malimbe

Malimbus coronatus

French: Malimbe couronné **German**: Kronenweber **Spanish**: Malimbo Coronado
Other common names: Scarlet-crowned Malimbe

Taxonomy. *Malimbus coronatus* Sharpe, 1906, Ja River, Cameroon.
Monotypic.
Distribution. S Cameroon, Equatorial Guinea, N Gabon and NW PRCongo E to N & E DRCongo.



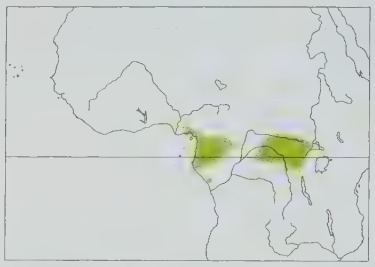
Descriptive notes. 17 cm; 32 g. Male has scarlet-red oval patch on crown, rest of plumage glossy black; iris dark red; bill and legs black. Female has completely black plumage; bare parts as for male. Juvenile has oval patch of light chestnut-brown extending from base of bill to hindcrown, rest of plumage matt black, lacking gloss, iris brown, bill and legs brown. Voice. Song described as very high-pitched series of trills, varying in speed and pitch. Chattering call by male at nest; continuous contact calls from group-members during nest-building; aggressive "pi-tsit-tsit".
Habitat. Lowland primary forest, sometimes in swamp-forest and mature secondary forest.
Food and Feeding. Insectivorous; stomachs of 19 specimens contained only insect material, including eggs and larvae, beetles (Coleoptera), caterpillars (Lepidoptera), cockroaches (Blattodea) and grasshoppers (Orthoptera). Forages chiefly in canopy (above 20 m), searching in masses of dead leaves and on lianas; characterized as a leaf-gleaning insectivore. In groups of 3–7 individuals, and often in mixed-species flocks.
Breeding. Breeds mainly Nov–Feb (also Mar–Apr) in Gabon, Dec and Mar in PRCongo, and Jan–Mar and Sept in DRCongo. Monogamous. Group of 3–6 individuals may participate in nest-building, then single pair left to breed. Male sings at nest, and wing-quivering display described. Of 18 nests in Gabon, two built by single pair, two by two males and one female, three by one male with two females, four by two males and two females, six by three males and two females, and one by two males and three females; only adults involved in building, arrive as a group, but only one individual works on nest at a time, one nest took 10 days to complete; nest retort-shaped, with short spout c. 9 cm long, constructed from dry spiral tendrils of vines with small twigs and leaf stems, rough in appearance and with projecting ends of material directed outwards and downwards, apparently unlined, suspended 7–25 m (usually 8–9 m) above ground from dangling thorny vines, usually over open space or clearing; male defoliated area around nest at one site; nests used for roosting outside breeding season. Clutch apparently 2 eggs, eggs undescribed; incubation by both sexes, nest seldom unattended, both also brood and feed chicks, no information on duration of incubation and nestling periods. In Gabon, many nests destroyed by chimpanzees (*Pan troglodytes*).
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally not uncommon. Present in a number of national parks in several countries.
Bibliography. Bannerman (1949), Bates (1909, 1911), Borrow & Demey (2001), Brosset (1974, 1978), Brosset & Érard (1986), Carroll (1988), Chapin (1932, 1954), Collias, N.E. & Collias (1964), Fishpool & Evans (2001), Fry & Keith (2004), Lippens & Wille (1976), Moreau (1958), Péron & Crochet (2009), Prigogine (1971).

109. Red-bellied Malimbe

Malimbus erythrogaster

French: Malimbe à ventre rouge **German**: Rotbauchweber **Spanish**: Malimbo Ventrirrojo

Taxonomy. *Malimbus erythrogaster* Reichenow, 1893, Yaoundé, Cameroon.
May form a superspecies with *M. ibadanensis*. Monotypic.
Distribution. SE Nigeria, SW & S Cameroon, extreme SW Central African Republic, Equatorial Guinea, Gabon, NW & SW PRCongo, and NE & E DRCongo.
Descriptive notes. 17 cm; 45 g. Male has black from lores extending posteriorly, slightly above eye, to ear-coverts and down to chin, throat and upper breast; forehead, crown and nape red, linked by broad band to red of underparts, red mixed with black on thighs, paler on undertail-coverts; upperparts, upperwing and tail black; iris dark brown; bill black; legs brown. Female differs from male in having smaller black face mask and less intense red colour in plumage; chin and throat orange-red, breast deeper red, thighs and undertail-coverts greyish with some red feather fringes. Juvenile has forehead, crown and nape orange-red, upperparts, including wings and tail, dull matt



black, lores and ear-coverts dull brown, chin, throat, cheek and upper breast orange-red, paling to grey-brown on belly and thighs, darker brown on flanks and undertail-coverts; iris dark brown, bill pale horn-brown. Voice. Song a sequence of phrases such as "tya-tya-tay", "tsee-tsee-tsee-tsee-chu-way" and "weeo-woy-woy" linked by "wee-tsip", "tseeyu" and "zwee" calal notes. Contact call a repeated dry "ptsik".
Habitat. Inhabits both undisturbed lowland forest and regenerating forest; at 1000 m in Cameroon, and up to 1500 m in E DRCongo (Itombwe).
Food and Feeding. Diet mainly insects; also small snails (Mollusca), insect eggs, fruit and seeds in some stomachs. Insects recorded include caterpillars (Lepidoptera), beetles (Coleoptera), bugs (Hemiptera), grasshoppers (Orthoptera). Forages mostly above 25 m at middle levels and in canopy. Perches on tops of trees and on exposed, dead branches; searches bare branches and dead twigs, as well as clumps of dead leaves. Forages usually in pairs, sometimes with dependent juveniles in groups of up to six individuals; often in mixed-species flocks, associating with *M. racheliae*, *M. cassini*, *M. rubricollis* and *Ploceus tricolour*.
Breeding. Breeds Jul in Nigeria, Feb–Mar in Cameroon and Gabon, and Dec in PRCongo; in DRCongo, Mar in Itombwe and Mar–Apr and Aug–Sept in Ituri region. Monogamous. Solitary nester in Nigeria, and small colonies up to 20 nests reported in DRCongo. Courtship involves chasing and song approaches prior to nest-invitation displays. Nest spherical, with tunnel up to 18 cm long (may be added once nest occupied), roughly built from dry vine stems and tendrils, egg-chamber lined with horsehair lichen, attached to outer leafy branch high in canopy; female may defoliate branches around nest; cluster of active nests found in nesting tree of Crowned Hawk-eagle (*Stephanoaetus coronatus*) in DRCongo; nesting association with *Ploceus tricolor* reported in Gabon, and nesting in same tree as *M. rubricollis* and Velvet-mantled Drongo (*Dicrurus modestus*) in Nigeria. No other information.
Movements. Presumed sedentary.
Status and Conservation. Not globally threatened. Locally common to rare within forested region. Old records from S Sudan (Bengengai Forest) and W Uganda (Bwamba and Semliki area).
Bibliography. Bannerman (1949), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brosset & Érard (1986), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Crook (1964b), Dowsett-Lemaire (1997), Elgood *et al.* (1994), Fry & Keith (2004), Hartert (1907), Lippens & Wille (1976), Marchant (1942, 1953), Moreau (1958), Prigogine (1971), Rand *et al.* (1959), Serle (1957).

110. Ibadan Malimbe

Malimbus ibadanensis

French: Malimbe d'Ibadan **German**: Ibadanweber **Spanish**: Malimbo de Ibadán

Taxonomy. *Malimbus ibadanensis* Elgood, 1958, Ibadan, Nigeria.
May form a superspecies with *M. erythrogaster*. Monotypic.
Distribution. SW Nigeria.



Descriptive notes. 17–20 cm; male 40–44 g, female 33–39 g. Male has forehead, crown and nape scarlet-red, linked by collar to red breast, which merges irregularly onto black belly; rest of plumage black; iris dark brown; bill black; legs brownish-black. Female is similar to male, differing in having red area on breast narrower (1–2 cm wide); red plumage areas often appear more orange than on male. Juvenile has black plumage areas duller and red areas more orange than on adult, chin, throat, cheek and ear-coverts dull orange-brown; iris brown, bill brown, legs dark brown. Voice. Song described as "chup ee wurr" followed by a "zzzzzzzz" wheeze; both sexes noted as singing from trees.
Habitat. Forest patches and forest edges, also secondary forest and woodland, often along tracks and openings in forest; recorded also in gardens and cultivated areas. Recent observations of foraging birds suggest some possible link with kola (*Cola gigantea*) tree, but further study of this possibility required.
Food and Feeding. Diet from stomach contents includes insects, caterpillars (Lepidoptera), winged ants (Formicidae), alate termites (Isoptera) and palm nuts. Forages primarily in middle storey at 5–25 m. Searches leaves, flowers, and dry pods and leaf clusters; not seen to cling to tree trunks in manner of congeners. In pairs or in small groups of 3–5 individuals, often with *M. rubricollis*, also in mixed-species flocks with Fork-tailed Drongos (*Dicrurus adsimilis*), Black-winged Orioles (*Oriolus nigripennis*), and with other forest weavers e.g. *Ploceus nigricollis*, *Ploceus tricolor*, *M. nitens*, *M. malimbicus* and *M. scutatus*; occasionally in association with Levaillant's Cuckoo (*Clamator levaillantii*), Yellowbill (*Ceuthmochares aereus*) and Western Black-headed Oriole (*Oriolus brachyrhynchus*).
Breeding. Breeds mainly May–Aug, but nesting recorded also in Feb, Sept, Oct and Dec; may be double-brooded. Monogamous. Solitary nester. Nest like an inverted sock, entrance tunnel 20–25 cm long, woven from strips of palm leaves and tendrils of climbing plants, in one case male worked on two separate nests and female lined one of these, at another nest second male assisted in construction; placed 12–20 m above ground near tip of branch of mature forest tree, sometimes close to active nests of *Belonogaster* or *Polistes* wasps; sometimes in same tree as *M. rubricollis* and Fork-tailed Drongo nests. Clutch 1–2 eggs, pale greenish-white with small irregular dark brown spots and underlying lilac shading, one egg 23 × 15 mm; incubation by female, estimated period 14 days; chicks fed by both male and female, estimated nestling period at least 14 days; male observed feeding a fledgling in a foraging flock.
Movements. Apparently resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in South-west Nigeria Secondary Area. Uncommon and local. Has very small global range and small population. Alleged sightings of this species (or *M. cassini*) in Ghana probably referable to *M. malimbicus*. Total population estimated at fewer than 4500 individuals, probably c. 2500, and declining. Following original discovery, this species was known only from a small area of SW Nigeria bounded by Ibadan, Ife, Iperu and Ilaro. Very few records between 1970s and early 1990s, and in 1980s not

seen at all until Nov 1987, when four individuals recorded during intensive ten-day search at Ibadan; in late 1990s found only in grounds of International Institute of Tropical Agriculture, near Ibadan, where searches had been concentrated, and where two pairs and five females were found (along with one female at Akanran, 15 km E of Ibadan) between Oct 1998 and Apr 1999. In 1999–2002, on basis of transect surveys at 52 forest patches in SW Nigeria (covering almost all remaining forest fragments within species' historical range), maximum total population estimated at 2469 individuals in 112 km² of surviving forest; this species was located at only 19 of the 52 sites, results suggesting that its range has declined by c. 66% since 1950s–1970s. In Dec 2006, during ten-day survey in Ifon Forest Reserve, six sight records made; foraging pairs seen on two separate occasions, and two solitary males seen. In addition to this reserve, it occurs in a small protected forest area at type locality. This species' habitat selection not understood, as forest degradation does not appear to explain its distribution, although it seems to be absent from isolated forest patches. Able to use secondary habitats, but these may be suboptimal; moreover, competition from congeners and from other ploceids better adapted to modified habitats could be having adverse effect. Further research and fieldwork required.

Bibliography. Ajagbe *et al.* (2009), Anon. (2009e), Ash (1991), Borrow & Demey (2001), Button (1967), Collar & Stuart (1985), Dowsett, Dowsett-Lemaire & Hester (2008), Elgood (1958, 1964, 1975, 1982, 1988, 1992), Elgood *et al.* (1994), Fry & Keith (2004), Macdonald & Taylor (1977), Manu (2001), Manu, Peach, Bowden & Cresswell (2005), Manu, Peach & Cresswell (2005), Stattersfield & Capper (2000).

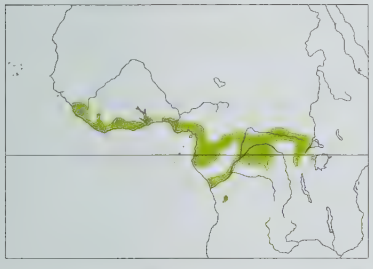
111. Crested Malimbe

Malimbus malimbicus

French: Malimbe huppé **German**: Haubenweber **Spanish**: Malimbo Crestado

Taxonomy. *Tanagra malimbica* Daudin, 1802, Malembo, Cabinda, Angola.
Differences between nominate race and larger-billed *crassirostris* possibly due to clinal variation, and latter perhaps better subsumed in nominate. Three subspecies tentatively recognized.

Subspecies and Distribution.
M. m. nigrifrons (Hartlaub, 1855) – S Guinea, Sierra Leone, Liberia, S Ivory Coast, S Ghana and Togo.
M. m. malimbicus (Daudin, 1802) – S Nigeria, S Cameroon, SW Central African Republic, Gabon, Equatorial Guinea, PRCongo, W DRCongo (around mouth of R Congo) and NW Angola (Cabinda and Cuanza Norte).
M. m. crassirostris E. J. O. Hartert, 1919 – SE Central African Republic, N, W & E DRCongo, and W & SW Uganda.



Descriptive notes. 17 cm; 30–40 g. Male nominate race has red crown with long crest of spiky feathers, red extending over ear-coverts and cheek to chin (except for black strip between flanges of lower mandible), throat and upper breast; black lores and area around eye, narrow band of velvety black behind nape and around breast patch; upperparts, including upperwing and tail, also underparts from belly downwards dull charcoal-black; iris dark brown to brownish-red; bill and legs black. Female is rather similar to male, but lacks spiky crest, and has smaller scarlet area on breast and narrower band of velvet black. Juvenile initially has forehead black, crown, nape and ear-coverts dull maroon, lacks crest, no red areas on breast, has throat black mixed with red, upperparts and underparts dull charcoal-black, iris brown, bill brown, legs dark brown; during intermediate stages before adult plumage, mixture of red and black feathers on crown and chest, and underparts may be dark olive-brown. Race *nigrifrons* has glossy black underparts, a relatively small bill and a short crest; *crassirostris* is heavier-billed than nominate, with a crimson crest and a larger black face mask. Voice. Song has been described as a varied mixture of twitters and sizzling; reported as singing one theme for 2–3 seconds, then switching to another, one recorded song lasting for 37 seconds. Contact call is a harsh "scree scree scree".

Habitat. Primary lowland forest and old secondary forest, also banana, coffee and oil palm (*Elaeis guineensis*) plantations. To 1000 m on Mt Nimba (Liberia–Guinea) and in Cameroon, and to 1500 m in Uganda and DRCongo; occasionally to 1900 m in Itombwe region (E DRCongo).

Food and Feeding. On basis of observations, and stomach contents of 20 specimens, diet includes arthropods such as spiders (Araneae), grasshoppers (Orthoptera), beetles (Coleoptera), cicadas (Cicadidae), caterpillars (Lepidoptera) and insect eggs, also fruit of oil palm. Forages from canopy and middle levels down to taller undergrowth at heights of 5–25 m in Congo Basin, but rarely above lower canopy levels in Nigeria. Gleans on tree trunks and branches, also on flowers; makes sallies after aerial insects. Mainly in pairs in understorey or middle stratum (3–20 m) of Congo forest, singly or in pairs in Nigeria, in groups of 3–4 individuals in E Congo Basin. Regular participant in mixed-species flocks in Sierra Leone, Ivory Coast, Cameroon and C DRCongo, flocks including bulbuls (Pycnonotidae), Old World flycatchers (Muscicapidae), thrushes (Turdidae), sunbirds (Nectariniidae), other weavers (*M. nitens* and *M. scutatus* in Sierra Leone and Ghana), and woodpeckers (Picidae); not found in mixed flocks in Gabon.

Breeding. Breeds in Apr in Guinea, Sept–Nov in Liberia, Apr–May and Sept in Ivory Coast, Feb in Nigeria, Aug–Nov in Cameroon, Nov–Mar in Gabon, Mar in Central African Republic, Oct–Mar in Angola, and Jan, Apr and May in Uganda; in DRCongo, Apr–Jun in C, Dec–May in Kivu and Oct–Dec in E. Monogamous. Solitary nester, but several nests built by same pair can be found at a site. Male courtship includes pursuit of female, song stretches and nest-invitation displays; female may respond with quieter version of song. Male starts to build nest, female then participates in construction, and nest can be completed in a single day; one pair seen to work on three nests simultaneously; nest retort-shaped, with short entrance tunnel usually less than 10 cm long, crudely woven from fibres 2–3 mm in diameter, including strips of palm leaf, leaf petioles and vine fragments, with roofing of two layers (despite rough appearance, sheds water effectively even after torrential rain), suspended from palm or attached to spiny climbing palm, 5–22 m above ground in Liberia, 4–10 m up in Gabon. Clutch 1–2 eggs, white or greenish, with spots of ochre, grey and brown, mean size of four eggs 22·8 × 15·8 mm; incubation by female only; no information on incubation and nestling periods. One record of parasitism by Diederik Cuckoo (*Chrysococcyx caprius*).

Movements. Generally sedentary. Unconfirmed reports from SE Mali, where species might be a seasonal visitor.

Status and Conservation. Not globally threatened. Widespread within forested regions, and locally common to uncommon. Only isolated records from Togo and unconfirmed ones from Mali. Records from Ghana previously ascribed to *M. cassini* or *M. ibadanensis* now considered to involve misidentified individuals of present species.

Bibliography. Bannerman (1949), Bates (1909, 1927), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brosset (1974, 1978), Brosset & Érard (1986), Brown & Britton (1980), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Colston & Curry-Lindahl (1986), Crook (1964b), Dean (2000), Dean *et al.* (1988), Demey & Fishpool (1994), Dowsett-Lemaire & Dowsett (1989), Eisentraut (1973), Elgood *et al.* (1994), Field (1979), Friedmann (1978), Friedmann & Williams (1971), Fry & Keith (2004), Gatter (1997), Germain *et al.* (1973), Green & Carroll (1991), Grimes (1987), Halleux (1994), Heinrich (1958), Lamarche (1981, 1993), Lippens & Wille (1976), Macdonald & Taylor (1977), Marchant (1953), Moreau (1958), Morel & Morel (1988), Péron & Crochet (2009), Prigogine (1971), Sassi (1925), Serle (1950, 1957, 1981), Stevenson & Fanshawe (2002), Thiollay (1985), Traylor (1963a), Walker (1939), Waltert *et al.* (1999).

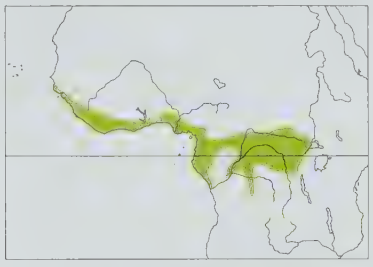
112. Blue-billed Malimbe

Malimbus nitens

French: Malimbe à bec bleu **German**: Rotkehlweber **Spanish**: Malimbo Piquiazul
Other common names: Gray's Malimbe

Taxonomy. *Ploceus nitens* J. E. Gray, 1831, Sierra Leone.
Monotypic.

Distribution. SW Senegal, W Guinea-Bissau, W & S Guinea and Sierra Leone E to SW Togo, S Benin, S Nigeria, S & SW Cameroon and SW Central African Republic, S to Equatorial Guinea, Gabon, N & W PRCongo, and NW & NE Angola (Cabinda and N Lunda Norte), also N, SW & SC DRCongo E to extreme SW Sudan (Bengengai Forest) and W Uganda (Bwamba).



Descriptive notes. 17 cm; male 38–47 g, female 29–36 g. Male plumage is entirely black, except for deep red patch on breast, extent of red individually variable (on some reaching onto throat and even chin, on others chin black, throat sooty black); underparts sooty black, lacking gloss; iris brown-red; bill blue-grey; legs blue-grey to dark grey. Female resembles male, but often with noticeably smaller red patch on breast (although individual variation in both sexes). Juvenile differs from adult in having upperparts less black, underparts charcoal-black, head coloration varying from blackish to brown with scattered red feathers, breast patch dull red or black with some red feathers, youngest individuals appear to have orange-brown fringe on feathers of chin and throat; iris brown, bill light brown, legs dark brown. Voice. Song consists of a mixture of warbling notes and shrill elements, "chisisisi-wer chi-wurrr chilly-wer", repeated; during courtship bows directed towards female, male sings "wookitiki wookitiki wheeze"; male alone on territory, or after encounter with another male, sang "wo wewo wewowe weee we we". Calls include rasping "zheep", repeated frequently; shorter "zhep-zhep" and "zwhep" sounds.

Habitat. Primary and secondary forest, particularly in swampy areas with *Raphia* palms, and in oil palm (*Elaeis guineensis*) clumps, often near forest streams and rivers; also in high mangroves. At up to 1000 m in W Africa; occasionally to 1500 m in E DRCongo.

Food and Feeding. Diet primarily insects and other arthropods, but in Ivory Coast recorded as 40% arthropods, 30% fruit, 30% other material; some vegetable matter also taken. Insect food included grasshoppers (Orthoptera), beetles (Coleoptera), butterflies and caterpillars (Lepidoptera), ants (Formicidae), cicadas (Cicadidae) and insect pupae; spiders (Araneae) eaten by birds in Cameroon and Gabon, and worms (Lumbricidae) commonly taken in Gabon. Seeds found in specimens from Liberia; oil palm fruit in two stomachs from Cameroon, whereas 28 other specimens had only arthropods in stomach contents. Forages up to canopy but also at lower levels, even 1–5 m above forest floor. Investigates masses of tangled vines, and probes dry leaf masses, pulling these apart with the powerful bill and utilizing a prying action; often clings upside-down. In Liberia, more observations of individuals on vertical and diagonal branches than on horizontal ones, whereas in Congo Basin this species was characterized as a leaf-gleaning insectivore. Forages in pairs in understorey or middle stratum (3–20 m) in Congo forest; larger groups form through amalgamation of several family parties. Regular member of mixed-species flocks, and associates with *M. coronatus*.

Breeding. Breeds in Jun–Jul in Senegal, Nov–Mar in Liberia, Jun–Mar in Ivory Coast, Jun–Jul and Sept–Oct in Ghana, Apr and Jul in Togo, Feb–Nov (mainly Apr–Jul) in Nigeria, May–Jun and Sept–Oct in Cameroon, Dec–Mar in Gabon; in all months except Apr and Aug in DRCongo, in Nov and Mar in Uganda, and Feb–Apr in Angola. Monogamous. Mostly solitary nester, and territorial, displaces intruders by chasing or in aggressive dances; in Ghana also loose colonies of 5–21 nests (average 10 at six sites), with up to six of these occupied. Male initiates courtship by chasing female, and then, with plumage fluffed out, sings to her; using distinctive vocalizations, he leads her to nest and sings at nest-site; female solicits copulation with wing-quivering. Nest built by male only, ball-shaped, with wide funnel-like entrance tube c. 8 cm long, 4 cm in diameter, often at angle of 45 degrees, resembles nest of *Ploceus cucullatus* more than it does nests of congeners; variety of material used, tightness of weaving varying greatly, sometimes ragged in external appearance (resembling flood debris caught in overhanging branches), outer layer constructed from strips of palm fibre and leaves, twigs, tendrils and rootlets, lined with fine fragments of palm fronds or horsehair lichen, generally suspended from palm frond or small bush 0·4–3 m above forest stream or pool (one site abandoned when pool dried up), rarely in dry forest and then up to 10 m above ground; female may strip leaves around nest-site; often new nests built alongside old ones, and nests can be more than 5 months old before eggs laid; sometimes in same palm tree as used by *M. scutatus*, but much higher up; in Ghana, nests much closer to dens of dwarf crocodile (*Osteolamus tetraspis*) than expected by chance, possibly for protection, and in Nigeria used site over pond in enclosure containing three crocodiles. Clutch 2 eggs (average of 25 clutches), whitish, grey, pale green or creamy-brown ground colour, large brown spots forming ring at thick end, sometimes salmon-pink with reddish spots (colour type apparently specific to individual females), average size of nine eggs 24·3 × 16·1 mm (Cameroon and DRCongo); incubation by female only, often absent from nest for extended periods, male perched nearby, gave alarm call when predators approached, incubation period 14 days; chicks fed by both sexes, nestling period 16 days. Of 14 broods in Gabon, nine probably fledged successfully; of 14 nests in Kakum Forest, in Ghana, one lost in storm, eight destroyed by predators.

Movements. Generally considered sedentary; appears to move over larger area within forests when not breeding, but no data on extent of these movements.

Status and Conservation. Not globally threatened. Generally common; uncommon in extreme E of range (W Uganda). Most widely distributed member of genus. In addition to current known range, an old record from Gambia, occasional records from S Mali, and two records from extreme SW Niger. At market for traditional medicines in Benin, eleven specimens of this species (of 690 Ploceidae, and more than 7000 birds in total) offered for sale.

Bibliography. Adjakpa *et al.* (2002), Bannerman (1949), Barlow *et al.* (1997), Bates (1911), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brosset (1978), Brosset & Érard (1986), Brown & Britton (1980), Button (1967), Carroll (1988), Carswell *et al.* (2005), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Colston & Curry-Lindahl (1986), Crook (1960c, 1964b), Dean (2000), Demey & Fishpool (1994), Din (1982, 1991), Dowsett-Lemaire & Dowsett (1989), Eisentraut (1963), Field (1979), Friedmann (1978), Friedmann & Williams (1971), Fry & Keith (2004), Gatter (1997), Giraudoux *et al.* (1988), Green & Carroll (1991), Grimes (1987), Halleux (1994), Hartert (1907), Herroelen (1955), Hudgens (1997), Lamarche (1981, 1993), Leisler (1995), Lippens & Wille (1976), Lowe (1937), Marchant (1942, 1953), Moreau (1958), Morel & Morel (1982), Nikolaus (1987), Péron & Crochet (2009), Prigogine (1971), Ripley & Heinrich (1966), Serle (1950, 1957, 1965, 1981), Thiollay (1973), Walker (1939), Waltert & Mühlenberg (1999), Waltert *et al.* (1999).

113. Rachel's Malimbe

Malimbus racheliae

French: Malimbe de Rachel **German**: Rachelweber **Spanish**: Malimbo de Rachel

Taxonomy. *Sycobius racheliae* Cassin, 1857, River Muni, Equatorial Guinea.
Has been thought to form a superspecies with *M. ballmanni*. Monotypic.

Distribution. SE Nigeria, W & SW Cameroon, Equatorial Guinea and NC Gabon.



Descriptive notes. 15–17 cm. Male has orange-red forehead and crown, passing into yellow on nape; upperparts, including wing and tail, black; lores, cheek, ear-coverts, chin and throat black; large bilobed patch on breast orange in centre, yellow towards margins; belly, flanks and thighs black, undertail-coverts yellow; iris deep red; bill black; legs slate-grey. Female differs from male in having wholly black head and upperparts; orange patch on breast variable in size and in amount of yellow/orange (differences appear to be individual, rather than sex-related); undertail-coverts dull yellow. Juvenile has top and side of head and entire upperparts black, chin, throat and breast orange, belly, flanks and thighs black, undertail-coverts buffy, iris brown, upper mandible brown, lower mandible pale, almost whitish, legs brown. Voice. Song described as short, ending in buzzing, reminiscent of that of *Ploceus cucullatus*. Harsh "zhep-zhep" as contact call.

Habitat. Lowland primary forest, at forest edge in groves of parasol trees (*Musanga cecropiodes*); below 400 m.

Food and Feeding. Insectivorous; in Gabon, caterpillars and moths (Lepidoptera), grasshoppers (Orthoptera) and mantids (Mantodea) noted in diet. Forages usually in canopy or at middle levels in forest, down to 10 m above ground, occasionally on forest edge. Forages in manner of a tit (Paridae), probing foliage. Social unit pairs or often trios, sometimes with young in family party; regularly joins mixed-species flocks, especially in association with drongos (*Dicrurus*) and barbets (Capitonidae).

Breeding. Nest-building activity and sightings of dependent juveniles indicate breeding in Apr, Jun and Nov in Nigeria and Mar, Jun and Nov in Gabon. Monogamous. Some form of co-operative breeding likely. Solitary nester; apparently territorial. Nest retort-shaped, resembling that of *M. scutatus*, attached to tips of lianas just below canopy 8–12 m above ground over open space; at three nests, two males and one female seen to be working together during construction. Observation of a fledgling fed by two males and one female. No other information.

Movements. Presumed sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cameroon and Gabon Lowlands EBA. Uncommon to locally fairly common; apparently sparsely distributed throughout its range. Present in reserves in Nigeria, Cameroon, Gabon and Equatorial Guinea; regarded as not uncommon in Campa Ma'an National Park, in Cameroon.

Bibliography. Bannerman (1949), Borrow & Demey (2001), Brosset (1974, 1978), Brosset & Érard (1986), Christy & Clarke (1994), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry & Keith (2004), Marchant (1953), Moreau (1958), Rand *et al.* (1959), Serle (1954).

114. Red-headed Malimbe

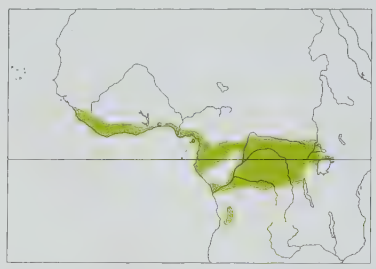
Malimbus rubricollis

French: Malimbe à tête rouge **German**: Kletterweber **Spanish**: Malimbo Cabecirrojo
Other common names: Red-collared Malimbe, Red-headed Quelea(!)

Taxonomy. *Ploceus rubricollis* Swainson, 1838, Malembo, Cabinda, Angola.
Several races proposed, including *nigeriae* (from Iju, near Lagos, in Nigeria), *rufovelatus* (from Bioko I), *centralis* (described from Ndussuma, in Ituri district of NE DRCongo) and *praedi* (from N'Dalatando, in W Angola); these, however, are separated by only slight differences in size, and variation in other characters considered trivial. Treated as monotypic.

Distribution. W Guinea, Sierra Leone and Liberia E to S Togo, S Benin, S Nigeria, Bioko I (Fernando Póo), S Cameroon, SW Central African Republic, Equatorial Guinea, Gabon, N, E & SW PRCongo, NW & W Angola (Cabinda; Uíge S to Cuanza Sul), also much of DRCongo (except extreme N and S & SE), extreme SW Sudan, W & S Uganda, extreme W Kenya (Kakamega and Nyandoro) and extreme NW Tanzania (Bukoba).

Descriptive notes. 18 cm; 40–55 g. Male has forehead, crown and nape scarlet, crown feathers stiff and spiky, scarlet extending behind ear-coverts to sides of neck; lores, cheek and ear-coverts black; rest of plumage entirely black; iris deep brown-red; bill black; legs blackish. Female is wholly black, except for scarlet-red patch on hindcrown (from line just behind eye) and nape; iris orange to red, bill and legs black. Juvenile is duller black than adult, forehead and crown to level of eye dull maroon, hindcrown and nape orange, cheek and ear-coverts dull brown; iris brown, bill brown, legs black. Voice. Song of introductory whistles, ending in sizzling "whuduteew-whuduteew szszszrrrrr"; male song at nest rendered as "tokui tokui wokti chwizz". Male and female may duet, "chee" from male eliciting "cheko cheko cheko cheee" from female. Call a harsh "zheet".



Habitat. Present in lowland primary forest and also transitional forest, as well as forest edge and clearings, and secondary growth; sometimes found in coffee and cocoa plantations, and in small forest outliers within farmland. Recorded up to 1000 m in W Africa; up to 1500 m in E DRCongo, and to 1600–1700 m in S Sudan and Uganda.

Food and Feeding. Mainly insectivorous; in Ivory Coast diet estimated at 50% arthropods, 30% fruit, 20% other material. Insect prey include ants (Formicidae), beetles (Coleoptera), grasshoppers (Orthoptera), caterpillars (Lepidoptera) and other insect larvae, also alate termites (Isoptera). Stomach contents included small snails (Mollusca), spiders (Araneae), also fruits and berries. Diet likely to overlap with that of *Ploceus tricolor* in Nigeria. Feeds mainly in canopy, generally at heights of 15–45 m, seldom below 25 m. Hops along horizontal branches, clambers about, often hanging upside-down; probes bark, lichens and patches of moss, also uses prying action of the bill, and hammers like a small woodpecker (Picidae) in search of grubs; movements reminiscent of those of a nuthatch (Sittidae). Hawks winged termites and other flying insects in clearings. In Nigeria, held dislodged ripe oil palm nuts (*Elaeis guineensis*) in feet and ate small pieces. Forages generally in pairs or small parties, often singly in Congo forest; joins mixed-species flocks, which may include *Ploceus bicolor*, *M. erythrogaster* and Golden Greenbul (*Calyptocichla serina*).

Breeding. Breeds Jul in Sierra Leone, Jan–Apr in Liberia, Dec–Mar in Ghana, Mar in Togo, Apr–May in Benin, mainly Nov–Apr (but activity at nests in all months except Jun and Oct) in Nigeria; in DRCongo, May and Oct in Ituri region and Jan–Mar in Kivu; Feb–Mar in Angola, Apr–Aug in Uganda and Feb in Kenya. Monogamous. Solitary nester, or in small colonies of up to five nests. Territory defended by chasing, and song bows. Courtship initiated by male pursuits, then song bows to female, both may take place in treetops away from nest; nest-invitation displays follow, and courtship feeding a prelude to copulation. Nest retort-shaped, with short, wide entrance tunnel c. 25 cm long, sometimes 2–3 nests fused together and with tunnels protruding (often appears as globular mass), built largely from tendrils of creepers, grass blades and rootlets of epiphytic orchids, with brood-chamber generally unlined, suspended from top below a branch, 6–30 m above ground in secondary habitats, 30–45 m up in primary forest; several nests in Liberia within 2 m of occupied Palm-nut Vulture (*Gypohierax angolensis*) nests, also some close to wasp (Hymenoptera) nests; in both Liberia and Nigeria, has nested in association with *Ploceus tricolor* and at similar height (12–16 m), but nests placed in crotch of main trunk or on thick branches, whereas *Ploceus tricolor* built in outer branches; also nested in same trees as drongos (*Dicrurus*), rollers (Coraciidae) and barbets (Capitonidae). Clutch 2 eggs, pure white, sometimes with reddish spots. No other information.

Movements. Apparently sedentary.

Status and Conservation. Not globally threatened. Widespread and fairly common within forest regions. Occasional records in extreme S Mali. One specimen of this species noted (of 2251 birds offered for sale) at market for traditional medicines in Nigeria.

Bibliography. Bannerman (1949), Basilio (1963), Bates (1911), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brosset & Érard (1986), Brown & Britton (1980), Button (1967), Carswell (1986), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1932, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Collias, N.E. & Collias (1964), Colston & Curry-Lindahl (1986), Crook (1960c, 1964b), Dean (2000), Dean *et al.* (1988), Din (1991), Dowsett-Lemaire & Dowsett (1989), Eisentraut (1973), Elgood (1982), Friedmann & Williams (1970, 1971), Fry & Keith (2004), Gatter (1997), Germain & Cornet (1994), Green & Carroll (1991), Grimes (1987), Halleux (1994), Hartert (1907), Heinrich (1958), Lamarche (1993), Leisler (1995), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lowe (1937), Mann (1985), Marchant (1942), Moreau (1958), Morel & Morel (1988), Nikolaus (2001), Pettet (1969), Prigogine (1971), Rand *et al.* (1959), Sassi (1925), Serle (1957), Seth-Smith (1913), van Someren (1916), Stevenson & Fanshawe (2002), Thiollay (1973, 1985), Walker (1939), Waltert & Mühlenberg (1999), Waltert *et al.* (1999), Zimmerman *et al.* (1996).

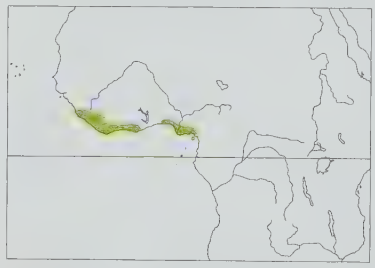
115. Red-vented Malimbe

Malimbus scutatus

French: Malimbe à queue rouge **German**: Rotsteißweber **Spanish**: Malimbo Culirrojo

Taxonomy. *S[y]cobius scutatus* Cassin, 1849, 'Western Africa' = Sierra Leone.
Has been thought to form a superspecies with *M. cassini*. Two subspecies recognized.

Subspecies and Distribution.
M. s. scutatus (Cassin, 1849) – S & SE Sierra Leone, SE Guinea, Liberia, S Ivory Coast, SW Ghana.
M. s. scutopartitus Reichenow, 1894 – SE Benin, S Nigeria and SW Cameroon.



Descriptive notes. 17 cm; 28–33 g. Male nominate race has forehead, crown and nape scarlet-red, linked by broad red band to large scarlet patch across breast; lores, cheek, ear-coverts, chin and throat black; rest of plumage black, except for red undertail-coverts; iris brown to deep chestnut-brown; bill and legs black. Female has head black, sometimes with irregular red feathering, broad scarlet patch on breast, breast patch sharply demarcated at throat, with curved posterior border; bare parts as for male. Juvenile is dull black above and below, with forehead and crown to midway between eyes bright orange, orange band from lores to chin joining orange area on throat and breast, orange undertail-coverts, iris dark grey-brown, bill pale horn-brown, legs dark brown. Race *scutopartitus* is larger than nominate, differs also in having broader red band on breast in both sexes, that of female split by black line in centre. Voice. Song described as melodious and pleasant, with repeated phrases, "peeyo-peeyo-tsitsi-pyurr-tsu-wee-tsurr-tsurr-tsu-wee-tsitsi-wer". Single nasal "zu-weeya" and loud "chirp" calls; characteristic calls, kept up by all birds in party for minutes at a time, loud, rasping "zee-zee-zee-zee" and hard "tuk tuk-tuk tuktuktuk tuk".

Habitat. Formerly inhabited upper canopy and tall emergent trees in mature lowland forest; now found also in more open habitats, secondary forest and oil palm (*Elaeis guineensis*) plantations, even small stands of trees near villages. Occurs down to sea-level; up to 1000 m on Mt Cameroon.

Food and Feeding. Diet chiefly insects, e.g. caterpillars (Lepidoptera) in stomach contents; also eats husks of oil palm nuts. Forages mainly in canopy, in mature forest often above 30 m (highest of any malimbe), particularly in thin, outermost twigs. Techniques include both gleaning in manner of a tit (Paridae) and capturing flying insects in aerial sallies. In groups of five or six individuals in Guinea, and larger parties reported in Nigeria. Joins mixed-species flocks, though less often than do some congeners; in Sierra Leone associated with *M. nitens* and *M. malimbicus*, but takes smaller prey than those preferred by these two species.
Breeding. Records of breeding season based primarily on nest-building and sightings of juveniles: in Feb in Guinea, Dec–Feb (also active at nests Apr–Jun and Aug) in Liberia, Oct–Dec in Ivory Coast, Dec in Ghana, and Sept–Feb (with some building activity in most months) in Nigeria. Monogamous. Solitary nester; pair may build 3–5 nests in one tree, but only one occupied. Courtship includes pursuit of female by male, and male directing song bows towards female; in nest invitation, flies back and forth to nest. Both male and female involved in nest construction, and one nest took 21 days to complete; several adults sometimes in attendance, but their involvement in building or in care of young unclear; nest an inverted-sock type, with globular egg-chamber and long entrance tube (30–60 cm long, 16 cm wide at entrance), resembling nest of *M. cassini* but with shorter and more flaring tunnel, neatly woven from palm fibres, egg-chamber lined with short strips of palm leaves, tunnel semi-transparent with fine tracery; thin, wavy coils of dry rootlets and vine tendrils used in some nests; suspended from palm leaflets as low as 6 m above ground or much higher in canopy; of twelve nesting sites in raffia palms (*Raphia*) in Nigeria, ten shared with *M. nitens*, present species always occupying upper sectors of plant. Clutch 2 eggs, pure white, mean size of seven eggs 21·6 × 15·9 mm. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally common within forest zone. Isolated record (of nominate race) from Togo. Total of 110 specimens of this species (of more than 7000 birds, of which 690 Ploceidae) offered for sale at a market for traditional medicines in Benin.
Bibliography. Adjakpa *et al.* (2002), Bannerman (1949), Borrow & Demey (2001), Button (1967), Collias, N.E. & Collias (1964), Colston & Curry-Lindahl (1986), Crook (1960c, 1964b), Demey & Fishpool (1991), Din (1991), Elgood *et al.* (1994), Fry & Keith (2004), Gatter (1997), Grimes (1987), Halleux (1994), Lowe (1937), Manu (2001), Marchant (1942), Moreau (1958), Serle (1954), Walker (1939).

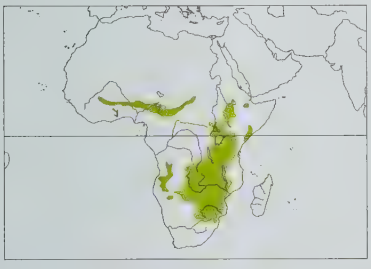
Genus *ANAPLECTES* Reichenbach, 1863

116. **Red-headed Weaver**

Anaplectes rubriceps

French: Anaplecte écarlate **German**: Scharlachweber **Spanish**: Tejedor Cabecirrojo
Other common names: Red-headed Anaplectes; Red-winged/Northern Red-headed Weaver (*leuconotos*)

Taxonomy. *Ploceus* (*Hyphanthornis*) [sic] *rubriceps* Sundevall, 1850, Mohapoani, Witfontein Mountains, North West Province, South Africa.
Formerly, often referred to by specific name *melanotis*, but that name invalid, as preoccupied. Sometimes placed in genus *Malimbus*. Race *leuconotos* considered by some authors to represent a separate species, but intergrades extensively with nominate in S Tanzania, Zambia and Malawi. Proposed race *gurneyi* (described from Caconda, in W Angola), is synonymized with nominate. Three subspecies recognized.
Subspecies and Distribution.
A. r. leuconotos (J. W. von Müller, 1851) – SW Mali, S Burkina Faso and N Ghana E to NC Nigeria, N Cameroon, S Chad, N Central African Republic, W & S Sudan and W Ethiopia, also NE DRCongo, Uganda, W Kenya and Tanzania S to N Zambia and N Malawi.
A. r. jubaensis van Someren, 1920 – S Somalia and N coastal Kenya.
A. r. rubriceps (Sundevall, 1850) – Angola, SE DRCongo, S Tanzania, Zambia, Malawi, Mozambique, N & NE Namibia, N & E Botswana, Zimbabwe, NE South Africa and Swaziland.



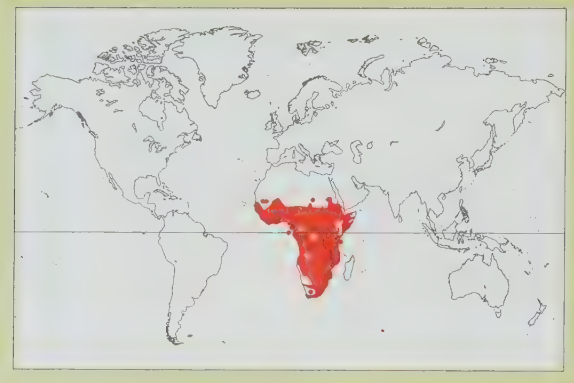
Descriptive notes. 12–15 cm; male 19–26 g, female 17–25 g. Male nominate race breeding has lores black, rest of head down to chin and throat red; mantle orange-red, bordered by variable V-shaped black markings, rest of upperparts dull grey with olive tinge; upperwing and tail grey-brown, bright yellow margins on primaries and tail feathers, yellow fringes on greater coverts, whitish fringes on terials, and broader whitish tips on median coverts forming wingbar; breast orange-red, sharply demarcated from dull white belly, flanks, thighs and undertail-coverts; iris dark red-brown to orange or red; bill orange-red; legs dull flesh-coloured. Male non-breeding has forehead, crown and nape yellow to golden-brown, upperparts grey-brown, wings and tail as in breeding male, chin to upper breast yellow, rest of underparts dull white; often a few orange feathers on crown and breast; bill pale horn-brown. Female is like non-breeding male, but paler yellow on head, no scattered orange feathers on head and breast. Juvenile resembles female but duller, with brown tinge on forehead and underparts, olive wash on upperparts, orange-yellow margins of remiges and wing-coverts, bill greyish. Race *leuconotos* male has lores, cheek, ear-coverts and chin black (forming mask around eye), both sexes have margins of remiges, wing-coverts and rectrices red, not yellow); *jubaensis* male is distinctive, has entire plumage red except for black lores, black edges of scapulars, and blackish wing and tail feathers (these broadly edged with red). Voice. Song a rapid series of squeaky, sizzling notes, "chu-tsee-tsi chu-tsi tsee-tsi tswi-tsi-tswee tzirrrr"; shorter sequences sung by male while hanging at nest. Flight call "tsi" or "tsi-whoo"; alarm call a high-pitched "chi-chi".
Habitat. Broadleaf woodland, bushveld, acacia (*Acacia*) savanna, miombo (*Brachystegia*) woodland, also gardens. Usually below 1600 m in W & S Africa; to 2100 m in Sudan and E Africa.
Food and Feeding. Diet primarily insects; some plant material taken, including acacia seeds, *Premna* fruit, and fruit of the mistletoe *Tapinanthus leendertziae*; attracted to fruiting *Sapium* trees in Uganda. Stomach contents included bugs (Hemiptera), beetles (Coleoptera), mantids (Mantodea), alate termites (Isoptera). Spiders (Araneae) and small snails (Mollusca) fed to chicks. Searches leaves and branches for insects, moving singly or in pairs; often hangs upside-down, and uses prying action of bill; also hawks aerial insects. Frequently joins mixed-species flocks in woodland; in Kenya, regular foraging association with White-crested Helmet-shrike (*Prionops plumatus*), also with *Ploceus intermedius*, and observed in group of sunbirds (Nectariniidae); in Mozambique, joined flocks with hyliotas (*Hyliota*), crombecs (*Sylvietta*) and woodpeckers (Picidae); present in c. 25% of mixed-species flocks in Zambia, most frequent flock-members being Fork-tailed Drongo (*Dicrurus adsimilis*), Chin-spot Batis (*Batis molitor*) and Black-backed Puffback (*Dryoscopus cubla*).
Breeding. Breeds Dec–Mar in Ghana and Togo, Nov–May in Nigeria, Feb–Apr, Oct and Dec in Ethiopia, Feb and May–Jul in Uganda, Mar–Jul, Sept–Nov and Jan in Kenya, Feb–May and Sept–Dec in Tanzania, Oct–Dec and Mar–May in Rwanda, Aug–Nov in SE DRCongo and Jan–Feb in NE, Sept–Nov in Angola, Aug–Dec in Zambia, Aug–Jan in Malawi, Mozambique and Zimbabwe, Sept–Feb in Botswana, and Oct–Mar in South Africa. Generally polygynous, but some solitary monogamous pairs. Usually colonial, with up to nine nests together, rarely up to 40. Nest built by male, often constructing 3–4 in close proximity, retort-shaped, with spout 15–20 cm long, made from flexible twigs, leaf petioles and tendrils, meshed (rather than closely woven), but sometimes linked by bark strips, and with broad leaves and acacia pods included in roofing layer, inner lining of finer twigs, grass fibre and sometimes leaves, sited 1·5–15 m above ground near branch tip and with cover of leaves above, or sometimes attached to verandah or telephone line, or on pylon, or even inside building; nests near homesteads used in successive season; of twelve nest-sites in N Nigeria, six associated with Red-necked Buzzard (*Buteo auguralis*) nests, one with Black Kite (*Milvus migrans*) nest and one with Hooded Vulture (*Necrosyrtes monachus*) nest, and at one buzzard nest both species present for four consecutive years); c. 15 occupied nests around Crowned Hawk-eagle (*Stephanoetus coronatus*) nest in Malawi; may nest near other weavers, e.g. *Ploceus cucullatus*, *Ploceus velatus*, *Ploceus intermedius* and *Bubalornis niger*; old nests of present species occupied by Cut-throat Finch (*Amadina fasciata*) in Kenya and South Africa, in South Africa also by Brown Firefinch (*Lagonosticta nitidula*) and occasionally by Bronze Mannikin (*Spermestes cucullata*) and Southern Black-flycatcher (*Melaenornis pammelaina*). Clutch 2–4 eggs, usually 3, pale blue, often darker at thick end, average size of 60 eggs 20·4 × 14 mm (South Africa); incubation mainly or solely by female, period 12–13 days; chicks fed by both sexes, nestling period 12 days (Malawi), in captivity 17 days. Nests parasitized by Diederik Cuckoo (*Chrysococcyx caprius*) in Zambia, Malawi, Zimbabwe and South Africa; report of parasitism by Klaas's Cuckoo (*Chrysococcyx klaas*) erroneous, apparently result of misidentification. Maximum longevity in ringing studies at least 9 years.
Movements. Mainly resident; some local wandering, moving away from nesting areas after breeding. Two ringed individuals recaptured, respectively, 9 years and 5 years later within 5 km of ringing sites.
Status and Conservation. Not globally threatened. Widely distributed and regionally common. Generally uncommon to rare and local in NW of range; occasional records from other regions in W Africa, e.g. old records from Gambia and Senegal, but no published records for Guinea and Ivory Coast. Locally common in Angola. Locally common in E parts of range. Estimated population in Kruger National Park, in NE South Africa, greater than 16,000 individuals, more than 30,000 estimated in C & S Mozambique. One report of specimen for sale in Nigerian market of animal products for traditional medicine.
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Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family VIDUIDAE (WHYDAHS AND INDIGOBIRDS)



- Small passerines with short, stubby bill, breeding males of most species with extensive black in plumage, some also with greatly elongated central tail feathers, females and non-breeding males mostly brownish and streaked.
- 10–43 cm (including elongated inner rectrices of male whydahs).



- Sub-Saharan Africa.
- Open country, from grassland to open woodland.
- 2 genera, 20 species, 28 taxa.
- No species threatened; none extinct since 1600.

Systematics

The 19 species of whydah and indigobird in the genus *Vidua*, together with the Cuckoo Finch (*Anomalospiza imberbis*), constitute the family Viduidae, a group confined to sub-Saharan Africa. All of the species are brood-parasites, laying their eggs in the nests of other species; the hosts rear the young viduids, typically along with their own young. The brood-parasitic Viduidae and the waxbills (Estrildidae), which are their primary host species, diverged about 20 million years ago. Over the years, most workers have included *Vidua* within Estrildidae or Ploceidae (weavers), often in a subfamily of its own. *Anomalospiza*, too, has repeatedly been moved back and forth between these two families, and has not been closely linked with *Vidua*. However, several morphological characters support a close relationship between *Anomalospiza* and *Vidua* and are different from those of the weavers. Most significantly, the skull, the bony palate, the horny palate and the pterylosis of *Anomalospiza* are much like those of *Vidua* and unlike those of the other Old World "finches".

Phylogenetic relationships among the viduid species have been estimated using molecular genetics. In analyses of mitochondrial restriction sites and nucleotide sequences, the *Vidua* finches are a single lineage, more closely related to each other than they are to any other bird species. The indigobirds are short-tailed birds whose ancestors had long-tailed males. Indigobirds are closely related to the Straw-tailed Whydah (*Vidua fischeri*) and the Shaft-tailed Whydah (*Vidua regia*). A second species group consists of the five paradise-whydahs: the Long-tailed (*Vidua paradisaea*), Broad-tailed (*Vidua obtusa*), Sahel (*Vidua orientalis*), Exclamatory (*Vidua interjecta*) and Togo Paradise-whydahs (*Vidua togoensis*). The relationships among the other whydahs are less well known. Different models indicate uncertainty over whether the basal branch of the lineage consists of the paradise-whydahs, the Steel-blue Whydah (*Vidua hypocherina*) or the Pin-tailed Whydah (*Vidua macroura*). Certain species groups have been assigned distinct genera, with the indigobirds in *Hypochera*, the Shaft-tailed and Straw-tailed Whydahs in *Tetraenura*, and the paradise-whydahs in *Steganura*. Because the relationships among these species groups are uncertain, however, recognition of these genera would be problematic. A broad genus *Vidua* is supported by the morphological and genetic data.

Vidua species differ from one another in size, in breeding plumage and colour, and in the songs used in courtship and mate choice. The long-tailed whydahs are distinctive in breeding plumage. In contrast, the indigobirds are very similar to one another in appearance, and the true taxonomic status of the various "cryptic species" formerly included within an expanded *V. chalybeata* was resolved only when their songs were discovered: each mimics the song of its host species. Before that time, H. Lynes commented, in 1924, that "One wonders whether the highest education will ever enable them to be distinguished apart in the field, or whether one will have to give it up because breeding males all look 'just indigo' and all others 'just like sparrows [Passeridae]' with striped faces". Early studies of indigobirds were based on museum specimens, and authors in the 1960s estimated that there were from one to eight species. The males have glossy black breeding plumage and no ornamental patches or plumes; they differ from one another in average size, in brightness and colour of the plumage gloss, in the colour of the flight-feathers, which are black, dark brown or pale brown, and, in some cases, in the colour of the bill and feet. The females differ in size, plumage, and bill and foot colours. Field observations and tape recordings have shown that males with different plumages mimic the songs of different estrildid finches, which are their host species (see Voice). The present understanding is that there are ten indigobird species. The mouths of begging nestlings have distinctive colours and patterns and, in some cases, these mimic the mouths of their host species' nestlings.

Mitochondrial and microsatellite genetic markers are shared among the various indigobird species. These shared genetic markers may perhaps be traceable to a recent common ancestor, with gene lineages that have not been sorted through time owing to a time lag between speciation of the birds and lineage sorting of their genes. Their ancestral species was genetically diverse with polymorphic mitochondrial and microsatellite genes. These variant forms of genes in a population are shared by the descendant species for a time after speciation, until one species loses some forms and the other species loses the others, in an evolutionary process known as lineage sorting. At this later stage the two species would differ in the alternative forms of the gene in their lineages. The indigobird species appear to have separated only recently, and time has not yet led to complete and distinctive differences between these forms of the genes, which are in a state of incomplete lineage sorting. Alternatively, the shared genes may indicate hybridization between species, or, indeed, both processes may occur. In addition, these genetic markers indicate two geographical sets of species. The indigobird species in West Africa are each other's closest relatives, and they share mitochondrial

genes. Similarly, the indigobirds in East Africa and southern Africa are each other's closest relatives and, again, they share mitochondrial genes with each other. The speciation of these indigobirds is recent, the southern African species having diverged a few thousand years ago as calculated from the frequencies of their mitochondrial morphs, and approximately the same time period applies to the West African species.

The five paradise-whydahs were once considered conspecific under the name *V. paradisaea*. Of the currently recognized species, two, the Long-tailed and Sahel Paradise-whydahs, are song mimics and brood parasites of the Melba Finch (*Pytilia melba*), but mitochondrial restriction-fragment lengths and nucleotide sequences indicate that these two whydahs are not each other's closest relative. Instead, the Long-tailed Paradise-whydah and the Broad-tailed Paradise-whydah are sister-species, as are the Sahel, Exclamatory and Togo Paradise-whydahs. No interbreeding between the Long-tailed and Broad-tailed Paradise-whydahs has been observed in regions where the two co-occur, at many localities in Zimbabwe, Zambia, Malawi and Tanzania.

In 1758, in his description of "*Emberiza paradisaea*", Linnaeus noted the long acuminate tail with the innermost rectrices not as long as the next pair, and this clearly represents the Long-tailed Paradise-whydah of eastern and southern Africa. In addition to his description, Linnaeus listed the sixteenth-century woodcut that appeared in the work of U. Aldrovandi in 1600, the "*Passer indicus*" of F. Willughby in 1676, and the "red-breasted long-tailed finch" of G. Edwards in 1747. Aldrovandi's paradise-whydah appears to be the bird now known as *V. orientalis aucupum*. J. Ligozzi's painting of this bird shows it with a reddish nape of the same colour as the breast, as in Aldrovandi's description, and a tail lacking a tapered tip. Willughby described Aldrovandi's two whydahs, but Willughby's plate xlv shows "Passer Indicus macrouros rostro miniaceo", *V. macroura*, and not "Passer Indicus macrouros alius", the paradise-whydah. Finally, Edwards, in his 1747 *A Natural History of Birds*, described and illustrated in a colour plate an aviary bird from Angola, and this "red-breasted long-tailed finch" matches Linnaeus's description of *paradisaea*. Although Linnaeus's citations might suggest a composite whydah, his description of *V. paradisaea* is clearly referable to the paradise-whydah with a long, tapering tail as illustrated by Edwards. Later, in 1766, Linnaeus designated the type locality of *paradisaea* as "Africae regno Angolensi", or modern-day Angola.

As with the paradise-whydahs, the indigobirds were once considered all conspecific. The ten species now recognized differ, as already noted, in male breeding plumage, in bill and foot colour, and usually in song, and in some cases in nestling mouth pattern and colours. The adults differ also in average wing length, notwithstanding some overlap in measurements between certain species. As many as three or four species are sympatric in some localities, but with no morphological evidence of interbreeding. Although earlier authors considered the red-billed subspecies *amauropteryx* of the Village Indigobird (*Vidua chalybeata*) to be a distinct species, red-billed and white-billed individuals occur in mixed populations, have the same songs and compete for the same call-sites and breeding females in south-west Zambia, north-west Zimbabwe and north Botswana.

Speciation in the genus *Vidua* has occurred with a shift of host species. This is remarkable for the importance of a behavioural switch as a defining event in the origin of new species, rather than simply a geographical separation of populations. At one time, it was thought that speciation of the brood-parasitic finches was linked with speciation of their host taxa. In this model of co-speciation, *Vidua* were tied forever to their hosts, in so far as only the usual host species would rear the young, owing to the importance of chick mouth mimicry in the parental care by the host. A gradual change in nestling mouths of host species could be tracked by the brood parasites, in a one-to-one pattern of gradual co-evolution. The idea was tested by genetic comparisons of *Vidua* and their hosts. When the model of co-speciation was compared with a model of host-switching or the colonization of a new host, the species phylogeny of *Vidua* did not parallel the phylogeny of their hosts. From that result, the idea of co-speciation can be rejected.



*The breeding plumage of the male **Cuckoo Finch** is very canary-like, and early authors assigned it to the canaries* (Serinus). *It was then placed in the weaverbird family (Ploceidae), and is still widely known as the Parasitic Weaver. But morphological characters, such as the skull, horny and bony palates, and arrangement of feathers, suggest a closer relationship with the indigobirds and whydahs, and molecular analysis has reinforced this. However, the Cuckoo Finch also has unique skeletal features and this monospecific genus is, as its scientific name suggests, an anomalous member of Viduidae.*

[*Anomalospiza imberbis imberbis*, Masai Mara National Park, Kenya. Photo: Dave Richards]



The indigobirds are very similar to one another in appearance. The males all have black breeding plumage, with no ornate patches or plumes. Based on studies of museum specimens, in the past authors proposed as few as one or as many as eight species. The ***Dusky Indigobird*** *has been treated as conspecific with either the Village Indigobird* (Vidua chalybeata) *or the Purple Indigobird* (V. purpurascens). *Field observations have shown that male indigobirds with slight plumage differences—varying in the brightness and colour of gloss, for example—mimic different host species. In some cases, the mouth colours of begging nestlings also mimic those of their hosts.*

[*Vidua funerea funerea*, Grahamstown, Eastern Cape, South Africa. Photo: Alan Weaving/ardea.com]

Field observations and breeding experiments point to host shift and song mimicry as the drivers of speciation through sexual selection. In the field, a few odd males mimic the songs of the "wrong" host species, and these bear witness to the success of the occasional host switch by females whose offspring were reared by an alternative host species and had learnt its songs and calls. In one case in the Transvaal lowveldt of South Africa, a male Village Indigobird mimicked the songs and calls of Jameson's Firefinch (*Lagonosticta rhodopareia*), the host of the Purple Indigobird (*Vidua purpurascens*), rather than those of its own usual host, the Red-billed Firefinch (*Lagonosticta senegala*). A few male indigobirds, just four out of 484, whose songs were recorded in localities where two or more indigobird species occur together gave the mimicked songs of an alternative host species. The Village Indigobird is the most abundant viduid in southern and south-central Africa, and the number of "misimprinted" individuals of this species reflects their abundance.

In the field, females were identified as they visited the singing males. In southern Africa, female Village Indigobirds have a red bill and feet like those of the males, and female Purple Indigobirds have a whitish bill and feet like males of that species. Nearly all females visit males with the matching bill and foot colours. Females that visit males with odd songs are females of the other indigobird species. In one such case, a female Purple Indigobird in the Transvaal was attracted to the male Village Indigobird that mimicked songs of Jameson's Firefinch, just as female Purple Indigobirds are normally attracted to male conspecifics that mimic Jameson's Firefinch. Females appear be attracted more to song mimicry of their host species than to the plumage and bill and foot colours of the singing males, and it is likely that the Transvaal female was reared by the alternative host species.

Host switches occur also at the local population scale of "song races" or "host races". On the upper Zambezi River, some Village Indigobirds mimic songs and parasitize nests of their usual host species, the Red-billed Firefinch; other indigobirds mimic songs of the Brown Firefinch (*Lagonosticta nitidula*). These two song races are the same in morphology and in mitochondrial and microsatellite genetics. The local population of those mimicking the Brown Firefinch was derived from Red-billed Firefinch song mimics, which are widespread; the nestlings of Brown Firefinch mimics have mouth markings like those of nestling Red-billed Firefinches, not like those of nestling Brown Firefinches. The two song races are the result of a recent switch to a new host species at a population level, with no geographical separation between them. Colonization of the host Brown Firefinch involved several female indigobirds, as determined by the diversity of the maternally inherited mtDNA.

Over a wider geographical region, two or more song races of Cameroon Indigobirds (*Vidua camerunensis*) live together in a mixed population in West Africa. In Cameroon some males copy songs of the African Firefinch (*Lagonosticta rubricata*) and other males mimic the Black-bellied Firefinch (*Lagonosticta rara*), and in south-east Nigeria some males mimic the Brown Twinspot (*Clytospiza monteiri*). In the Fouta Djalon uplands of Guinea and Sierra Leone, and in Guinea-Bissau, males mimic the African Firefinch, the Black-bellied Firefinch or Dybowski's Twinspot (*Euschistospiza dybowskii*). These song races do not differ in plumage colour or in size.

Local populations that mimic the songs of different host species are not necessarily themselves of different species, at least where the indigobirds concerned do not differ in morphology. Further, as has been revealed in several studies, populations of Village Indigobirds that mimic the songs of different firefinch species are not genetically distinct in mitochondrial or microsatellite markers. In Cameroon, in playback tests where song races of the Cameroon Indigobird occur together, a male responded more strongly to songs of his own species and his own song race than he did to songs of males with other mimicry songs. This aggressive response indicates that song may function to counter the reproductive challenge of other males. When extrapolating from this to females, which do not respond to song playback in the field, the response suggests a degree of sexual isolation between song races.

The process of host-switching in times past has been reproduced among individuals breeding in the aviary. In these experiments, the male Village Indigobirds reared by a novel host species imitate the songs and calls of their new host, and not those of their normal host species. Females reared by the novel host are attracted to male songs that mimic those of this novel host, and females lay their eggs in the nests of this novel species, rather than in the nests of the normal host. Finally, estrildid finches rear the chicks that hatch in their nest, irrespective of whether the nestlings are of their own species, of another estrildid species or of an indigobird. In

these experiments, some nestlings were reared in mixed broods, whether or not the young had matching mouth pattern and colours. Food was never in short supply, and in these conditions there was no sign of discrimination against any nestlings in terms of parental care. The change in behaviour would need to persist over many generations before genetic differentiation had progressed to a stage at which song populations could be recognized as new species.

Males of different song races also mimic begging calls of the different host species, and so do males of other indigobird species: all give a song containing the begging call of their host species, as well as a begging call like that of the young indigobird. Taken together, field observations indicate that females sometimes have success when they lay in the nests of an alternative host species, and the new host rears the young indigobirds, which become imprinted on the new host species and thus establish a new brood-parasite–host association. The begging calls have not diverged to mimic the nestling calls of most host species, even though the mouth colours and pattern of the begging young of several indigobird species mimic those of the nestlings of their host species.

A switch from one host species to another has been a critical process in speciation, and this host switch occurs in areas of sympatry of the host species, yet geographical isolation may also be involved in the differentiation of indigobird species. Village Indigobirds differ in plumage and bill colour across Africa. Those in Senegal have the male breeding plumage green to blue, but in most of West Africa the plumage is bright blue; in Ethiopia it is purple, and in East and southern Africa it is dull blue to steely greenish-blue. Wing colour is black in West Africa, and dark brown in eastern and southern Africa. Finally, the bill is white in most of Africa, but red in southern Africa. These populations are described as subspecies, and their variation points to the evolution of geographical differentiation in this species.

Within one region, the indigobird species are more similar to each other in body size and in mitochondrial DNA (mtDNA) than they are to the species in another region. In one case, the birds that mimic songs of the African Firefinch in West Africa are more similar in morphology and mitochondrial genetics to song mimics of other firefinch species in West Africa than they are to their counterparts with mimic songs of the African Firefinch in southern Africa. In another case, the indigobird song mimics of the Red-billed Firefinch in West Africa are more similar in mtDNA and size to other West African indigobird species than to the eastern and southern African mimics of this firefinch. In Kenya, the population is a mix of West and East African mtDNA; in this population, the plumage is morphologically uniform, being intermediate between those of the subspecies to the west, the north-east and the south, and this intermediacy in plumage, as well as the shared mimetic songs used in mate choice, are reasons for treating the various populations as representatives of a single species, the Village Indigobird. The few individuals in East Africa having West African mitochondria may be indicative of dispersal between regions, or may represent a genetic morph that was retained when birds in one of these regions underwent a major genetic change. As suggested by N. K. Klein and R. B. Payne in 1998 and by M. D. Sorenson and colleagues in 2003, the overlap in mtDNA between indigobird species within a region may result from a time lag in lineage-sorting of gene morphs that were present in ancestral populations, and from hybridization between the species.

Hybridization between indigobird species is uncommon. The males differ in breeding plumage, and only very rarely are individuals in intermediate plumage seen. The competitive interspecific interactions of males at a call-site and the attraction of females to "song-misimprinted" males, as well as the misimprinting of females reared by an alternative host species, may result in interspecific hybridization. The low incidence of misimprinted singing males, less than 1% in one study, does, however, indicate a strongly assortative mating system. A few males have mitochondrial genes unlike those of others of their species, and like those of another local species. A male Quailfinch Indigobird (*Vidua nigeriae*) at Garoua, in Cameroon, showed song mimicry of an African Quailfinch (*Ortygospiza atricollis*) and the mtDNA of a Village Indigobird. Introgression of a Village Indigobird gene into the Quailfinch Indigobird population may be due to a Village Indigobird maternal ancestor that was reared by and imprinted on an African Quailfinch, the usual host of the Quailfinch Indigobird, and then joined the population of indigobirds that parasitize the African Quailfinch. This is similar to the case of hybridization by an indigobird with a whydah, described below.

In the field, a few hybrids are known between members of different species groups. The best-documented hybrids are two indigobird × paradise-whydahs in Zambia, where males in breeding plumage appeared at the same site and chased each other. Their plumage and their display behaviour were intermediate between those of indigobirds and those of the Long-tailed



In breeding male whydahs, the two inner pairs of tail feathers become greatly elongated. Those of the ***Steel-blue Whydah****, for example, are around 20 cm long, more than twice the body length. Despite their sometimes dramatic external differences, the whydahs and indigobirds belong to a single lineage, more closely related to one another than to any other species. The ancestors of the short-tailed indigobirds also had long-tailed males, and indigobirds sometimes grow the two central feather pairs slightly longer than the outer four pairs. Whydahs and indigobirds occasionally hybridize in the wild, as well as in captivity.*

[*Vidua hypocherina*, Samburu National Park, Kenya. Photo: Dave Richards]



Tail development in breeding male viduids reaches its extreme in the paradise-whydahs. The greatly elongated central tail feathers are twisted vertically, as can clearly be seen in this ***Sahel Paradise-whydah****. The five paradise-whydahs were formerly thought to belong to a single species, and were all lumped within the Long-tailed Paradise-whydah* (Vidua paradisaea). *The Sahel Paradise-whydah differs from this species mainly in having a slightly shorter tail.*

[*Vidua orientalis aucupum*, Baban Naira, Borno, Nigeria.
Photo: A. P. Leventis]

Paradise-whydah, and their song mimicked the songs and calls of the Melba Finch, the normal host species of the whydah. Mitochondrial DNA of the hybrid male was like that of the indigobirds, which parasitize and mimic the songs of firefinches. The individual life history of one of these hybrid viduids was recovered from its song mimicry and its mitochondria, as *Vidua* species learn the songs from their foster parents and the birds inherit their mitochondrial genes from their mother. In the first generation, a female indigobird laid an egg in a Melba Finch nest. The Melba Finch reared the young indigobird, a female, and the latter became imprinted upon the song of her foster parent. As a breeding adult, she was attracted to and mated with a male paradise-whydah mimic of the Melba Finch. She was then attracted to nesting Melba Finches and laid her eggs in their nest, and her hybrid young were reared by the Melba Finches. The two male whydahs, hybrids in the third generation of this family history, mimicked the songs of the Melba Finch.

Other *Vidua* hybrids seen or captured in the field or bred in captivity are thought to be crosses between indigobirds and Long-tailed Paradise-whydahs, between an indigobird and a Shaft-tailed Whydah, and between a Shaft-tailed Whydah and a Long-tailed Paradise-whydah. Other long-tailed, black individuals are thought to be Pin-tailed Whydah × indigobird hybrids; it would be worth testing museum specimens of long-tailed black whydahs for genes of these species. A few hybrids have been described as distinct genera and species. Two of these whydahs, "*Microchera haagneri*", described in 1926, and "*Prosteganura haagneri okadai*", named in 1930, had the central two pairs of tail feathers twisted by 90°, and the innermost pair enveloped by the next pair; the pointed feather tips suggested the Long-tailed Paradise-whydah as one parent species, and the all-black plumage indicated an indigobird as the other parent. Hybrid black whydahs without a flag at the end of the tail were bred in captivity from the Village Indigobird and a cross between the Dusky Indigobird (*Vidua funerea*) and the Shaft-tailed Whydah. In Botswana, another black whydah had songs that mimicked the Violet-eared Waxbill (*Granatina granatina*), the host of the Shaft-tailed Whydah. In some cases, it has been thought that a black viduid with a long tail might have been simply an indigobird with elongated tail feathers. In most instances of hybridization, the causes appear to involve the act of laying in the wrong nest, misimprinting, or female attraction to host-mimicry songs by a male of a species that is usually reared by her own host species.

Morphological Aspects

Viduids are small songbirds with a short, stubby bill. The species are similar in body size, being approximately 10–20 cm long, excluding the long ornamental central tail feathers of male whydahs, and weighing 9–27 g. All are sexually dimorphic. The male Cuckoo Finch is greenish and yellow. Males of the whydahs and indigobirds have extensive black in the breeding plumage, and whydah males have the inner two pairs of rectrices elongated, in contrast to the additional elongated rectrices of the long-tailed male widowbirds in the ploceid genus *Euplectes*. Female viduids are streaked brown.

Whydahs and indigobirds undergo a seasonal change in plumage through two annual moults. The body plumage is moulted twice each year, the wing once, and the tail once except for the central feathers, which are replaced twice a year in both males and females, this tail-moult pattern applying even to the short-tailed indigobirds. Indigobirds sometimes grow the two central feather pairs longer, by 2–10 mm, and more pointed than the outer four pairs. The double annual moult of the inner tail feathers and their occasional elongation are traits retained by the short-tailed indigobirds in their evolutionary derivation from long-tailed whydahs.

Cuckoo Finches change their appearance with the season as a result of feather abrasion. The male has a dark-streaked greenish back in the non-breeding season, but he shows yellow upper- and underparts in the breeding season. The dark feather tips and edges wear away to reveal brighter yellow, and the feathers become more pointed, the plumage change being acquired by wear, unlike the situation with *Vidua* and the *Euplectes* widowbirds, in which the change is brought about by moult. Female Cuckoo Finches are streaky brown above and whitish below, similar in appearance to females or non-breeding males of *Euplectes*, especially the short-tailed red bishops, namely the Southern Red (*Euplectes orix*), Northern Red (*Euplectes franciscanus*) and Black-winged Bishops (*Euplectes hordeaceus*).

The wing has a very small outermost (tenth) primary, shorter than the outer primary covert, so that no free tenth primary is apparent. This small outer primary is by no means unique to the viduids, as most songbirds have ten primary feathers, and the outer primary is small and well concealed below the outer covert in certain other songbird clades, for example ploceids (*Quelea*), canaries (*Serinus*) and the so-called "New World nine-primaried



The tail of the ***Broad-tailed Paradise-whydah*** *is proportionately shorter than that of other paradise-whydahs, but, as the name suggests, much broader. Broad-tailed Paradise-whydahs are brood-parasites of the Orange-winged Pytilia* (Pytilia afra), *and the song of the male and the mouth colour of the young mimic this species. Analysis of mitochondrial DNA suggests that Broad-tailed and Long-tailed Paradise-whydahs* (Vidua paradisaea) *are one another's closest relatives; and that the other three paradise-whydahs form another set of sister species. These relationships were rather unexpected, since the two most similar species, the Long-tailed and the Sahel Paradise-whydahs* (V. orientalis), *are also both parasites and song-mimics of the Melba Finch* (P. melba). *All* Vidua *species parasitize memebers of the Estrildidae and, with a few exceptions, each is exclusively associated with a different host species. It was once thought that, because nestling mouth-colour mimicry bound the viduids to a single host, new* Vidua *species could only emerge following a gradual process of co-evolution with their hosts. But genetic comparison revealed that the species phylogeny of* Vidua *does not parallel the phylogeny of their hosts. Field and captive breeding observations suggest that speciation may follow a host "shift" by laying females. Males reared in the nests of the "wrong" host species learn its songs and calls. Females raised by alternative host species respond to males who mimic their foster parents rather than the normal host.*

[*Vidua obtusa*, Transvaal, South Africa. Photo: Peter Craig-Cooper/VIREO]





All viduids are sexually dimorphic, although outside the breeding season, the males—except the Cuckoo Finch (Anomalospiza imberbis)*—resemble the brown, streaked, sparrow-like females. In breeding plumage the male* ***Straw-tailed Whydah*** *(above) has a yellow crown and forehead. The rest of its head, upperparts and upper breast are black, its wings brown and its lower underparts yellowish-buff. Its straw-coloured central retrices are more than 20 cm long, but the rest of its tail is short and brown. The bill varies from orange to coral-red, but outside the breeding season it is the same orange-red as the female's (below). Whydahs and indigobirds moult their body plumage twice each year. The wings and tail are moulted once, except for the central tail feathers, which are replaced twice a year in both males and females, even in the short-tailed indigobirds. When it comes to moults, the Cuckoo Finch is once again anomalous. The fresh plumage of the non-breeding male is olive-green and moderately streaked above, and dull yellow below. The dark tips and edges of the feathers are gradually worn away, until by the breeding season, the brighter yellow and more distinct streaking of the underlying plumage are revealed.*

[Above: *Vidua fischeri*, Negele, Ethiopia. Photo: Jacques Erard.

Below: *Vidua fischeri*, Serengeti National Park, Tanzania. Photo: David Hosking/ FLPA]



These male ***Purple Indigobirds*** *are at various stages of moulting into their breeding plumage. In this species the gloss is dull even when the plumage is fresh. The colour of the gloss on the black plumage of breeding male indigobirds is characteristic of some species, but can be difficult to determine in the field according to the light and the angle of the sun. It can also vary between races. The nominate race of the Village Indigobird* (Vidua chalybeata) *has a green to steel-blue gloss, but the gloss of the race* ultramarina *is bluish-purple to purple.*

[*Vidua purpurascens.* Photo: Cyril Laubscher]

oscines", which include, among others, the families Parulidae, Thraupidae, Emberizidae and Icteridae.

Several characters of the feather tracts, or pterylosis, are common to both *Vidua* and *Anomalospiza*, and they appear to be derived within the Viduidae, or they occur within Viduidae and Estrildidae but not in the ploceid finches. These features are as follows: two rows of upper greater secondary coverts; eight upper median secondary coverts; four upper tertiary coverts; nine under greater primary coverts; a single row of ocular feathers; eight longitudinal rows of feathers on the crown; and three rictal bristles.

The skull undergoes delayed development. The frontal region of adult *Vidua* has a single clear layer of bone on each side of the dorsal mid-line; the clear region contrasts with the spotted appearance of the skull of other songbirds, in which two layers of bone are joined by columns and the layers are otherwise separated by a layer of air, the mature skull being pneumatized or "ossified". Nearly all adults have an incompletely pneumatized skull. In yearling indigobirds the skull is pneumatized by about half, individuals two years old and older have the skull more than 70% pneumatized, and fewer than 5% of all birds have a fully pneumatized skull. Cuckoo Finch adults also have an incompletely pneumatized skull.

Unique skeletal features of *Anomalospiza*, the Cuckoo Finch, include the bill, the mouth and the palate. The bill is short and stubby, with the outline straight. The jaw is bent downwards at the frontonasal–maxillary hinge at an angle of about 110° in relation to the jugal. Inside the mouth, a thick lateral surface is formed by the edge of the maxilla and a broad ventral protuberance that articulates with the jugal bone. This complex forms a crushing surface. The lower mandible of all of the viduids has a thick, flat rostral flange that is expanded ventrally at its posterior margin.

The thick bill of *Anomalospiza* shows several features that suggest a common ancestry with *Vidua* and others that emphasize its uniqueness. The jugal bone has a laterally compressed expansion and a ventral protuberance. The palatine has a caudal angle narrower and smaller than that found in the larger *Vidua* species. The vomer in *Anomalospiza* has a deep curling concavity matched to a lesser degree in *Vidua*. The pterygoid is broadly flattened, the rostral pes is expanded, and the pterygoid has a broad lateral ridge that is rotated ventrally by nearly 80°, rather than narrowly flattened, as in the Straw-tailed Whydah; the whydahs also have a ventrally rotated pterygoid. The pterygoid of *Anomalospiza* and *Vidua* is distinctive, and it differs from that of other thick-billed finch-type species such as the estrildid Black-bellied Seedcracker (*Pyrenestes ostrinus*), the ploceid Thick-billed Weaver (*Amblyospiza albifrons*) and the cardueline Hawfinch (*Coccothraustes coccothraustes*). The horny palate of *Anomalospiza* and *Vidua* has large depressions, or pits, near the posterior margin, one on each side of the mid-line. In *Vidua*, a median ridge is present on the palate. *Anomalospiza* lacks this ridge, and has the horny palate greatly thickened. The thick maxilla reduces the buccal cavity by more than half, and leaves a narrow medial groove into which the tongue or a seed can fit. The pits displace the lateral ridges of the palate, in contrast to the palatal condition of the ploceid finches. The medial sides of the lower jaw are dilated inwards to form two horny pads that occlude the palate pits, or fossae, when the bill is closed. The bird has a remarkably forceful bite. These structures of *Anomalospiza*, namely the shape of the horny palate and the thick, internally flattened lower mandible, function in breaking and crushing hard seeds. The Cuckoo Finch's crop contains crushed seeds, not intact, hulled seeds, as in crops of the whydahs and indigobirds.

In the postcranial skeleton, *Anomalospiza* has a sternum with a spina interna dorsal to the sulcus carinae, its base formed so that the internal corner of each coracoid fits into a small socket, rather than in a groove. This is much as the arrangement in the

ploceid buffalo-weavers in the genera *Bubalornis* and *Dinemellia*, the sternum of which has a large spina interna and the spina externa fused anteriorly into a lateral bifid tip.

The breeding plumage of male indigobirds is black with a gloss of green, blue or purple, while that of male whydahs is black with a pattern of white, yellow, buff or reddish. Females of both groups are streaky brown and black, several having prominent stripes on the head. Non-breeding males are generally similar to the females, but the dark brown or black streaks and other marks are bolder than they are on the latter. Juveniles are dull, in some species indistinctly streaked above, and in others, such as the paradise-whydahs, unstreaked uniform grey. The plumage of juvenile paradise-whydahs is like that of the juveniles of their hosts, but without a red rump.

In the case of indigobird males, the colour of the plumage gloss is characteristic of some species. Plumage colour is difficult to determine in the field; the less glossy males can look greenish at dawn, their appearance changing through blue to nearly purple at midday with an overhead sun. The flight-feathers and the tail are brown or dull black with the exception of the three innermost secondaries, which are glossy black, like the breeding plumage. The tail feathers are short and spread horizontally, as in females.

Male whydahs in breeding plumage have elongated tail feathers, the two inner pairs of rectrices being several times the length of the body. These feathers are twisted 90° sideways, with the inner web directed upwards, the rachis in a lateral position, and the outer web twisted downwards and inwards. These feathers are concave on the medial ("under") surface. In the Shaft-tailed Whydah, the end of each of the four central rectrices, pairs T1 and T2, is flared in a "flag" up to 6 mm broad, most of the rest of the feather having just a narrow vane 1 mm wide on each side of the rachis. The central rectrices of the breeding male Straw-tailed Whydah are narrow, just 1–2 mm broad, from the base to the tip, the narrow vanes projecting from the stiff yellow rachis. The Steel-blue and Pin-tailed Whydahs have the four central rectrices 4–6 mm broad throughout their length. The males of these four whydah species display in a short flight from a perch or the ground, the tail flopping up and down in a jerky motion.

Tail-feather structure reaches its most remarkable extreme in the breeding male Long-tailed Paradise-whydah. Each of the central pair of rectrices, T1, is long, broad, and held vertically, the "inner" or medial web in a dorsal position and the "lateral" web in a ventral position. The adjacent rectrices on each side, T2, are much longer, broad, and rotated or twisted, and they fold around the central rectrices; as with the latter, the inner webs turn 90° dorsally and the outer ones turn 90° ventrally. The webs of T1 are wave-like, the wave "crests" at nearly right angles to the feather shaft, providing structural support in flight display. Both T1 and T2 have a long filament composed of interlocking barbs that hold it together. That of T1 extends from the tip of the feather; the T2 filament develops from the base of the feather, much like an aftershaft, and its barbs and hooks zip into the ventral edge of the T2 web. The filament attaches to the web near the feather base; in the case of rectrix T2, the long, loose filament extends 200 mm or more, almost to the tip of the feather. The filament of T2 is lost after a few weeks, whereas that of T1 becomes abraded and loses its connection to the distal edge of the web of T2 as the breeding season progresses. The longest tail feathers, T2, bow outwards and conceal the inner T1 along the length of the tail from below; the upper edges of T1 often project above the edges of T2. In flight display, the male lifts the central feather pair to a vertical position while the adjacent T2 trail behind. In courtship display from a perch (see Breeding), the male lifts the long central pair of rectrices free of the enveloping sheath in a lateral posture that exaggerates his size and shape.

Habitat

Viduid finches live in grassland, savanna and open woodland, and are often found in bushed grassland around cultivation. Pin-tailed Whydahs inhabit wet meadows, marshes, and brushy and grassy woodlands near water, whereas paradise-whydahs are common in places far from any surface water. Most of the whydahs occur in areas having an annual rainfall of less than 1000 mm. The Pin-tailed Whydah and the indigobirds will also colonize recently cleared, once forested areas, including places in south-eastern Nigeria with an annual rainfall exceeding 2000 mm.

The Village Indigobird is commonly found in open grassy woodland and along rivercourses, even in desert regions along the River Nile and the River Niger, and near human habitations where surface water is available. The indigobirds do well in weedy cultivated areas with cotton (*Gossypium*), maize (*Zea mays*),



This male ***Long-tailed Paradise-whydah*** *has not yet completed its transition to breeding plumage. In this and at least some other paradise-whydah species, males achieve full breeding plumage in their second year, although the first-year male sometimes has incomplete breeding plumage. In some other* Vidua *species, for example the Straw-tailed Whydah* (Vidua fischeri) *and the Village Indigobird* (V. chalybeata)*, the male acquires full breeding plumage in his first year.*

[*Vidua paradisaea*, Mapungubwe National Park, Limpopo, South Africa. Photo: Clifford Frith]



Female and non-breeding male whydahs and indigobirds are found in flocks throughout the year. Males may feed and roost alone during the breeding season, but certainly rejoin the flocks at the end of it. This flock of ***Shaft-tailed Whydahs*** *includes males still in full breeding plumage, and others which have begun their moult. Roosts may include several viduid species, and some feed and associate with the species whose nests they parasitize. While some viduids are usually seen in small groups, others form flocks of 100 birds or more outside the breeding season. Cuckoo Finches* (Anomalospiza imberbis) *have been recorded in flocks of up to 1000.*

[*Vidua regia*, Etosha National Park, Namibia. Photo: Warwick Tarboton]

millet (Poaceae) and manioc (*Manihot esculenta*), in regions where their estrildid host species, particularly the firefinches (*Lagonosticta*), are common. Much like their estrildid hosts, the whydahs and the indigobirds are common in the annual grasses growing around lush latrine areas near towns and villages.

Cuckoo Finches live in grassland, shrubby woodland, and grassy marshes and swamps. Unlike some of their relatives in the present family, however, they are not associated with human activities.

General Habits

The members of this family are most conspicuous during the breeding season, when male whydahs and indigobirds sing and display on their breeding territories. Male indigobirds defend their song-perch territories against males of their own species, and are also interspecifically territorial. Singing males are well separated from males of other indigobird species, the inter-male distances being much as those between males of their own species. Males of species with different local song races also space themselves as far apart as males of the same song race. This has been found for Village Indigobird song races imprinted on, respectively, the Red-billed Firefinch and the Brown Firefinch, and for three song races of the Cameroon Indigobird, those mimicking the Black-bellied Firefinch, those imitating the African Firefinch and those copying Dybowski's Twinspot. The singing males chase intruding conspecific males or males of other indigobird species which approach near their call-site. Moreover, when a male disappears from his call-site, another species sometimes replaces him. In playback experiments, a singing male responds to the non-mimetic song themes more strongly than it does to mimetic song themes, and to song mimicry like his own more than to mimicry of other host species. Even so, he responds to songs of other species, and songs of a Village Indigobird have been used in playback to attract and capture other indigobird species.

Viduids occur in flocks at any time of the year, gathering together in the evening, and they often roost in flocks both in the breeding and in non-breeding seasons. Sometimes several species will flock and roost together at night in leafy trees. When gathered together, birds will occasionally produce a harsh "chut" or short chatter; they do not give song mimicry at their roosting assemblages. It is uncertain whether the actively breeding males join in these roosting flocks or roost alone, but at the end of the breeding season, and still in breeding plumage, they certainly feed together and flock for the evening roost along with the moulting males, as well as the females and juveniles. Cuckoo Finches have not been observed closely through the day, but the breeding females at all stages of their laying cycle spend much of their time in flocks; males tend to occur alone on song territories, where they are well-spaced from other males, but they also occur in flocks throughout much of the day.

Daily activity begins shortly after sunrise. The indigobirds spend the first half-hour or so feeding and drinking, after which the males take their places at their call-sites, where they sing. Some males may remain on their song perches for a full hour, but more often they take a few minutes off each hour, to feed or drink nearby, before returning. Females are less conspicuous and are perhaps most often observed when visiting a male and feeding with him near his display area. Males that have been successful in attracting a female to their sites in the previous week or so may sing throughout the day until as late as a half hour before sunset,



*Breeding male **Pin-tailed Whydahs** have been found to be more successful in attracting females when their display sites have food and water nearby. But water for bathing is also important for feather maintenance. Breeding male viduids spend several minutes in every hour preening themselves, fluffing their body feathers and shaking their wing and tail feathers. They scratch their heads by lifting the leg over the wing.*

[*Vidua macroura*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]

but most males leave the call-site a few hours after they first appear in the morning. Both males and females often feed with other small finches including their estrildid host species. Pin-tailed Whydahs and most of the other long-tailed whydahs appear to start their day at much the same time as the indigobirds. Male Long-tailed Paradise-whydahs feed early and spend about an hour in the late morning and again in mid-afternoon devoted to breeding display, alternately singing from a tree and flying over their territories; most other paradise-whydahs are likewise sometimes seen in display-flight. Female whydahs are usually seen feeding alone or near a male. Viduids also spend about half an hour feeding intensively before they fly to roost at night.

In contrast to most of the estrildid finches, viduids do not spend time with their bodies in contact during daytime behaviour or while roosting at night, and they do not allopreen, even between mates or between fledged juveniles. Their comfort or maintenance behaviour includes preening the body plumage with the bill and feet, scratching the head, fluffing the plumage, and wiping the bill on a branch. During the breeding season, male indigobirds often spend several minutes each hour on their call-sites preening themselves; they give song mimicry of their host species more often when preening and fluffing, apparently feeling at ease. Bill wiping is less clearly a movement made in connection with body maintenance, as it also occurs when an intruding male is in the call-tree, or when a male returns to his call-site after chasing a rival male.

When a flying raptor passes near the call-site, the male often stops singing, and when the raptor is within about 10 m of the site, he darts into a leafy bush and remains quiet and out of sight for a minute or two. While he is on the perch he sometimes gives a short "chut" or chatter, but he does not chase or mob the raptor. When a snake is near the call-site, the male and sometimes the female appear near the snake along with other small finches, such as Blue Waxbills (*Uraeginthus angolensis*), which mob and give alarm calls, but the viduids do not give alarm calls in response to the snake, nor do they take an active part in the mobbing. Terrestrial mammals such as the common dwarf mongoose (*Helogale parvula*) and Egyptian mongoose (*Herpestes ichneumon*) are generally ignored, and a male will continue to sing while the predator is on the ground nearby. Females sometimes even visit a singing male when a person is within 10 m of the call-site.

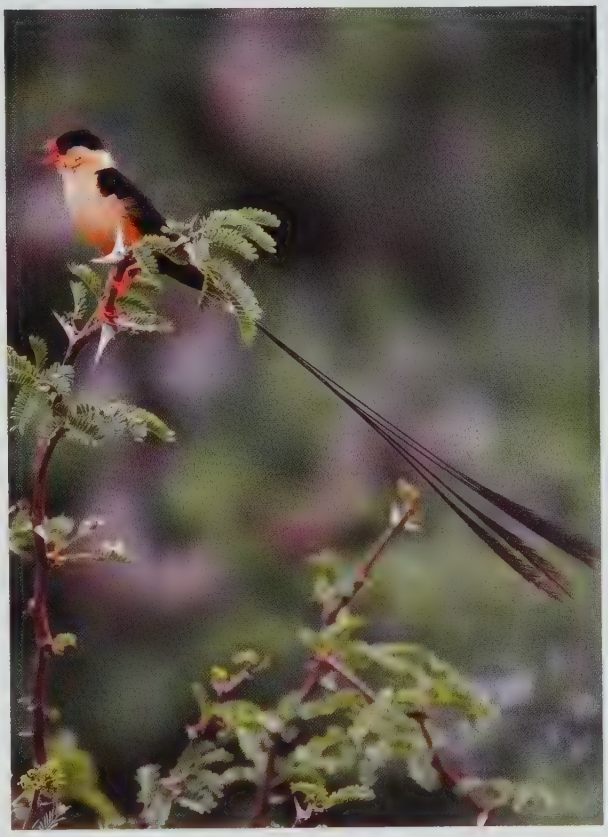
Voice

In most *Vidua* species, each male has two sets of song themes. One set mimics the whistled songs and social calls of the host adults, and the begging calls of the latter's nestlings and fledglings. The other set is harsh and obtrusive and does not mimic the songs of the host species. Together, the two sets comprise up to 24 distinct song themes.

This is typified by the Village Indigobird. The male of this species has eight song themes which imitate the songs and calls of the host species, the Red-billed Firefinch. Three of these mimic songs of the male firefinch; the remaining five are the begging call of the young firefinches, and the social contact calls and alarm calls of the adult firefinch. In addition to mimicry of song themes, a male has 16 kinds of chatter and song themes that are unlike any vocalizations of the host species. Certain songs are given in special social contexts. First, the male has a slow harsh chatter, "cha cha cha", and a rapid harsh chatter, "chchchch"; he gives slow chatters while perched and when chasing another male. The male gives two other song themes when a female flies to his call-site: he utters a rapid chatter, and then, as she perches, he gives a slow chatter and then a rapid chatter and a brassy flourish. Two other songs are given during mutual chases with other males, and one of these initiates the long series of song bouts. One song theme is the begging call of the nestling and fledgling indigobird, which differs from the begging call of the nestling Red-billed Firefinch host.

In a song bout, the male Village Indigobird performs much of his song repertoire in a predictable series. The first song theme, a non-mimetic one, is often repeated several times; the other themes are repeated once or twice or are followed by a particular other one. When a male gives one theme, the next themes are somewhat predictable; alternatively, he pauses and repeats the series from the beginning, rather than running through his full repertoire. Mimetic song themes are given in a long sequence of a bout, in their own standard sequence, and a male sometimes gives mimetic begging calls for as long as one minute.

Male Village Indigobirds in a local neighbourhood within a few kilometres of each other share the details and sequence of the same 24 song themes. These songs are delivered together as a set and form a local song dialect. Males a few kilometres away



Most Vidua *species have two sets of song themes, one which mimics the host species, and one including harsh or sharp notes, often delivered with little variation. The* ***Shaft-tailed Whydah****, for example, mimics the songs of its host, the Violet-eared Waxbill* (Granatina granatina)*, but also has a set of canary-like song elements, and harsh buzzy chatters. Altogether, most species have some 20–24 song themes. The mimetic elements are used in attracting and displaying to females, while the harsher, chattering elements may be used in aggressive contexts, for example in pursuing other males, when they may be interspersed with bouts of singing.*

[*Vidua regia*, Kalahari Gemsbok National Park, South Africa. Photo: Johann Grobbelaar]

have a different set of song themes, which they share in another song dialect.

Other indigobird species similarly mimic the songs and calls of their own host species. They also sing non-mimetic songs, which they share with other males within the local population, or "song neighbourhood". All adult males give the begging call of a young indigobird, which is the same as the begging call of the young of certain firefinches, specifically the African Firefinch and Jameson's Firefinch, and which differs from the begging calls of other host species.

Among the whydahs, male paradise-whydahs mimic songs of a pytilia (*Pytilia*) species, the Shaft-tailed Whydah imitates its host the Violet-eared Waxbill, and the Straw-tailed Whydah mimics its host the Purple Grenadier (*Granatina ianthinogaster*). Mimicry of the calls or songs of the host species by Pin-tailed Whydahs has not been recorded, or, at least, it has not been recognized. The Steel-blue Whydah usually parasitizes nests of Black-faced Waxbills (*Estrilda erythronotos*), but the songs of this whydah so far recorded seem not to mimic the songs and calls of these waxbills. In contrast, male Steel-blue Whydahs north of Kavirondo Gulf, in Kenya, do mimic the songs, contact calls, alarm calls and begging calls of the Red-cheeked Cordon-bleu (*Uraeginthus bengalus*), which may be a local host species.

The Cuckoo Finch does not mimic the songs of its host species, the prinias (*Prinia*) and cisticolas (*Cisticola*) in the family Cisticolidae. Its song bears similarities to those of certain ploceids and estrildids, respectively the Village Weaver (*Ploceus cucullatus*) and Dybowski's Twinspot, and to the non-mimetic songs of the indigobirds and the Straw-tailed and Shaft-tailed Whydahs.

Indigobirds learn the songs of their foster species and the songs of older adult indigobirds. A male Village Indigobird reared by a pair of Red-billed Firefinches gives the song of a firefinch, but not necessarily the same song as that of his individual foster parent. A male has three mimicry themes in his song repertoire, rather than just one; the latter would be expected if he learned his mimetic song only from his own foster father, as a male firefinch has only one song theme. Indigobirds appear to copy each other's mimicry, and all males in a local population have the same set of local firefinch songs.

In the field, juvenile indigobirds associate with others of their species shortly after the end of the period of parental care. They are attracted to the call-sites of singing conspecific males, and they join the conspecifics that feed nearby; this may be the time when the young learn additional songs of their own species. In Zambia, a few indigobirds in juvenile plumage in July utter subsong, with recognizable song mimicry, and court females with a hover display, in a "school for song-learning" group near the call-site.

Adult male indigobirds modify their songs from year to year. They alter the details of each song theme to match the current song themes of another male in their song neighbourhood, as a result of which the same song changes occur both within and among individuals. All 24 song themes that can be in a male's repertoire, including the mimetic songs, change slightly within a season and from one breeding season to another, and these changes accumulate over the years. The change is related to the mating success of the singing males. When a male's song changes within a season, his neighbours copy the changes only when the innovation originates in the male with the highest rate of female visits and matings. When a male moves from one song neighbourhood to another, he often takes on the songs of the new neighbourhood and no longer sings the songs of his old song dialect. Adult song-learning does, however, have its limits in so far as the male continues to imitate songs and calls of the same host species throughout his lifetime. These year-to-year changes in the continual cultural evolution of songs have been recorded in the field in Zambia for colour-ringed Village Indigobirds and Purple Indigobirds.

In experimental studies of song-learning, one male indigobird copies the mimetic songs of another male indigobird, and this is repeated across three or more generations of song transmission. A male also learns the non-mimetic songs of other males that mimic his own foster species. Further, when a male is reared by another species of foster parent, he learns and sings the song of the latter, and not the song of his normal host species, even if he lives in circumstances where his normal host sings in the same aviary.

Female indigobirds are attracted to a male which gives mimetic songs like those of her foster parents. In cross-fostering experiments, when females are reared by a new species, the adult female is attracted to indigobird song that mimics her foster species, rather than to mimicked song of her species' normal host. In

Many indigobirds can be confidently identified only from their mimicry of the songs of their host species. The churring and scratchy song of the ***Jos Plateau Indigobird****, otherwise much like the songs of other indigobirds, is mixed with imitations of the Rock Firefinch* (Lagonosticta sanguinodorsalis)*. Male viduids have the same songs as neighbouring males, but the songs differ over a wider area. Observations suggest that they learn their mimicry, as well as their non-mimetic songs, from one another, even when the mimicked songs differ from those of their own foster-parents.*

[*Vidua maryae*, Jos Plateau, Nigeria. Photo: A. P. Leventis]



addition, breeding females reared by their normal host species seek out nests of that host, and females reared by the new host species seek out the nests of the new host and lay in those nests. Both the songs and the host association are behaviourally imprinted upon the female during her period of foster care.

The function of song mimicry is known from the social context of song in the field and from experiments with birds in captivity. Female Village Indigobirds are attracted to songs of their host species, and to male indigobirds that mimic these songs. They develop large ovaries when they hear these songs. A male's song mimicry is not directed at a nesting host but, rather, it is directed at a conspecific female. A male's mimicked songs signal his early experience in being reared by a foster species. It is to a male's advantage to attract a female reared by the same foster species as he himself was, and it is to a female's advantage to mate with a male reared by the same species as her own foster parents. In this way, male and female have offspring that are likely to be reared by this host species, in as much as their chicks match the mouth pattern of the host and can gain the advantage of nestling-mouth mimicry in a mixed brood.

Although the female indigobird learns the songs of her foster species as a young bird, and when adult is attracted to these songs, she does not exhibit any courtship behaviour towards the foster species. She is attracted to a male indigobird that mimics her own foster species, and she is attracted to the singing foster species when the time comes for her to parasitize a nest. Her mate choice involves both the song, which she learns from her foster parents, and an innate recognition of a suitable mate. In a cross-fostering experiment, Village Indigobirds were reared by a novel foster species, the White-rumped Munia (*Lonchura striata*). All of these indigobirds were taken as eggs where they had been laid in a host nest in an aviary. The eggs were placed under the foster finch in a birdroom where there were no indigobirds, the only birds in social and auditory contact with the young indigobirds being their foster species. These young indigobirds were moved in the following year to an outdoor mixed-species aviary. The female indigobirds with no previous experience of other indigobirds were attracted to and mated with male indigobirds that had been fostered by White-rumped Munias and mimicked the songs of this foster species. The female indigobirds showed no sexual behaviour towards the nesting munias in these aviaries, and they visited the munias' nests to lay their eggs. The female indigobirds appear to have innately recognized the male indigobirds as mates by their appearance and courtship behaviour, as these females responded appropriately when courted, even though they had never experienced a male indigobird in their early life. The females are attracted to the songs that sound like those of their own foster parents, and the next step in breeding is to respond to the behaviour of the male indigobirds and to copulate, and then to lay their eggs in the nest of the foster species.

Some information is available on some other *Vidua* species. For example, in a mixed-song population of Cameroon Indigobirds in which some males mimicked songs of the African Firefinch and others copied songs of the Black-bellied Firefinch, genetic markers indicated that father and son nearly always mimicked the same host species. Nevertheless, one father had a son that gave songs of the African Firefinch and another son that sang Black-bellied Firefinch songs. The genetic markers generally indicate a rather low degree of interbreeding between the two song populations.

Young males of the Straw-tailed Whydah learn the songs of their foster parent, normally the Purple Grenadier. When reared by another foster species, the males learn the vocalizations of that other fosterer. Each male has three or four loud mimicry song themes. Songs of males are nearly identical to those of other males nearby, populations 2–4 km apart have different songs, and the songs differ regionally. Chatters first develop at 32–35 days of age, and songs are given within the first year; the chatter is innate, whereas songs are copied from other whydahs. Begging calls incorporated in the songs of Straw-tailed Whydahs are unlike the begging calls of young Purple Grenadiers; the adult male whydah mimics the adult calls and songs of the host grenadiers. More field studies are needed in order to record the begging calls of whydahs and their host species.

Captive female Broad-tailed Paradise-whydahs lay in nests in aviaries when they hear songs of their host species, the Orange-winged Pytilia (*Pytilia afra*). Female Long-tailed Paradise-whydahs are attracted to songs of their host, the Melba Finch, and in aviaries they sometimes lay when they hear its songs. Males of this paradise-whydah mimic songs of the Melba Finch, and in natural conditions the females are attracted to male whydahs giving these songs.



*Breeding male **Pin-tailed Whydahs** are aggressive towards other birds on their feeding areas, and defend the seed-bearing grasses near their display sites. Members of the Viduidae feed almost entirely on the seeds of these annual grasses, usually taking them from the ground after they have ripened and fallen. But Pin-tailed Whydahs also feed directly on the seeds of shorter stemmed grasses, or perch on the stems and remove seeds from the seedheads, sometimes using their own weight to bend the stem to the ground where they can feed more comfortably.*

[*Vidua macroura*, Obudu Plateau, Nigeria. Photo: A. P. Leventis]

Food and Feeding

Members of this family are almost entirely granivorous. They consume mainly the small seeds of annual grasses, taking these on the ground after the seeds have ripened and fallen. Indigobirds and whydahs take the same kinds of grass seed as their estrildid host species. A few species are known to feed very occasionally on insects, too. The Pin-tailed Whydah sometimes feeds on flying termites (Isoptera), and the Village Indigobird similarly exploits small termites when they emerge during the rains. Straw-tailed Whydahs supplement their diet of small grass seeds with both larval and adult insects, which they catch on the ground. The Cuckoo Finch has been seen on rare occasions to take insects, sometimes hawking these at dusk. It feeds its young with insects, including caterpillars and wasps (Hymenoptera). Wilson's Indigobird (*Vidua wilsoni*) will associate with domestic fowl on chicken farms, exploiting the feed put out for the chickens. Laying females of the Cuckoo Finch eat the eggs of their estrildid host, as sometimes do a number of *Vidua* species.

When foraging, viduids utilize a technique known as the "double-scratch". Using both feet nearly simultaneously, they scratch the ground in order to uncover seeds in the dust; they then hop backwards and pick up the seeds. The bird dehusks grass seeds in the bill, using the tongue to roll them, one seed at a time, forwards and back against the ridge of the palate. In a feeding bout, an individual gathers and holds in the crop as many as several hundred small seeds. The act of feeding while perched on grass stems and when the seeds are still on the plants is uncommon. Indeed, it has been noted only for the Pin-tailed Whydah. In a fledged family group consisting of the host species and *Vidua* young, the latter feed together with their foster parents and foster siblings.

Cuckoo Finches forage on the ground and on erect stems of fruiting heads. They use the bill to crush large seeds, such as sunflower (*Helianthus*) shells. They have not been observed to double-scratch in the field, nor have captives in an aviary been seen to utilize this method with small grass seeds scattered on sand. The Cuckoo Finch takes grit and sand, which serve to pulverize hard seeds in the crop; *Vidua* species apparently do not do so.

Drinking is performed in much the same manner as it is by most other passerines. The viduid finches tip forwards and sip water, before lifting the head higher than the body in order to take in the liquid.

Breeding

The Cuckoo Finch, the whydahs and the indigobirds are brood parasites, laying their eggs in the nests of other kinds of songbird. The nesting birds, the hosts, rear the young brood parasites, typically along with their own brood.

Observations made in the field, in museum collections and in breeding aviaries all led to the discovery of brood parasitism. The phenomenon was first detected for the Pin-tailed Whydah. The earliest observation, in 1895, was made in Uganda by F. J. Jackson's collector, Baraka. Jackson encouraged him by promising a reward for finding the whydah's nest. Baraka found that the whydah did not build its own nest but that, rather, it laid an egg in the clutch of a Common Waxbill (*Estrilda astrild*). Baraka and Jackson then found other nests parasitized by the whydah. In 1938, Jackson wrote that "Baraka... is due the credit of solving the mystery". In South Africa, A. Roberts independently discovered that the whydah parasitized the waxbill. He noted a Zulu report that "King-red-beak", a colloquial name for the Pin-tailed Whydah, "is reared out of every 'Rooibekje's' (*Estrilda astrild*) nest". Roberts followed up this report and found waxbill nests with both small and large eggs, nests with two kinds of young, and a nest from which a female whydah flew, perched and wiped her bill; the nest had a half-eaten egg of a waxbill and a large egg of the whydah. In 1925, F. E. O. Mörs reported that he had found waxbill nests with young whydahs in the brood; he distinguished their eggs and their young, and over 30 years he found no whydahs building their own nests.

The Cuckoo Finch was discovered to be a brood parasite after V. G. L. van Someren, in 1912, photographed and collected a young bird in the nest of a Rattling Cisticola (*Cisticola chiniana*), at the time erroneously identified as the nest of a Cardinal Quelea (*Quelea cardinalis*). He identified the young as that of a Cuckoo Finch only after Roberts had photographed young Cuckoo Finches in the nests of prinias and cisticolas. Chicks thought to have been of "*V. macroura*" found in cisticola nests in Ethiopia were saved and kept as specimens in the British Museum (Natural History);



Foraging viduids like this ***Jambandu Indigobird*** *shuffle or hop in search of fallen grass seeds on the ground. They also make use of a very efficient technique known as the "double-scratch" to uncover seeds hidden by loose soil or litter. They scratch with both feet almost simultaneously, and at the completion of the movement have moved a little backwards, so that they can simply lean forwards to pick up any exposed seeds. The action is powerful and vigorous, flinging puffs of dirt behind them. As well as disturbing the surface, the birds sometimes concentrate on one spot, digging shallow pits.*

[*Vidua raricola*, Agenebode, Edo State, Nigeria. Photo: A. P. Leventis]



Village Indigobirds *come readily to bird feeders, and take crushed seeds and manioc meal from stores. They will also perch on the stems of cereals like millet to feed on the ripe seedheads, relatively unusual behaviour in birds that generally obtain their food from the ground itself. They dehusk seeds in their bills, using their tongues to roll seeds one at a time against the ridge of the palate. Several hundred small seeds may be held in the crop during a single feeding bout. The ever-anomalous Cuckoo Finch* (Anomalospiza imberbis) *additionally takes large and hard seeds, and swallows sand and grit to pulverize them in its crop.*

[*Vidua chalybeata centralis*, Nairobi, Kenya. Photo: Dave Richards]

examination of these reveals that they are, in fact, young Cuckoo Finches.

In South Africa, Mörs reported Shaft-tailed Whydahs to be brood parasites of Violet-eared Waxbills, the nestlings of the two species growing up together in waxbill nests. Roberts found young Long-tailed Paradise-whydahs in a party of Melba Finches, and a large egg appeared in a Melba Finch nest when a female whydah was there. Other cases of brood parasitism were discovered in museum material in cases when two kinds of juvenile had been collected together. First, C. F. von Erlanger's Ethiopian collection of Purple Grenadiers in the Berlin and Frankfurt museums, in Germany, in fact had more than one species: the long-winged, short-tailed birds were darker and had no blue on the rump. When comparing museum specimens, R. Neunzig recognized the long-winged individuals as Straw-tailed Whydahs. Secondly, Neunzig, noting the similar distributional ranges of the Steel-blue Whydah and the Black-faced Waxbill in East Africa, reconsidered van Someren's identification of a whydah egg in this waxbill's nest; he described the similar juvenile plumages of the two species, and he reasoned that they formed a species pair consisting of a brood parasite and its host.

Neunzig was aware of the existence of brood parasitism among the finches, he knew of large and small eggs in the nests of certain estrildid finches, he knew of the similar juvenile plumages of *Vidua* and certain estrildids, and he recognized the matching geographical distributions of these *Vidua* species and the corresponding estrildid species. From these observations combined with examination of museum material, he concluded that the *Vidua* were species-specific brood parasites, and both the plumage and the mouth patterns and colour of the young mimicked those of the young of their host species. Later field observations have supported Neunzig's conclusions.

Species-specific brood parasitism by the indigobirds was first discovered among Village Indigobirds. In the second half of the nineteenth century, in Sudan and Ethiopia, T. von Heuglin reported the indigobird and the Red-billed Firefinch as building nests of grass and feathers in the roofs of houses, in holes in walls, and in trees, and even as living in mixed families when the young were out of the nests. Elsewhere, field observers commented on seeing these birds together. In Kenya, van Someren reported an indigobird nest with three eggs; a male sang nearby, but indigobirds were not seen to visit the nest or to rear the young, and the nest was probably that of a firefinch. In Gambia, G. Hopkinson, in a 1921 letter to D. A. Bannerman, stated that he found indigobirds to be common around villages with firefinches. He suspected that the indigobird was a species-specific brood parasite of the firefinch. At one nest that he found, the young occupants, two young firefinches and an indigobird, were in the act of leaving the nest; when he captured the young indigobird, the adult firefinches fed it while an adult indigobird nearby showed no interest in the young. In the 1930s, in Mali, G. L. Bates saw indigobirds and firefinches as they entered the same nest-holes, and he commented that the two species might always breed together unless the indigobird were, in fact, parasitic on the firefinch. To the east, in Nigeria, F. C. R. Jourdain and R. Shuel found a female indigobird with a shelled egg in her body, dead in a nest; apparently she had entered a firefinch nest, caught her foot and died.

Neunzig remarked on the close similarity in plumage and mouth markings of young Village Indigobirds and Red-billed Firefinches and, on the basis of mouth markings and Heuglin's field observations, he concluded that the indigobird was a species-specific brood parasite of the firefinch. Nevertheless, as late as 1938, Jackson suggested that the indigobirds sometimes nested or took over the nest of another bird and reared their own young, and sometimes were brood parasites. The first detailed field study, in the 1950s, was by G. J. Morel and M. Y. Morel in Senegal, where Village Indigobirds were species-specific brood parasites of the Red-billed Firefinch. Subsequently, the work of J. Nicolai revealed that many *Vidua* species, including this indigobird, mimicked the songs of their host species. Fieldwork has confirmed Nicolai's ideas of the host specificity of song mimicry and brood parasitism in most members of the genus *Vidua*.

Although some aviculturists wrote that indigobirds and whydahs nested and reared their own young, others reported that the young were reared by estrildid finches. Indeed, some aviculturists reported both nesting and brood parasitism for some *Vidua* species. Aviculture, however, was not at the time held in high regard by field ornithologists or systematists. In addition, sceptics suspected that birds might behave differently in aviaries from



Breeding male ***Long-tailed Paradise-whydahs*** *spend the early part of the day feeding, and drinking when water is available. Towards the evening, they leave their territories and gather in parties to forage. Paradise-whydahs are common in places far from any surface water unlike, for example, Pin-tailed Whydahs* (Vidua macroura), *which are found in wet meadows and marshes, and other habitats near water. Village Indigobirds* (V. chalybeata) *also seem to require nearby surface water, and will make seasonal movements to find it. Like most other passerines, viduids take water a beak-full at a time, and lift the head to swallow it, sometimes gulping as they do so.*

[*Vidua paradisaea*, Chobe National Park, Botswana. Photo: Richard du Toit/ naturepl.com]

the way in which they do in the field, and aviary observations were discounted when they did not concur with field reports. Reports of the viduid finches building a nest and rearing their own young are in error.

Members of the Viduidae time their breeding to coincide with the breeding season of their hosts. Males develop enlarged gonads and breeding plumage in the weeks before the host species builds its nest. In females, the final stages of egg development take place when they see or hear the nesting host species. In captivity, female Village Indigobirds and Long-tailed Paradise-whydahs have laid eggs when they heard the songs of their host species, even when they had no contact with conspecific males or the host. The laying histories of female finches have been determined by examination of the ovary, including post-ovulatory follicles and growing follicles, and of the oviduct. In the parasitic finches, the Viduidae, the clutch size is variable, usually three or four eggs; in this case, clutch size is calculated as the number of eggs that develop in a set and are laid on successive days, and corresponds to a clutch in the nest of a host finch. A total of three eggs is laid, more than one nest being exploited, or two or three eggs are laid in a single nest; both strategies have been observed for female indigobirds in breeding aviaries. The incubation period is about two days shorter than that of the host species.

The female viduid searches for a host's nest on her own. Village Indigobird females perch and look on as firefinches gather nest material, especially a feather. They then follow the hosts to the site, where the male firefinch displays the feather in his bill as he courts his female. Females also search through thatch-roofed houses and chicken and pig barns, the habitat where the firefinches have their nests. In the case of the Village Indigobird and the Shaft-tailed Whydah, the female sometimes enters the host's nest and lays her egg even when an adult host is present in the nest. Eggs of *Vidua* are white and unmarked, as are those of their estrildid hosts. They tend to be larger and more rounded than their hosts' eggs, but not all eggs are identifiable by size and shape. For some *Vidua* species, formed eggs have been found in the oviduct of breeding females, thus providing additional information on their appearance. They can be distinguished with certainty only if they hatch and the young are reared and identified, or if the eggs or chicks are identified by molecular-genetic methods. The most reliable means of determining the identity of suspected brood parasites are the distinctive mouth markings or feathered plumage of the nestlings, and the use of genetic techniques to identify eggs and young. After they leave the nest, young *Vidua* are distinctive in plumage, and they lack the red or blue rump of the young of the host species. Fledglings and young juveniles forage together with family groups of the host, the young being less active in their movement. A week or two after they fledge, the juveniles join flocks of adult *Vidua*.

Cuckoo Finches lay in the nests of prinias and cisticolas in grassland, marshes, savanna and open woodland. These hosts rear the young Cuckoo Finch, usually the only chick in the brood that fledges. This is because the Cuckoo Finch, when she lays her egg, removes the host's eggs, thereby leaving her own young brood parasite as the only chick in the nest. Occasionally, a host lays after the Cuckoo Finch has done so, and it may then rear its own young along with the parasitic nestling. Sometimes, more than one Cuckoo Finch egg is deposited in the nest and two chicks survive and fledge. The survival of more than one chick, including either a host chick or another brood-parasitic one, indicates that the young Cuckoo Finch does not evict its nestmates.

Nestling and fledgling whydahs and indigobirds are fed by their foster parents. They crouch, twist the head and neck, wave the head from side to side, and beg with the head turned to one side or even upside-down, in the manner of the young of their estrildid hosts. The nestlings and fledglings are fed with seeds regurgitated by their foster parents. In contrast to the whydahs and indigobirds, the young Cuckoo Finch begs in an upright posture, without waving the head, and it feeds directly, taking insects held in the fosterer's bill.

Indigobirds and whydahs lack a strong pair-bond. They are, in fact, socially promiscuous. A female visits several males and will sometimes mate with more than one of them, and a male courts several females. Their mating system is explained as arising from the absence of parental care.

The male indigobird sings throughout the day, centring his behaviour on one bush or tree, referred to as the "call-site". He defends this territory, sings, and chases other males, keeping them from the site. When chasing off intruding males, the resident male



*In his courtship display, the male **Shaft-tailed Whydah** hovers over the perched females, or holds on to the perch, flapping his wings while his long tail feathers flop up and down. The "hover-hold" display may last as long as five minutes. All members of the Viduidae are promiscuous brood parasites. They time their courtship and mating to coincide with the breeding cycle of their host species. Females are attracted to the male's mimicry of the foster species, then after mating, are drawn by the songs of the host species itself in order to find the nest and lay eggs therein.*

[*Vidua regia*, Kalahari Gemsbok National Park, South Africa. Photo: François Savigny/ Biosphoto]

stays lower than the intruder and closer to the site; the chase describes an ovoid ellipse, with a narrow focus at the branch from which the male sings. Singing males are often within hearing distance of one another, separated by no more than 100 m, but they can also be out of hearing range, as far apart as a kilometre or so. A male Village Indigobird in the centre of his social neighbourhood remains on his call-site through most of the day. His neighbours and more peripheral males sing on their own sites and visit each other within this area, paying visits especially to the central male. Visiting males appear to listen to the singing male for about five to ten minutes, and then return to their own call-sites and sing. The central male remains on his site for more than 50 minutes in every hour, from a half-hour after sunrise until shortly before sunset. In contrast, peripheral males are away from their sites for most of the day. A resident male generally uses the call-site year after year. When he disappears, another male often occupies the site, sometimes within an hour, and mates there on the next day. The central sites in a neighbourhood are traditional; when the older male disappears, presumably having perished, another male takes his place, and this process is repeated again for years, as long as the call-site tree remains intact. A call-site which few or no females visit remains unoccupied after the first male disappears.

When a female Village Indigobird visits his call-site, the male displays with aerial bobs and hovers, the plumage fluffed and the body bouncing. The two sometimes copulate on the perch. After display, the male flies to the ground near the tree, where the female usually joins him, and the two feed together, the male directing soft mimicry songs towards her. The female then visits several other singing males in succession, and is courted by each one; she returns to one of them, often the male in the centre of the local neighbourhood, and mates with him, although she sometimes mates with another male, as well. Males compete for sites and court the same females in a "dispersed lek". Females visiting the various sites may assess the males by the amount of time that they devote to singing, the successful central males being the most attentive to their call-sites. In a neighbourhood with about 20 Village Indigobird males singing within an area of a few square kilometres, the central male attracts more visiting females to its site than do peripheral males, and it gains nearly all of the matings.

Other species of indigobird exhibit breeding behaviour like that of the Village Indigobird. Neighbouring males visit each other at their call-sites, females visit the males and mate with one male on his call-site, and the male displays are the same bobs and hovers as those of the Village Indigobird.

The Straw-tailed Whydah and the Shaft-tailed Whydah chase and display in much the same way as the indigobirds. The male sings from several trees within a few metres of each other; females visit more than one male and mate mainly with one of these males. Males of the Pin-tailed Whydah and Steel-blue Whydah sing on a call-site and sometimes display on the ground. Long-tailed Paradise-whydahs have a daily schedule of mid-morning and mid-afternoon behaviour, when they fly high in horizontal display over the grassy woodland, the tail trailing behind and the central pair of rectrices held above the other feathers at an angle of nearly 90°. In display, they give chatters and non-mimetic songs; after a minute or so, they swoop into the top of a bush or tree, perch there, lift the head over the back, and deliver songs that mimic those of their host species, the Melba Finch. Female whydahs are attracted to mimicry songs; they fly to the males on their song perches and copulate with them.

Less is known about the breeding behaviour of the Cuckoo Finch. Adults and juveniles of this species form flocks both outside and within the breeding season. When not in a flock, a male sometimes sings at a single site for a few minutes, as has been recorded at Lochinvar National Park, in Zambia, and at Harare, in Zimbabwe. The male's courtship displays, with the wings raised, look more like the nest-displays of *Ploceus* weavers than like the displays of most male whydahs and indigobirds.

Movements

Viduid finches are resident. None of their populations is known to move long distances seasonally.

A few indigobirds ringed as adults have been recovered more than 20 km from their breeding site, but nothing is known about the juvenile dispersal of these birds. At the end of the breeding season, some whydahs form large flocks and move many kilometres, and a marked Shaft-tailed Whydah was recovered 150 km



Perched on a tree at the heart of his display area, the male ***Straw-tailed Whydah*** *sings from sunrise through the heat of midday to sunset, with song bouts lasting as long as 60 minutes. This contrasts with the Long-tailed Paradise-whydah* (Vidua paradisaea), *which performs its display-flight and song twice daily, in late morning and late afternoon. When a female visits, the male Straw-tailed Whydah performs a "hover-hold" display while still gripping the perch, before flying over to her, hovering and flopping his tail. If she responds, he may mount her immediately, but more often he leads her to the ground, where the pair forage for grass seeds before copulating.*

[*Vidua fischeri*, Mkuru, Arusha National Park, Tanzania. Photo: Martin Goodey]

from its ringing site. In the dry non-breeding season, Cuckoo Finches appear in flocks far from their known breeding areas, and they may, in fact, be seasonal migrants.

Relationship with Man

In Europe, whydahs and indigobirds have been kept as cagebirds for centuries, being held in esteem for their song and colourful breeding plumage. Renaissance scholar Michel de Montaigne visited the Italian city of Florence in 1581 and saw them in the Medici aviaries. His description of a finch with *la cue deus longues plumes comme celles d'un chapon*, "a tail of two long plumes like those of a rooster", would seem to refer to a paradise-whydah. Shortly thereafter, Aldrovandi, of the Universitá di Bologna, described and illustrated three *Vidua* in breeding plumage in the Medici aviaries: these appear to be the Village Indigobird, the Pin-tailed Whydah, and the Sahel Paradise-whydah. Aldrovandi's encyclopaedic *Ornithologiae* was edited and published mainly after his death, the section covering these viduids first appearing in 1600. These finches had been painted in gouache on paper by Ligozzi, chief botanical painter of the Medici court, in his depiction of *Ficus carica*, the common fig, one of several illustrations commissioned for the visual catalogue of Aldrovandi and now housed in the Gabinetto Disegni e Stampe degli Uffizi in Florence. Aldrovandi's illustration is a woodcut after this painting, identified by the postures of the paradise-whydah and indigobird and by the branches and leaves of the common fig.

Although not usually considered agricultural pests, the whydahs and indigobirds can sometimes be a nuisance locally. In the Fouta Djalon highlands of Guinea and Sierra Leone, they feed on the small seeds of cultivated fonio (*Digitaria exilis*), known also as "acha" or "hungry rice", before the harvest. This grain is the first food available to local human inhabitants after the season of rains, and people do their best to keep the birds from the crops until harvest time. Indigobirds also take drying manioc meal in Sierra Leone and feed on maize meal in South Africa and Malawi.

The birds are clearly well known to human inhabitants, as is evidenced by some local names for them. For example, the Arabic name for the breeding male Long-tailed Paradise-whydah, *Abu Mus*, meaning "father of the knife", describes the blade-like shape of this bird's middle tail feathers.

Variations on the English name given to the Barka Indigobird (*Vidua larvaticola*) may give an insight into the way in which the family is sometimes perceived by humans. This species is frequently referred to as the "Bakra Indigobird" and the "Baka Indigobird". The name "Barka" refers to *barkà*, a Hausa greeting used in the region in north Nigeria where the birds were first observed; in some regions *bakra* is used. Both words are sometimes transliterated as *baka*, which also means "black", and *bako*, meaning "guest" or "stranger", either of which would be appropriate names for the brood parasite.

The alternative common names of the Cuckoo Finch show the changing ideas about its systematic relationship. The species was described by Cabanis as a canary, in the genus *Crithagra*. Later it was thought to be a ploceid and was given the name "Canary-like Bishop Finch". When it was discovered to be a brood parasite it was called "Cuckoo-weaver" or "Parasitic Weaver". But when it was discovered to be most closely related to *Vidua* and not to the ploceid weavers and bishops, its name was changed again to its current form.

The genus name *Vidua* and the English vernacular name of "whydah" refer to a widow, the Latin word for which is, indeed, *vidua*, or to a widow's veil and train, the Portuguese word *véu* meaning "veil" and *viúva* meaning "widow". This is a reference to the male whydah's black upperparts and long tail. Another interpretation of the word "whydah" is that it is an imitation of "Ouidah", the name of a slave-trading port in Benin, West Africa, whence the birds were exported along with human slaves.

Status and Conservation

As a group, the Viduidae are common and not seriously threatened in any way. Indeed, none of the 20 species currently recognized is considered globally threatened or even Near-threatened.

Species having a relatively small and localized distribution and a low population density may exist in low total numbers, but these appear not to be at any significant immediate risk. This





*The male **Pin-tailed Whydah** spends most of the day on his display area, singing from a few favoured perches, and chasing other males. As he flies from tree to tree, his tail waves conspicuously; he also raises and lowers it when challenging intruding male whydahs. He displays rather indiscriminately to females of his own and other viduid species that perch in his tree, but also to canaries* (Serinus), *sunbirds (Nectariniidae) and even shrikes (Laniidae). In courtship, he flies over the female with his tail waving, then circles and hovers in front of her. As he hovers, with his body at an angle of 45°, he alternately flutters and closes his wings, so that he bobs up and down, his tail flopping towards her. This display, which can last five minutes, is accompanied by a chittering call. The female responds by crouching forward, fanning and vibrating her tail, with her head bent upwards. Male indigobirds also court females with a hovering display. But paradise-whydahs have true display-flights, flying slowly and conspicuously above their territories, often in sight of neighbouring males. As he flies in a slow circle around his territory, the Long-tailed Paradise-whydah* (Vidua paradisaea) *holds the central pair of long feathers upright, the outer pair trailing behind him. On reaching his perch, he sings for around 10–12 seconds. If no female approaches, he flies up at a sharp angle and repeats his display-flight, which is accompanied by a whistle.*

[*Vidua macroura*, Sabi Sabi Private Game Reserve, South Africa. Photos: Jürgen & Christine Sohns/ www.photolibrary.com]



*Only 8% of **Pin-tailed Whydah** courtship displays result in copulation. But active breeding males, who are visited by as many as 16 females in a season, achieve a mean of 0·38 copulations per hour, although less successful males may go for days without a female visit. The females visit several neighbouring males, and one was observed to mate with two different males in the space of three minutes. Successful male Village Indigobirds* (Vidua chalybeata) *attract up to 13 females over a ten-hour day, and copulate once or twice in that time. Less successful males watch these birds, listening to their songs and presumably learning them, before returning to their own sites.*

[*Vidua macroura*, Sabi Sabi Private Game Reserve, South Africa. Photo: Jürgen & Christine Sohns/ www.photolibrary.com]

applies particularly to the Togo Paradise-whydah and the Jos Plateau Indigobird (*Vidua maryae*), but also, to a lesser extent, to the Steel-blue Whydah. The last-mentioned, which is restricted to thorny scrub and thickets in the region from south Sudan, Ethiopia and north Somalia south to south-central Tanzania, is uncommon throughout its range; in some places in Kenya it has suffered from the effects of intensive grazing by cattle, and has become much scarcer than it was in the 1960s.

In West Africa, the Togo Paradise-whydah, found in open woodland and cultivation, is scarce throughout its fragmented range in Guinea, Sierra Leone, Ivory Coast, Ghana and Togo, perhaps with a small population also in north Liberia. This species' global population is not known with any degree of certainty, but it seems likely to be fairly small. The Jos Plateau Indigobird has the smallest geographical range of any member of the family. It is confined to a few rocky outcrops in semi-arid Guinean savanna on and near the Jos Plateau, in north Nigeria, where it extends into lightly farmed land and pasture, including grassland with scattered bushes. There are no available estimates of its global population, but this species is thought not to be at any immediate risk.

Indigobirds and whydahs, along with other finch-type species, are widely trapped for the cagebird trade. In Senegal, hundreds of thousands of birds are captured each year, under permit, for this purpose, yet this activity appears, perhaps somewhat surprisingly, to have no noticeable effect on population numbers. Viduids are trapped for the trade also in Guinea, Mali, Tanzania and Mozambique, and almost certainly elsewhere, too.

A few whydahs have become established as breeding birds in new regions where their host species were also introduced. The Orange-cheeked Waxbill (*Estrilda melpoda*) was introduced to the Caribbean island of Puerto Rico more than 100 years ago and, again, around 1950. Pin-tailed Whydahs were introduced on this island through the bird trade and became established around 1960. They parasitize Orange-cheeked Waxbills and may parasitize other waxbills. In the 1970s, Pin-tailed Whydahs and waxbills were also introduced to Hawaii, and they bred there, but the whydahs are no longer present.

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PLATE 12

inches 4
cm 10

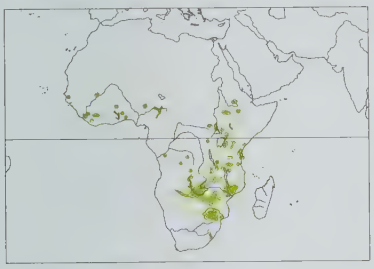
Genus *ANOMALOSPIZA* Shelley, 1901

1. Cuckoo Finch

Anomalospiza imberbis

French: Anomalospize parasite **German**: Kuckuckswitwe **Spanish**: Viuda Anómala
Other common names: Cuckoo/Parasitic Weaver, Yellow Swamp Finch, Canary-like Bishop Finch

Taxonomy. *Crithagra imberbis* Cabanis, 1868, "East Africa" = Zanzibar.
First described as a canary (Fringillidae), then placed in weaverbird family (Ploceidae), and then united with some weaverbirds (those with short outer primary and sexually dimorphic plumage) in a subfamily Viduinae of the waxbill family (Estrildidae); regarded as a ploceid through most of 20th century, but recent studies of morphology and molecular genetics indicate close relationship with *Vidua*. Races intergrade and poorly defined, with no constant distinction in size and plumage, and species sometimes treated as monotypic; also, individual variation in size apparent. Proposed race *tibatiensis* (described from W Africa) subsumed in *butleri*, and *macmillani* (from Ethiopia), *makandakunae* (W Zambia) and *nyasae* (Malawi) synonymized with nominate. Two subspecies currently recognized.
Subspecies and Distribution.
A. i. butleri W. L. Sclater & Mackworth-Praed, 1918 – Gambia, S Mali (inner R Niger Delta), Sierra Leone and Liberia E patchily to Nigeria and Cameroon; S Sudan and NE DRCongo (Uele).
A. i. imberbis (Cabanis, 1868) – patchily in Ethiopia, E Africa, S DRCongo (Kasai, Katanga) and N & SE Angola S to N & E South Africa.



Descriptive notes. 11–12 cm; 18–21 g (Kenya), 20–22·5 g (Transvaal). Small, stocky finch with short tail and short, stubby bill with upper mandible laterally compressed, culmen ridged and straight, lower mandible bulbous and deeper than upper mandible. Male nominate race in non-breeding season (fresh plumage) has forehead and face yellowish, nape and upperparts olive-greenish and streaked; upperwing and tail blackish, outer edges of primaries and margins of tail feathers buff to yellow, central tail feathers narrow and pointed; below, dull yellow, breast sometimes with grey wash; greater primary coverts dark brown with yellow edges; underwing-coverts yellow; iris blackish-brown; bill black, lower mandible light brown; legs pale greyish-horn to horn. Male breeding (worn plumage) is brighter, paler and more distinctly streaked black above, bright yellow with fine dark streaks below; bill all black, except for pale base of lower mandible. Female has crown and back buffy brown, broadly streaked blackish, pale crownstripe and supercilium; upperwing brown, greater primary coverts dark brown; tail dark brown, edged buffy, central rectrices pointed (as in male); face dull yellow to whitish, cheek brownish-buff; buffy white below, throat whitish, variable streaking on breast and flanks (buffier breast in fresh plumage, dark streaks more evident in worn plumage), buff undertail-coverts; underwing-coverts and inner webs of primaries buff. Juvenile has crown feathers tawny with rows of blackish scale-like tips, upperparts tawny-brown (centres of feathers blackish-brown, edges tawny buff), face, throat and breast golden sandy-buff, belly pale buff, flanks buff with fine black streaks (male slightly yellower than female from same nest), greater primary coverts blackish with buff edges; iris blackish-brown, upper mandible black, lower mandible pale brown (bill initially black above, yellow to straw-colour below with black spots on gonys and near tip), legs grey-brown. Race *butleri* is smaller than nominate. Voice. Male song, from perch in bush or tree, a high, chirping "choop-ee-choo" or "dzi-bee-chew" or a thin, sibilant "tissiwick" and "tissiway", or a "swi-sun-suit" sometimes with long wheezy note, lasts c. 4 seconds and consists of three parts: first, chirping notes in repeated pattern, the series drops in pitch (from 8 kHz to 2 kHz) and lasts for 1–2 seconds, each note type given once, notes have a half-tone (a sound trace occurs at half pitch of loudest trace), and most notes drop in pitch; second part a single descending sizzling or whistle-buzz, "choo" or "vweeeeeoooooo", not so loud as the chirping series, lasts 1·6 seconds; third part a chirp, peak frequency as at end of whistle-buzz. Most songs include only the chirping series. Calls in a flock include harsh distress call. Begging calls of young "tink" or "jit...jit", like calls of adults and unlike begging calls of host's own young.
Habitat. Open grassland and savanna, damp meadows with high grasses, grassy riverine floodplains, shrubland, grassy woodland, seasonal and permanent grassy marshes, and rice fields and weedy cotton fields; occurs on grassy airfields during rainy season. Habitat much like that of prinias (*Prinia*) and cisticolas (*Cisticola*), its host species. Flocks roost in reedbeds.
Food and Feeding. Grass seeds and other soft seeds, also hard seeds of sedges (*Scirpus*) and sunflowers (*Helianthus*). Rarely, insects. Takes fallen grass seeds on ground, where it walks or hops awkwardly in upright posture and pecks seeds from surface. Also takes seeds from inflorescences, e.g. of golden bristle grass (*Setaria sphacelata*), sorghum (*Sorghum*) and sunflowers, while perched on upright stems and stalks; pulls seeds from fruiting heads, and crushes them in bill. Takes sand and grit, which pulverize hard seeds in crop. Sometimes hawks insects at dusk. Female eats host's eggs. Young fed with insects, including caterpillars and wasps (Hymenoptera), and sometimes also small seeds; fledglings recorded as being fed mainly with caterpillars and grasshoppers (Orthoptera), but sometimes also with snails (Gastropoda) by fosterers. In non-breeding season in flocks mainly of 8–50 individuals, and to as many as 200–1000, in Zimbabwe and S Zambia; both sexes, including females ready to lay, occur in flocks also in breeding season. Often in flocks with bishop species (*Euplectes*).
Breeding. Breeds in rains, along with host species: lays in Aug and Nov in Ethiopia (W highlands); in E Africa, Feb–Jun in areas N & E of L Victoria, Jan, May, Jun and Oct in Kenya, and Sept–Jan on Pemba I (off NE Tanzania); in DRCongo, Aug–Sept in Uele and May–Jun in Kivu; Jan–Apr in Zambia, Apr in Malawi, Feb and Apr in Botswana, Nov–Mar (mainly Dec–Feb) in Zimbabwe, and Sept–Mar in South Africa; no information on season in W Africa. No pair-bond apparent. Male sings from exposed perch on bushes and grass, or on ground in rainy season; males spaced on separate display territories, giving territorial displays and chasing each other. In courtship display, male perches on twig or ground, faces female, arches wings high over back, and slowly flicks, fans and flaps them, stretches neck upwards and sometimes arches it so that bill points to ground; also flicks wings when display not directed at female and when she forages nearby. Female flicks wings over back. Brood-parasitic, lays in nests of cisticolids (*Prinia* and *Cisticola*), including ball nest with side entrance, "soda-bottle" nest with vertically elongated opening at top, and "tailorbird" nest attached or sewn to underside of large broad leaves; host species Tawny-flanked (*Prinia subflava*) and Black-chested Prinias (*Prinia flavicans*), and Rattling (*Cisticola chiniana*), Croaking (*Cisticola natalensis*), Red-faced (*Cisticola erythrops*), Singing (*Cisticola cantans*), Levaillant's (*Cisticola tinniens*), Zitting (*Cisticola juncidis*), Desert (*Cisticola aridulus*), Pale-crowned (*Cisticola cinnamomeus*), Wing-snapping (*Cisticola ayresii*), Pectoral-patch (*Cisticola brunnescens*), Cloud (*Cisticola textrix*) and Winding Cisticolas (*Cisticola marginatus*) and Neddicky (*Cisticola fulvicapilla*). Breeding adult host flies at female of present species near nest, chases and gives alarm calls; female removes all eggs of host before laying her own (host eggs in parasitized nests are laid later), but sometimes fails to remove eggs of largest hosts. Female lays c. 30 eggs in a season, in sets of 1–4 (mean 2·9), one daily, a few days between sets, lays one (less often two) eggs in each nest; eggs vary from dull whitish to light blue, unmarked or with dark markings, 17 × 13 mm, colour and markings often somewhat like hosts' eggs (bluish-white with no spots, or with speckles and spots; whitish with red spots; pinkish with faint purplish clouding at thick end and purplish and reddish-brown spots and blotches), eggs of most host species more spotted and whitish (less creamy or blue) than eggs of present species; situation complicated by question of identification, as not all eggs allowed to hatch to verify that they are of present species, rather than of a cuckoo (Cuculidae); incubation period less than 14 days. Nestling at hatching differs from host young, has skin dark purple on upperparts, dark flesh-colour on underparts, tufts of fine white down on crown, back and wings, mouth has broad border of deep orange-yellow, no palatal or mouth spots, mouth-lining unmarked flesh-coloured or flesh-purple, tongue purplish-pink with large black spots near rear, interior of both mandibles bright yellow (unlike cisticola nestling, which has skin light pinkish and mouth yellow with black tongue spots); nestling period 18 days, longer than that of host species. Young able to fly immediately on leaving nest, fed by host for 10 days, at which time it begins to feed itself, clinging on grass stems to reach seedheads while still accompanied by foster parents; then leaves foster family and joins flocks of its own species while the adults are still breeding. Two young of present species sometimes fledge from a nest, but host's and parasite's chicks rarely fledge together; one nest of Winding Cisticola had one host nestling and two of present species ready to fly. Loss of breeding success of parasitized nests due to removal of host eggs by laying female and by competition from or interference by nestling parasites, rather than by eviction.
Movements. Not well known. In most of range resident, or a seasonal wanderer moving with rains to regions with fruiting grass, numbers varying from year to year, breeding with host species after rains and emergence of seeding grasses. In Zambia present mainly Sept–Apr, in large flocks in large permanent wetlands in dry season, leaving during rains; in Zimbabwe in all months, most common Oct–May, and non-breeding flocks of hundreds in dry season in permanent wetlands in Hwange National Park; present mainly Nov–May in Botswana and N South Africa.
Status and Conservation. Not globally threatened. Widespread, but uncommon and local. Patchy distribution prevents any reasonably accurate population estimates; total of 250 individuals in Kruger National Park, in South Africa. In inner R Niger Delta, in Mali, often caught around rice fields for the cagebird trade. In captivity, over-active and aggressive towards conspecifics and other birds.
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Genus *VIDUA* Cuvier, 1816

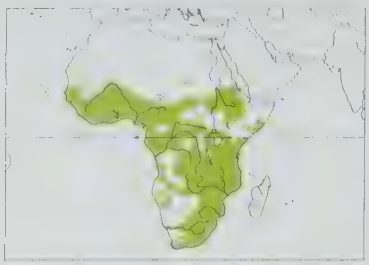
2. Pin-tailed Whydah

Vidua macroura

French: Veuve dominicaine **German**: Dominikanerwitwe **Spanish**: Viuda Colicinta
Other common names: Pin-tailed Widow

Taxonomy. *Fringilla* (*macroura*) Pallas, 1764, East Indies; error =Angola.
Supposedly paler birds in S of range described as race *arenosa*, but not constantly different in plumage colour from birds in W & E Africa. Monotypic.
Distribution. Sub-Saharan Africa except in driest regions: S Mauritania S to Liberia, E to Mali and S Niger, Nigeria and Cameroon, NE & S Chad (Ennedi Massif and S Ouaddai region), Central African Republic, C & S and Sudan, Ethiopia and Eritrea, and from Gulf of Guinea (islands of Bioko and São Tomé) E to Kenya, C & S Somalia, Tanzania and Zanzibar, and S to Namibia, N & E Botswana and South Africa.
Introduced on Puerto Rico, in Caribbean.
Descriptive notes. 11–12 cm, breeding male 30–32 cm; 12·2–18·8 g. Small finch with stubby bill, breeding male with long narrow tail feathers. Male breeding has forehead and crown black, face and collar white, upperparts mainly black, rump white with black streaks; two central pairs of rectrices greatly elongated (to c. 20 cm in length), narrow, black, rest of rectrices black, outer three pairs (T4–T6) with white tips and inner webs; upperwing black, white patch formed by upperwing-coverts; chin spot black (sometimes absent), side of upper breast black (extent of black variable), throat to undertail-coverts white; underwing-coverts white, mottled black; iris dark brown; bill red; legs blackish-grey. Non-breeding male and first-year male are streaked, like female, but head pattern bolder, median crownstripe whitish (not buff), supercilium black, bill red. Female has head

On following pages: 3. Steel-blue Whydah (*Vidua hypocherina*); 4. Long-tailed Paradise-whydah (*Vidua paradisaea*); 5. Broad-tailed Paradise-whydah (*Vidua obtusa*); 6. Sahel Paradise-whydah (*Vidua orientalis*); 7. Exclamatory Paradise-whydah (*Vidua interjecta*); 8. Togo Paradise-whydah (*Vidua togoensis*); 9. Straw-tailed Whydah (*Vidua fischeri*); 10. Shaft-tailed Whydah (*Vidua regia*).



and face distinctly striped dark brown and tawny-buff, crown to rump rufous-buff with blackish streaks, small concealed white flank patch, buff median crownstripe, dark brown stripe on side of crown and through eye, rufous to buff superciliary stripe; tail brown, T4–6 with white on inner webs (white visible from below); upperwing brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat buffy white, breast buff with dark streaks at side, belly to undertail-coverts whitish, underwing-coverts grey; iris dark brown; bill black in breeding season, black with red base at end of breeding, red in non-breeding season; legs blackish-grey; differs from congeners in more conspicuously streaked crown and face, red bill and black legs, also tail longer than that of indigobirds and with white on inner webs of outer feathers. Juvenile has crown and upperparts uniformly mouse-brown, cheek paler, obscure pale superciliary line, tail mouse-brown, throat whitish, breast to undertail-coverts light buff, iris dark brown, bill black (after independence, becoming red from base), gape with white swellings, legs black; moults into streaked non-breeding plumage c. 3 months after fledging. Voice. Song a jerky series of single notes with sibilant quality, "tsip, tsep, tsuc, tyap, tsrrr, wee, tip, jaa...", interspersed with trills (8–10 notes per second), and runs of rapid tinny jingling, less often a sweet downslurred "tee-yew" or upslurred "way-yee" whistle and a grating "jaa-jaa" or "jajaja"; male also directs quiet twittering at intruding male, "whit-whit-whit" and "chee-chee-chee" interspersed with short warbling passages. Not known to mimic calls and songs of host species. Both sexes give harsh chatter in alarm and on taking flight; other calls include low "peeee" and, in flight, double "chip-chip". Nestling call unlike that of host's young; begging calls of fledgling "wehk-wehk-wehk", unlike the "chewnk" of fledged Common Waxbill (*Estrilda astrild*).

Habitat. Grassy and open shrubby habitats, marshes, bushed lands, cultivated lands and gardens, old maize (*Zea mays*) lands with seedy grass, disturbed clearings and bush tracks; around villages. In forested regions, found in clearings near margins of forests and along larger rivers; absent in some natural grass savannas in otherwise forested areas. In E Africa from sea-level to 3000 m, generally below 2300 m; mainly below 2600 m in Ethiopia. Flocks roost in trees with other members of genus.

Food and Feeding. Mostly small grass seeds, taken after seeds have fallen to ground; also flying termites (Isoptera). Breeding female eats host eggs (both shell and contents). In Zambia, takes same kinds of grass seeds (*Echinochloa*, *Urochloa*, *Setaria*) as do *V. chalybeata*, *V. purpurascens* and several estrildid finches; in cultivated upland regions of Guinea and Sierra Leone takes seeds of fonio (*Digitaria exilis*), in NE DRCongo (Uele) seeds of *Eleusine colonara*, and in E South Africa seeds of *Panicum maximum* and *Paspalum paspalodes*; also takes pounded maize or manioc (*Manihot esculenta*) meal, nutlets from stems of small sedge *Cyperus flavescens*, and filamentous algae in shallow streams. Uncovers seeds on ground by rapidly kicking aside topsoil with one foot and then the other (technique known as "double-scratch"), then hops backwards and pecks at exposed seeds, rate of two pecks in 5 seconds. Also perches on grass stem, thrusts bill deep into seedhead to loosen each seed, works the item in bill, rejects outer husks. If, when feeding on ground, a bird sees a grass inflorescence overhead, it flies up, settles on stem in order to bend it down to ground, and feeds on seedhead until finished, then allows stem to whip back up to its original position. Forages alone or in flocks with other finches; in non-breeding season, sometimes in large single-species flocks or in mixed flocks of congeners. Young, once independent, join family groups of other finch-type species. Breeding male aggressive towards other birds on feeding areas; defends sites of annual grasses near his display area.

Breeding. Breeds in rains (except in wettest regions), during nesting season of host species: lays Aug–Sept in Senegal, Jul–Sept in Mali, Apr–Oct/Nov in Liberia; in Mar–Sept rains in coastal S and in Apr–Oct rains in N in Ghana; Mar–Nov in E Nigeria, Jan–Jun in São Tomé, mainly in long Jun–Sept dry season in Gabon; Feb, Apr, Oct and Nov in Uganda, Apr–Jul (sexual displays in feeding flock by Mar) in Kenya, and Dec–Mar in Tanzania; Nov–May in N Angola, males in breeding plumage Dec–Mar (rarely to May) in Malawi, and laying mainly Jan–Mar in Zimbabwe; in South Africa varies with rainfall regions and host breeding schedules, Nov–Apr in N & NE (Limpopo, KwaZulu-Natal), Nov–Dec in E and Sept and Oct in SW. No pair-bond. Male sings on a few favoured perches in trees or shrubs, nearly all day (up to 90% of his time on display territory), chases other males and other species from display area, flies conspicuously from tree to tree, tail flopping; displays to visiting female and other birds that perch in his tree, e.g. canaries (*Serinus*), sunbirds (Nectariniidae) and even shrikes (Laniidae), hovering over and chasing them. Male often uses same call-sites in successive years; when removed from active call-site, is often replaced by another male. Courtship and copulation take place in tree, sometimes on ground. In courtship, male flies at female on perch or ground near his site, bounces in flight over her, and waves and bends long tail feathers; flies in a circle, hovers c. 0·5 m in front of her, body forward at angle of 45°, wings alternately fluttered and closed, with slow choppy wingbeats as he jerks up and down, tail cascading towards her, and gives chittery call (louder than wingbeats), the display lasting for as long as 5 minutes; female crouches, tail fanned and vibrated, head tipped upwards. After courting, male leads female to a feeding area with grass seeds, where the two feed together; only c. 8% of courtship displays result in copulation, male more successful in attracting female and copulating when his site has food and water nearby. Male behaves in same way to another male whydah, flipping tail and holding it upright for a few seconds, raising and lowering long central feathers. Female visits several neighbouring males, and several females visit and copulate with one male; one female mated with two nearby males within period of 3 minutes; as many as 16 females in a season visit an active breeding male, which displays and copulates all day, mean of 0·38 copulations per hour; less successful males may go days without a female visit. Brood-parasitic, lays in nests of waxbills (*Estrilda*) and occasionally other estrildids, hosts rear young of present species together in mixed brood with own young; host species include Common, Crimson-rumped (*Estrilda rhodopyga*), Orange-cheeked (*Estrilda melpoda*), Fawn-breasted (*Estrilda paludicola*) and Black-rumped Waxbills (*Estrilda troglodytes*); in Senegal parasitizes Black-rumped and Orange-cheeked Waxbills, may use both also in Nigeria and Cameroon, in coastal Ghana additionally exploits Bronze Mannikin (*Spermestes cucullata*) (young of which have two bars, not five spots, on palate, and lack white gape papillae of nestling whydah), in Gabon parasitizes last-mentioned, in Kenya usually Common and Crimson-rumped Waxbills but occasionally African Silverbill (*Euodice cantans*); in Malawi c. 40% of Common Waxbill nests contain eggs of present species; in S of range parasitizes mainly Common Waxbill and also Swee Waxbill (*Coccopygia melanotis*) and Yellow-bellied Swee (*Coccopygia quartinia*); in South Africa, young often attended by Common Waxbill in mixed-species groups, Swee Waxbill seen to feed two fledglings of present species, and Zebra Waxbill (*Amandava subflava*) sometimes parasitized; other records, based on eggs alone, are questionable. Female usually visits nests alone (male remains on call-site and mates with other visiting females), but sometimes accompanied by male; she removes an egg from host's clutch and eats it. Female lays sets of 3–4 eggs, one per day, a few days between sets, mean total of 25 eggs in a season, parasitized nest has one or two whydah eggs, rarely as many as five, eggs white, unmarked, 14·5–16·6 × 11–12·2 mm, broader than eggs of waxbill; incubation period 11 days. Hatchling has skin mauve, head pink, bill black, nostrils prominent (waxbill nostrils flat), down on crown and back dusky grey, pale yellow on secondaries and white on rump (some without natal down on wing and back), older chick has skin dark pinkish-mauve, paler below, natal down grey, base of upper mandible forms white raised flange in form of a "U", ends of which meet a broad papilla on lower bill, side of gape has three distinct swellings, lower papillae fit into each side of a comma-shaped upper ridge outlined in black; palate pale pinkish with ring of five black spots, tongue pinkish with incomplete black bar, lower mouth with sublingual black bar (most waxbill nestlings have similar mouth pattern); nestling period 20 days; young reared together with young waxbills, and nestlings of both species often fledge together, sometimes two whydahs from a nest; fledglings of both fed by adult waxbills, young of present species less active than waxbills in feeding group, perches nearby, not joining restless waxbills, remains in host family group for more than a week, later joins whydah flock. Parasite nestling has no overall effect on survival of host's nestlings; whydahs have lower survival rate to fledging than do waxbills. Ringed individuals have lived for at least 5·5 years.

Movements. Resident. Small flocks gather at end of breeding season; perhaps seasonal migrant into drier areas during rains, and migratory or nomadic over wide area in arid parts of range in NW South Africa; during rains disappear from NE DRCongo and then appears in S Sudan. A male translocated 53 km returned to site in six hours; farthest movements of ringed individuals less than 20 km.

Status and Conservation. Not globally threatened. Common or locally common throughout range; e.g. in Kenya widespread in S, absent in arid N except along R Tana and extreme NE and NW corners. Population estimates include in excess of 10,000 individuals in S Mozambique, 50,000 in Swaziland and, in South Africa, 30,000 in Kruger National Park. Range has expanded in past 50–100 years with increase in dams and irrigation and the colonization of new habitats by Common Waxbill, as in Namibia. Absent in some areas where waxbills are common, e.g. N Namib Coast of Namibia and W South Africa (Namaqualand, in W Northern Cape). Fairly common on Puerto Rico, where introduced; exploits introduced Orange-cheeked Waxbill and perhaps other species of estrildid finch as hosts.

Bibliography. Alatalo *et al.* (1988), Aldrovandi (1600), Andersson (1982b), Bannerman (1949), Barlow *et al.* (1997), Barnard (1989, 1991a, 1991b), Barnard & Markus (1989), Belcher (1930b), Benson & Benson (1977), Brosset & Érard (1986), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1954), Cheesman & Sclater (1936), Clancey (1977b), Delacour & Edmond-Blanc (1933, 1934), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Elgood *et al.* (1994), Friedmann (1960), Fry (1976), Gatter (1997), Godfrey (1929), Greig-Smith (1977), Grote (1925), Günther & Feiler (1985), Harrison, C.J.O. (1964a), Harrison, J.A. *et al.* (1997), Hockey *et al.* (2005), Immelmann (1969b), Jackson (1938), Lamarche (1981), Lever (1987), Macdonald (1980a), Maclean (1993), Markus (1970), McCarthy (2006), Mines (1999), Morel & Morel (1990), Mörs (1910, 1925), Nicolai (1964, 1968d), Payne (1977a, 1977b, 2004, 2005a), Raffaele (1983), Raffaele *et al.* (2003), Roberts (1907, 1913, 1917, 1930, 1939), Savalli (1990, 1995c), Schmidt (1965), Schuetz (2005a, 2005b), Serle (1957), Shaw (1984), Skead, C.J. (1957, 1995, 1997), Skead, D.M. (1975), van Someren (1916, 1922, 1956), Sorenson & Payne (2001b, 2002), Sorenson *et al.* (2004), Stevenson & Fanshawe (2002), Vincent (1936).

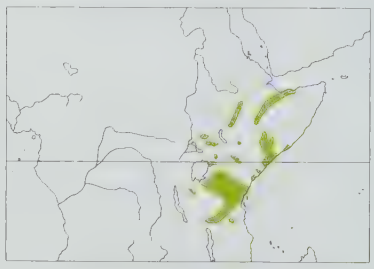
3. Steel-blue Whydah

Vidua hypocherina

French: Veuve métallique **German**: Glanzwitwe **Spanish**: Viuda Metálica
Other common names: Steel-blue Widow

Taxonomy. *Vidua hypocherina* J. Verreaux and É. Verreaux, 1856, coast of West Africa; error = East Africa.
Monotypic.

Distribution. S Sudan (S of 5° N and E of R Nile), NE Uganda, Ethiopia, NW & S Somalia, Kenya, and Tanzania (dry C plateau from E Rift Valley S to Tabora, Morogoro, Mikumi and Usangu Flats in Mbeya region, and Iringa).



Descriptive notes. 10–11 cm, breeding male 30–31 cm; 11–13 g. Male breeding is glossy blue-black, with small white patch on upper flank (normally concealed by back feathers); central two pairs of tail feathers (T1, T2) black, narrow (5–6 mm near tip, where broader than near base) and extremely elongated (length c. 20 cm), remaining rectrices (T3–T6) black with buff-white margin on inner webs; upperwing dark brown, inner webs of primaries and secondaries white (visible as broad white band when seen from below), underwing-coverts white; iris dark brown; bill short and stubby, white (in museum specimens red, grey or black); legs grey. Non-breeding male is similar to female, but head markings more distinctly blackish and white; bill light grey or horn-coloured, legs grey. Female has crown dark brown with whitish central streak, whitish supercilium, face light greyish with dark streak behind eye, indistinct streak below greyish ear patch; upperparts grey-brown with black streaks, tail dark with white edge on inside and tips of feathers and narrower white edge on outer margin, upperwing brown, inner webs of primaries and secondaries buffy white; breast grey, throat, side of breast and flanks whitish, streaked buff and grey, undertail-coverts white, small concealed white flank patch, underwing-coverts white; bill grey, darker on upper mandible. Female and non-breeding male distinguished from those of congeners by tiny pale bill, grey legs, more definite eyestripe, white inner tip and edge of tail feathers; from *V. macroura* also by less strongly patterned face, less rufous on head and upperparts, smaller bill grey (not red or black). Juvenile is similar to female, upperparts light grey-brown, indistinctly streaked, a light streak above eye, and dark grey cheek contrasting with rest of face (as in host species), whitish below, undertail-coverts ashy brown, tail with narrow white margin, underwing-coverts white, iris dark brown, bill dark grey, legs grey, plumage similar to that of young of waxbill hosts; male develops breeding plumage or partial breeding plumage when one year old. Voice. Song a series of short phrases lasting many minutes with little repetition, a long bout of short twitters and chatters, repeated "chiff", "tik", "chuff" and "whezzz", 1–4 notes per second, notes plaintive, dropping in pitch, like calls of a swallow (Hirundinidae) or canary (*Serinus*); song broken into short phrases, and fast and slow chatters. Not known to mimic songs or calls of waxbill host species; N of Kavirondo Gulf, at L Victoria, songs mimic those of Red-cheeked Cordon-bleu (*Uraeginthus bengalus*), nests of which females of present species visit.

Habitat. Lowland thorn-scrub country and acacia (*Acacia*) thickets with short grass, to 1360 m. Nests of hosts sited in trees and high shrubs 2–6 m tall (*Acacia brevispicata*, *Acacia mellifera*, *Commiphora shimperi*, *Balanites aegyptiaca* and *Capparis tomentosa*).

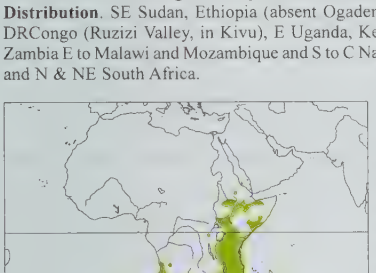
Food and Feeding. Small grass seeds, taken from ground. Nestlings fed with half-ripe seeds and insects. Uncovers seeds scattered on ground surface by rapidly kicking aside topsoil with one foot and then the other (technique known as "double-scratch"), then hops backwards and pecks. In breeding season feeds mainly within defended display area (male, and female visiting courting male); at other times forages singly or in flocks.
Breeding. Lays in May in Sudan, female with oviduct egg in Nov in Ethiopia, and fledglings in Sept in S Somalia; in Kenya, season Jun–Sept at L Baringo (males in breeding plumage, May–Sept) and May–Jul at L Victoria (Kisumu). Territorial male sings from a high perch, defends song perches at least 300 m from other males; when a female visits site he flies to ground and sings there, and when she joins him he makes a quick jump over her and flutters his wings and bobs tail in a tight circling flight for up to 30 seconds; repeats display or forages with her, then leads her in flight back to his perch. Brood-parasitic, main host is Black-faced Waxbill (*Estrilda erythronotos*). Lays sets of 3–4 eggs, one egg per day, a few days between sets, parasitized nest has one or two whydah eggs, white and unmarked, 17·1 × 12·1 mm, larger than those of hosts; no information on incubation period. Hatchling has skin blackish, swollen white wart-like flange around gape, with internal bulge and black oral surface, palate white with five black spots, central one smaller, tongue light pink with two black spots above joined by black band below, differs from waxbill chicks in thicker head and shorter bill, differences increase with age, central palatal spot smaller and black band on tongue more extensive; nestling period c. 20 days; become independent of foster parents at 28 days.
Movements. Resident; seasonal movements are likely to take place in arid habitats to permit breeding during rains.
Status and Conservation. Not globally threatened. Uncommon throughout its range. Estimated global range 570,000 km². Decidedly uncommon in areas with intensive grazing; around L Baringo, in Kenya, was common in 1960s and 1970s, but was not seen in 1988, when the area had more cattle and little grass.
Bibliography. Anon. (2009b), Ash & Miskell (1998), Britton (1980), Brown & Britton (1980), Cunningham-van Someren (1974a, 1978), Delacour & Edmond-Blanc (1933, 1934), Elliott (1972), Erlanger (1907), Friedmann (1937, 1960), Neunzig (1929b), Nicolai (1964, 1989, 1990), Nikolaus (1979, 1987, 1989), Payne (1977a, 1997a, 1997b, 2004), van Someren (1918a, 1922, 1956), Sorenson & Payne (2001b), Sorenson *et al.* (2004), Stevenson (1981), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

4. Long-tailed Paradise-whydah

Vidua paradisaea

French: Veuve de paradis **German**: Schmalschwanzwitwe **Spanish**: Viuda del Paraíso
Other common names: (East African/Eastern) Paradise Whydah, African/Acacia Paradise Whydah, Long-tailed Paradise Widow

Taxonomy. *Emberiza paradisaea* Linnaeus, 1758, Africa = Angola.
Formerly considered conspecific with *V. obtusa*, *V. orientalis*, *V. interjecta* and *V. togoensis*, and all sometimes placed in a separate genus *Steganura*. Molecular-genetic data, however, indicate that present species and *V. obtusa* are sister-species; not closest to *V. orientalis*, despite fact that the two are both song mimics and brood parasites of Melba Finch (*Pytilia melba*). Occasional hybridization recorded with indigobirds (species undetermined). Monotypic.
Distribution. SE Sudan, Ethiopia (absent Ogaden desert and E Bale), Somalia (W of 47° E), E DRCongo (Ruzizi Valley, in Kivu), E Uganda, Kenya, Tanzania, and from W & S Angola and S Zambia E to Malawi and Mozambique and S to C Namibia, C & SE Botswana, Zimbabwe, Swaziland and N & NE South Africa.



Descriptive notes. 13–14 cm, breeding male 36–39 cm; 18–24 g. Male breeding has top and side of head black, nape golden-yellow (straw-coloured when plumage faded), upperparts black, upper breast maroon-chestnut, lower breast paler chestnut, belly and vent pale buff, undertail-coverts mostly black; tail black, central two feather pairs (T1 and T2) greatly elongated, broad at base and tapering to tip, twisted longitudinally c. 90° and prominent in lateral view, longer T2 (mean length c. 29 cm) encloses T1 (basal filaments of pair T2 form a "zipper" that binds the two feathers together on ventral edge), T1 exposed and elevated in display; iris dark brown; bill black; legs blackish, dark grey or brown. Differs from *V. obtusa* mainly in less extensive chestnut on breast, paler nape, longer T2 with tapered shape (not broad through most of length), longer and more pointed T1 (visible in display or when T2 in moult). Non-breeding male resembles female, but black crownstripes and black face marks broader and more distinct, pale head stripe whiter (less buffy), and breast more distinctly streaked black; bill grey. Female has buffy-whitish central crownstripe bordered by blackish streak, pale supercilium, and blackish crescentic mark extending from behind eye around rear ear-coverts, upperparts grey-brown, streaked blackish, breast light grey to buffy with indistinct streaks, belly white, undertail-coverts whitish, underwing-coverts light grey; bill dark grey with lighter base of lower mandible, dark when breeding, paler during moult. Female differs from female of *V. obtusa* in darker bill and legs and in presence of crescent marks on face. Juvenile differs from female, has face nearly unmarked (obscure paler grey eyestripe), upperparts unmarked grey-brown, rump grey, wings and tail brownish-grey, underparts paler grey, belly and undertail-coverts white, tail rounded to slightly graduated, bill black to blackish with brown on top centre and at base of lower mandible, legs brownish-grey to dark grey, fledgling initially has mouth like that of Melba Finch host (whitish gape swellings, and light pink palate with central black spot and purple-blue lateral spots), begins post-juvenile moult 1–2 months after fledging; first-year male sometimes has incomplete breeding plumage, partly streaked like non-breeding male and partly with maroon on underparts, develops full breeding plumage in second season. Voice. Male mimics calls and songs of host species, the Melba Finch; songs vary in elements and sequence, vary also regionally much as do those of its host. Mimetic songs as long as 16 seconds, sound like a drop of water splashing, then long and short whistled notes, then gurgling and trilling sounds which end with flute-like notes; motif often repeated several times; individual males within distance of a few kilometres match their mimicked songs, which differ from songs further away. Males match songs of local populations and races of Melba Finch, which differ among regions (e.g. S Somalia and NE Kenya; Paré Mts, in NE Tanzania; and Lochinvar National Park, in Zambia). Males at L Baringo, in Kenya, mimics songs and calls of Blue-capped Cordon-bleu (*Uraeginthus cyanocephalus*), perhaps indicative of a brood-parasitic relationship; this whydah's distribution in Ethiopia matches that of Blue-capped Cordon-bleu in regions where Melba Finch does not occur. In addition, male gives non-mimetic calls, high and thin, sweet and hissing, "weeeee", "weee-tssss" or "seeee-tsi-tseeeew", triple hissing "sss-sss-ssssss", buzzier "zzzeeee", sometimes in mix of chatters and short notes. Both sexes give non-mimetic chatters, the calls soft in flight, long and rapid when perched, and loud and complex before flying. Begging call of nestling initially like that of nestling Melba Finch; later becomes more distinct, a husky, harsh "chew chew chew" (Melba Finch "chuc chuc, peett").
Habitat. Woodland with scattered trees and bushes, mainly acacia (*Acacia*) woodland and other semi-arid scrubland. Occurs in miombo (*Brachystegia*), Zambezi teak (*Baikiaea plurijuga*) and mopane (*Colophospermum mopane*) open woodland, and in fallow and lightly cultivated habitats; in *Acacia tortilis* savanna in N South Africa. In E Africa generally in dry country below 1400 m. Roosts in leafy trees.
Food and Feeding. Small grass seeds, scattered on open ground, along tracks, paths, roadsides, and near old livestock pens and water sites. In Zambia, takes mainly annual grasses *Echinochloa colonum*, *Setaria*, *Urochloris* and *Dactycynodon*, also seeds of the herb *Amaranthus* around old cattle pens. Nestling fed with insects in first 8–10 days after hatching, also with seeds throughout period in nest. Laying female sometimes eats 1–2 eggs from host's nest. Breeding birds leave display territories and gather in evening parties to forage; intense feeding 20 minutes before sunset, when female had more than 400 small grass seeds in crop. Small flocks of males, females and juveniles gather at end of breeding season; flocks with other members of genus.
Breeding. Eggs in May–Jun in Ethiopia; males in breeding plumage May–Aug, and into Oct in wet years, in Kenya (L Baringo); in Tanzania, breeds Apr–May and nearly grown fledgling in family group of Melba Finches in Jul in NE (N Pare Mts) and breeds Feb–Mar in S (Iringa); display and singing Mar–May in Zambia and Feb–Jun (males in breeding plumage rarely to Aug) in Malawi; lays Jan–Jun/Jul in S Africa. Males display within sight of each other, each over a separate territory (c. 3 ha); when male intrudes overhead during resident's display period, resident male accompanies rival away, flying low between intruder and song trees, tail feathers T1 enclosed within T2, until rival leaves territory. Display arena has trees and shrubs, used as song perches and as launch pads for display-flights, male performs courtship display-flight and song in late morning and in late afternoon, twice daily for c. 20 minutes, flies up from tree at angle of 30–60°, chatters, then flies slowly with rapid shallow beats at height of 20–30 m, circles an area 50–100 m in radius in horizontal flight, cruises slowly across territory, gives whistle, central pair of rectrices held upright, long pair T2 trailing behind; after c. 20 seconds folds wings to sides and then flaps again, descends in jerky flight, then plunges head first (rectrices T1 concealed by envelope of T2) and perches in another tree or bush, where gives long (10–12 seconds) song; if no female approaches, he flies up at sharp angle, rustles tail feathers, ascends to 20–30 m, and repeats slow flight display and whistle (tail rustle heard only at close range). Male courtship also takes place on treetops, and female visits male at display perches in neighbouring trees; male bows head and neck low towards her, tosses head up and over back, bill tilted, mouth opened and closed, breast thrust forward, holds this posture, then arches head high and raises long tail feathers T1 vertically, so that body and tail form U-shape; he raises tail, exposes pair T1, while longest rectrices T2 arch behind, and turns sideways to present alternate lateral views to female, then turns to her and bows; he swings head from side to side, and then flies to her, hovers, and the pair copulates. Brood-parasitic, female lays in nests of Melba Finch, perches in bushtop for 15 minutes or more, looks for nesting activity, then flies to investigate host site; proportion of Melba Finch nests parasitized sometimes high, e.g. 28% of 75 nests in N South Africa (Limpopo), 47% of 15 nests in Malawi, and as many as 92% of 51 nests in Tanzania; one record of parasitizing Purple Grenadier (*Granatina ianthinogaster*). Female lays sets of 3–4 eggs, one egg per day, a few days between sets, total of c. 22 eggs in a season, white, unmarked, 17·3–18·4 × 12–14·1 mm, larger than eggs of host; parasitized nest has 1–5 whydah eggs (in South Africa, eleven nests had one whydah egg, seven had 2, and three had 3; in Tanzania, nine nests held 1, 18 had 2, five had 3, one had 4 and one had 5; in Zambia and Malawi, 1–3 whydah eggs in host nests); sometimes two or more females lay in same nest (in one nest, 3 whydah eggs laid on same day, by three different females); incubation period 11 days. Hatchling has skin black, pale grey down on crown and back, gape-flange whitish with upper and lower swellings lined black, palate black at tip, white with single black spot in centre, and pink with long violet-blue spot on each side in back, distinguished from Melba Finch chick by larger size, darker skin, grey-white (not sandy-white) natal down, and broader more conical bill, feathered nestling nearly identical except for brown rump (red on host); little difference in begging behaviour between parasite and host's own chicks, former begs more persistently and more obstinately and grows faster than host nestlings; nestling period 21 days. Parasite and host's young leave nest together; in captivity, young whydah independent 27–30 days after hatching. Female breeds from first year; male in full breeding plumage only from second year, but first-year males in female-like plumage lift central pair of rectrices in display to female. Longest recorded survival of ringed individual in the wild 5 years.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common. Common in Kenya below 1400 m, in coastal bush to lower R Tana, Voi, Samburu, L Baringo to Turkana, Kerio and Rift Valleys, Tsavo and Amboseli; in Tanzania common throughout bush country, but absent NE L Tanganyika and few in S (except in miombo woodlands). Density at Lochinvar National Park, in Zambia, c. 2–4 displaying males/km² in breeding season in 1972–1976, few in 1997 when grasslands overgrazed. Similar densities observed in lightly grazed woodlands near L Baringo, in Kenya, and at Marble Hall and Merensky Nature Reserve, in South Africa; lower densities in other areas. In S Mozambique estimated population c. 10,000 individuals, in Swaziland 3000 birds, in Kruger National Park (NE South Africa) 8000 birds.
Bibliography. Aldrovandi (1600), Ash & Atkins (2009), Barnard (1989, 1995), Belcher (1930a, 1930b), Benson & Benson (1977), Benson *et al.* (1971), Carswell *et al.* (2005), Chapin (1922, 1929a, 1929b), Cheesman & Sclater (1936), Clancey (1971), Curtis (1997), Delacour & Edmond-Blanc (1933, 1934), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Dowsett-Lemaire & Dowsett (2006), Edwards (1747), Erlanger (1907), Friedmann (1960), Harrison *et al.* (1997), Hockey *et al.* (2005), Hoesch (1939), Hoesch & Niethammer (1940), Irwin (1981), Klein & Payne (1998), Koenig (1962), Markus (1970), McCarthy (2006), Mörs (1925), Neunzig (1928, 1929b), Nicolai (1964, 1965a, 1968d, 1969, 1974, 1977, 1991), Oakes & Barnard (1994), Parker (1999), Payne (1971, 1973b, 1977a, 1980b, 1997a, 1998b, 2004, 2005a), Payne & Sorenson (2004), Roberts (1926, 1930, 1939), Rutschke & Stresemann (1961), Skead (1975), Skinner (1995), Sorenson & Payne (2001b), Sorenson *et al.* (2004), Stevenson (1981), Stevenson & Fanshawe (2002), Strickland (1850a, 1850b), Tarboton *et al.* (1987), Tweedy (1965), Weeks (1968a), Willughby (1676), Witschi (1961), Yamashina (1930), Zimmerman *et al.* (1996).

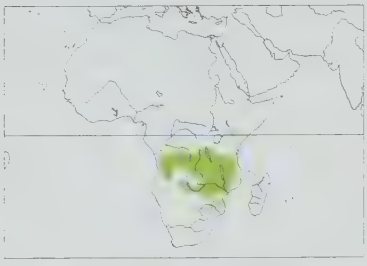
5. Broad-tailed Paradise-whydah

Vidua obtusa

French: Veuve de Chapin **German**: Breitschwanzwitwe **Spanish**: Viuda Coliancha
Other common names: Broad-tailed Paradise Widow, Chapin's Paradise Whydah

Taxonomy. *Steganura aucupum obtusa* Chapin, 1922, Luchenza, Malawi.
Formerly considered conspecific with *V. paradisaea*, *V. orientalis*, *V. interjecta* and *V. togoensis*, and all sometimes placed in a separate genus *Steganura*. Molecular-genetic data, however, indicate

that present species and *V. paradisaea* are sister-species, using different host species and differing in song. Monotypic.
Distribution. C Kenya (old record); S & E DRCongo, N, C & SE Angola, Tanzania (except NE), Zambia, Malawi, NW & S Mozambique, Botswana (Chobe), NE Namibia (Caprivi), N & SE Zimbabwe and locally in N South Africa.



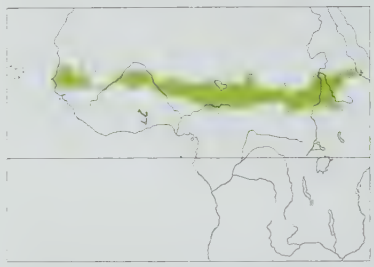
Descriptive notes. 13–14 cm, breeding male 26–28 cm; 17·8–26 g. Male breeding has top and side of head black, nape dark coppery rufous, upperparts black, breast dark maroon, belly and vent buff; tail black, long and broad (c. 2·5 times wing length), T2 broad from base to near tip; iris dark brown; bill black; legs dark brown to black. Differs from *V. paradisaea* in more extensive chestnut on breast, darker coppery nape, rectrix T2 short and broad through most of length, broadest halfway to tip and pointed only near tip (tail not long and tapered through most of length), T1 longer and more pointed (visible when lifted in display or when T2 in moult). Non-breeding male resembles female, but somewhat brighter, central crownstripe whitish bordered by black stripe, white stripe above eye, face light grey, upperparts blackish-streaked brown (feathers with dark central shaft and light brown edges), breast light greyish, belly white, undertail-coverts whitish, underwing-coverts grey; bill grey above, whitish below, legs fleshy grey to light grey. Female has whitish central crown bordered by blackish stripe, whitish superciliary stripe, upperparts grey-brown, streaked blackish, throat whitish, breast light grey to buffish, sometimes indistinctly streaked, belly white, undertail-coverts whitish, underwing-coverts grey; iris dark brown, bill pinkish-grey to blackish above, pinkish to whitish-grey or horn-coloured below, paler in non-breeding season, legs light grey or grey. Female differs from female *V. paradisaea* in paler grey bill and legs and in less contrasting pattern on ear-coverts. Juvenile is plain grey-brown above, rump grey, face nearly unmarked (slight paler grey eyestripe), wings and tail brownish-grey, underparts paler grey, belly and undertail-coverts white, tail rounded to slightly graduated, iris dark brown, bill black, legs grey, mouth like that of host Orange-winged Pytilia (*Pytilia afra*) with whitish gape ridges and light pink palate with lateral purple spots (and no medial black spot), differs from host's young in grey (not red) rump; male sometimes has partial breeding plumage in first year, full breeding plumage in second year. Voice. Songs and calls mimic those of Orange-winged Pytilia. Distinctive song with rattling note and fluty descending whistles followed by crackling note, and a simple descending fluty whistle with buzzy overtone, "zheee-zhoooow"; harsh contact call. Non-mimetic calls include soft chatter and "whoooeee" in flight, loud rapid chatter when perched, and loud complex chatter before flying.
Habitat. Miombo (*Brachystegia*) woodland and old cultivated fields, and grassland with riverine woodland; in Tanzania found at 300–1700 m in miombo woodland. In some areas occurs together with *V. paradisaea*: in Malawi occurs at higher elevations than latter in Nsanje district, but both species common near Monkey Bay and Rumphi; in Tanzania both occur in several places, but in Selous they occupy different habitats; in Zambia little range overlap, but both occur in Lochinvar National Park. Roosts in densely foliaged trees.
Food and Feeding. Small grass seeds. In breeding season forages alone, or male feeds with one or more females, on bare ground, on edges of tracks and open areas. Near end of breeding, occurs in flocks of 20–40 or more, foraging on burnt ground or on bare ground in miombo woodland in NW Zambia; feeds in mixed-species flocks (juveniles and moulting adults) with host Orange-winged Pytilia. Sometimes in large flocks in non-breeding season.
Breeding. Season Jan–Jul, from end of rains to well into dry season; males in breeding plumage Mar–Jul in DRCongo (Katanga), and large egg in nest of Orange-winged Pytilia; males in breeding plumage and others in non-breeding Aug–Sept in Angola; males in breeding plumage at end of rains and early dry season in SW Tanzania; in Zambia, laying Jul–Aug, fledglings in mixed broods fed by adult Orange-winged Pytilia as late as mid-Sept and others begin post-juvenile moult late Sept in Mwinilunga region (Zambezi Rapids), in breeding plumage Feb–Jun at Kafue, and juveniles in Apr–Jun in Lochinvar National Park; eggs Apr–Jun in Malawi; egg in oviduct in Mar and males in breeding plumage at Victoria Falls as late as Aug in Zimbabwe; male in breeding plumage and female oviduct egg ready to lay in Jan in N South Africa (Tzaneen). Male's display arena has trees and shrubs used as song perches. In courtship display, male flies slowly and conspicuously over singing area, innermost tail feathers (T1) enclosed by longer pair T2 (unlike *V. paradisaea*, does not erect T1), perches in top of tree and vocalizes; female flies towards male, he then approaches, his central tail feather exposed and held above drooping rest of tail, stretches head and body upright with legs stiffly extended, bill directed towards her, the corrugated central tail feathers produce slight rustling sound, he perches with body and tail presented sideways to her, bows and stretches head and neck up and down, flexing legs, bill going below level of perch in choking posture, and opens and closes bill; male then swings head from side to side, holding body still, sideways towards her, and turns to face her, turns away and then towards her again; male then flies to female, and hovers and courts her from above. Male sometimes courts other bird species, too. Brood-parasitic, lays in nests of Orange-winged Pytilia; in aviary female lays when she hears songs of latter, but in captivity chicks reared also by nesting Red-winged Pytilia (*Pytilia phoenicoptera*) and White-rumped Munia (*Lonchura striata*); eggs develop in sets of 3, laid one per day, a few days between sets, eggs white, unmarked, 17–18 × 13 mm; female sometimes lays more than 1 egg in a host nest, and sometimes two females lay in same nest, and in Malawi as many as 4 parasite eggs reported in single nest; eggs of both host and parasite found together in nests (e.g. in DRCongo and Malawi), and young of both species reared from same brood (e.g. Malawi and in N Zambia). Hatchling has skin blackish, down on crown and back whitish, whitish gape-flange lined with black, centre of palate pink with no black spot, back of palate whitish with violet spot on each side. No information on incubation and nestling periods. Begging call of fledgling unlike that of host's fledgling, but long-distance contact calls of the two (directed at adults providing parental care) are similar; young of both species forage together with host adults. Female breeds from first year; male gains full breeding plumage in second year.
Movements. Resident, or locally nomadic. Large flocks occur at end of breeding season in upper R Zambezi, may be migratory (some individuals extremely fat); in non-breeding season in NE Botswana, appears in large flocks far from known breeding area.
Status and Conservation. Not globally threatened. Locally fairly common. In breeding season c. 2 birds/km in Zambia (Mkushi, Mazabuka, Choma) and Zimbabwe (Victoria Falls, where best seen above the falls). Unusually large numbers, c. 30 birds/km, recorded along road near Kasane, in NE Botswana, outside breeding season. In Kenya, found (at least formerly) on E slope Mt Kenya, but most recent record from there was in 1947. In Uganda, formerly occurred on Mt Rwenzori and in Mbarara; apparently extirpated at those sites, though reasons unclear.
Bibliography. Baptista (1992), Benson & Benson (1977), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1922, 1929a, 1929b), Clancey (1971), Dean *et al.* (1988), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Güttinger & Nicolai (1973), Hockey *et al.* (2005), Klein & Payne (1998), Leonard (1998), Meise (1937), Nicolai (1964, 1968d, 1969), Payne (1967b, 1971, 1977a, 1997a, 2004, 2005a), Randall *et al.* (1994), Ruwet (1965a), Sorenson *et al.* (2004), Stevenson & Fanshawe (2002), Traylor (1965), Tree (1994), Tweedy (1965), Verheyen (1953), Vincent (1949b).

6. Sahel Paradise-whydah

Vidua orientalis

French: Veuve à collier d'or **German**: Senegalwitwe **Spanish**: Viuda del Sahel
Other common names: Northern/Broad-tailed(!) Paradise Whydah

Taxonomy. *Vidua paradisea orientalis* Heuglin, 1870, Keren, Anseba, Eritrea.
Formerly considered conspecific with *V. paradisaea*, *V. obtusa*, *V. interjecta* and *V. togoensis*, and all sometimes placed in a separate genus *Steganura*. More recently, present species has sometimes been treated as conspecific with *V. paradisaea* alone, but molecular-genetic data indicate that it is sister to *V. interjecta* and *V. togoensis*. Certain specimens in tattered plumage from E Sudan and Eritrea suggest interbreeding between present species and *V. paradisaea*. In Sudan, proposed races *kudugliensis* (described from Kadugli, in S Kordofan) and *nilotica* (from c. 16 km above Abu Zor, in Blue Nile) are synonyms of nominate. Two subspecies recognized.
Subspecies and Distribution.
V. o. aucupum (Neumann, 1908) – S Mauritania, Senegal, N Gambia and S Mali E to S Niger and N Nigeria.
V. o. orientalis Heuglin, 1870 – N Cameroon, S Chad, N Central African Republic, SC Sudan, N Eritrea and NW Ethiopia.



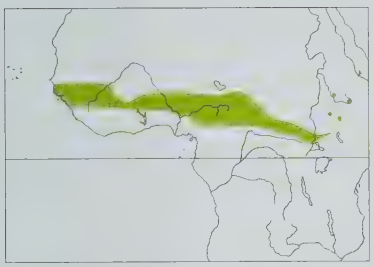
Descriptive notes. 13–14 cm, breeding male 30–31 cm; 15–27 g. Male nominate race breeding has black head, pale straw-coloured nape, black upperparts, black throat, brownish-red to dark maroon breast, yellowish belly; long tail black, central two feather pairs (T1, T2) twisted vertically to form a flag, T2 very long and broad from base nearly to tip (not tapered); iris dark brown; bill and legs black. Differs from *V. paradisaea* mainly in less long tail (appears less than three times wing length when fully grown), with rectrix T2 uniform in breadth along its length and pointed at end (not long and tapered throughout length). Non-breeding male is like female, but more strongly marked on head and breast, has whitish central crownstripe bordered by black stripe, white stripe above eye, light grey face with black eyestripe and black crescent around rear ear-coverts, a few dark streaks on buffish-brown breast; iris dark brown, bill grey with blackish culmen, legs grey. Female has pale buff central crownstripe bordered by dark brown streak, pale stripe above eye and dark brown streak through eye, face whitish-grey, indistinct dark crescent around rear ear-coverts, upperparts light brown with black streaking (feathers with blackish central shaft and light brown edges), wings brown, upperwing-coverts grey, whitish below, except for buff breast, hint of darker streaks on side of breast; tail brown, slightly graduated (central feather pair the longest), fresh outer feathers with white margin c. 1 mm broad; iris dark brown or reddish-brown. Female differs from that of *V. paradisaea* in lack of prominent dark cheek mark, from female *V. interjecta* in lack of red in bill and legs. Juvenile is plain grey above, rump grey, paler below, tail rounded to slightly graduated; iris dark brown, bill black, legs grey. Race *aucupum* differs from nominate in having nape noticeably darker, dark reddish-brown. Voice. Mimics songs and calls of its host, Melba Finch (*Pytilia melba*). In W Africa songs of host and its mimic are "veet" followed by 2 or 3 plaintive slurred whistles (song shorter and simpler than that of Melba Finch in E & S Africa). Alarm "pik" and contact "see-eh"; also a non-mimetic wavery chatter, a rapid chatter, and a single "chuff".
Habitat. Grassy Sahel acacia (*Acacia*) savanna and woodland with scattered shrubs and open ground, sometimes with rocky pavement. Throughout range, occurs with Melba Finch host of red-lored race *citerior* and grey-lored *jessei*.
Food and Feeding. Small grass seeds, taken from ground and from termite (Isoptera) mounds. Forages on ground, alone or in small groups.
Breeding. Season Jul–Dec in Senegal, Nigeria and Sudan, fledged young fed by adult hosts in Jan in Gambia, and males in breeding plumage Dec–Mar in Mali. In courtship display, male flies over trees in open savanna, finally dives into top of tree and sings; not described in detail. Brood-parasitic, lays in nests of Melba Finch (as evidenced by song mimicry, and field observations of fledged young fed by adult of that species in Gambia). In captivity, lays in nests of Melba Finch and sometimes other estrildids: eggs plain white, incubation period 11–13 days, nestling skin dark, nestling period 16 days, moult to adult plumage begins by 6 weeks after fledging.
Movements. No information; flocks of non-breeding individuals and flocks of birds in partial breeding plumage just before and after breeding suggest local movements.
Status and Conservation. Not assessed. Probably not globally threatened. Fairly uncommon. Density in SE Niger in Sept 1·1 birds/km² in one year, 0·3 in another year.
Bibliography. Aldrovandi (1600), Barlow *et al.* (1997), Benedetti & Mignone (1990), de Bie & Morgan (1989), Capecchi & Mignone (1990), Chapin (1922, 1929a, 1929b), Cheke & Walsh (1996), Elgood *et al.* (1994), Klein & Payne (1998), Leßmann (1984), Ligozzi (s.a.), Lloyd (1955), Lynes (1924), McCarthy (2006), Nicolai (1964, 1968d), Payne (1977a, 1985c, 1997a, 1997b, 1998b, 2004), Shelley (1905), Sorenson *et al.* (2004).

7. Exclamatory Paradise-whydah

Vidua interjecta

French: Veuve nigériane **German**: Langschwanzwitwe **Spanish**: Viuda Chillona
Other common names: Long-tailed Paradise Whydah(!), Nigeria Paradise Whydah/Widow, Uelle Paradise Whydah/Widow

Taxonomy. *Steganura paradisea interjecta* Grote, 1922, between Nola and Mbaika, Central African Republic.
Formerly considered conspecific with *V. paradisaea*, *V. obtusa*, *V. orientalis* and *V. togoensis*, and all sometimes placed in a separate genus *Steganura*. Recent molecular-genetic data indicate that it is sister to *V. orientalis* and *V. togoensis*. At least two intermediates between present species and *V. orientalis* are known (from SE Sudan and Central African Republic). Monotypic.
Distribution. Senegal (Casamance), Gambia and S Mali S to Guinea and Ivory Coast, E to S Niger, Nigeria, N & C Cameroon, S Chad, Central African Republic, S Sudan, NE DRCongo (Uele), and W & C Ethiopia (Borraga-Kokolata, Baro-Bonga fork, Gambela, Bahar Dar).



Descriptive notes. 13–14 cm, breeding male 38–40 cm; 20–21 g. Breeding male has most of head black, nape dark brownish-red, upperparts black, throat black with breast brownish-red to dark maroon, belly yellowish; tail black, central two feather pairs (T1 and T2) twisted vertically to form a flag, T2 very long and broad to near tip, shape of bird in flight likened to that of an exclamation mark (!); iris dark brown; bill black; legs dark brown-grey to grey. Distinguished from other whydahs mainly by broad tail about same as body depth throughout length (pointed only at tip, not tapering), like tail of *V. orientalis* but longer, more than three times wing length (less in *V. orientalis*), clearly broader than tail of *V. togoensis*. Non-breeding male has whitish central crownstripe bordered by black stripe, white stripe above eye, light orange-grey face with black mark around rear ear-coverts, upperparts dark-streaked brown (feathers with blackish central shaft and light brown edges), whitish below, buff breast; bill orange-yellow with blackish culmen, legs flesh-grey. Female has pale buff central crownstripe bordered by dark brown stripe, pale superciliary streak and dark brown streak through eye, rest of face plain buff, upperparts light brown, streaked black, wing brown, upperwing-coverts grey, tail brown, slightly graduated (inner feathers the longest), fresh outer feathers with white margin 1 mm wide, white below, breast buff; iris dark brown or reddish-brown, bill light orange, legs pastel red. Female differs from female of *V. orientalis* in having upperparts streaked greyish-brown (never yellowish or buffy), reddish colour of bill and legs. Juvenile is unmarked plain grey-brown; young male moults into female-like streaked plumage in a few weeks. Voice. Mimics songs and calls of Red-winged Pytilia (*Pytilia phoenicoptera*) in W of range (Gambia and Guinea E to N Nigeria): songs include sharp "pik" or "tik" followed by slurred whistle that rises and then falls, "tik-feew", a short whistle followed by a short buzz, a pair of loud descending whistles (double "chuck") or a train of these whistles, a two-part buzz-trill, "peeeezyoooo", calls a low grating "churr" and a "chink" alarm call. Mimicry of Red-faced Pytilia (*Pytilia lineata*) would be the same, a slow and then fast chattered trill, phrases with no change in pitch (unlike other *Pytilia* species); calls a sharp "tik" with short whistle, rising in pitch and sometimes falling at end, "tik-feew" (as for Red-winged Pytilia), a rhythmic "ta-ta-ta-ta" crackling chatter, faster in delivery than that of Orange-winged Pytilia (*Pytilia afra*) and not heard from Red-winged Pytilia, and a "chick"; these elements are combined in sequence "chatter-chip-tik-feew"; often whistle prolonged and introductory "tik" omitted. E from E Nigeria, presumably mimics both Red-winged and Yellow-winged Pytilias (*Pytilia hypogrammica*). Adult male also gives two non-mimetic calls, a soft chatter in flight, a loud rapid chatter "dzidzidzit" when perched, and loud complex chatter before flying.
Habitat. Guinean woodland, open grassy woodland with bare ground, tall grass and scattered trees and bushes, and rocky hillsides. Occurs within range of and in same habitats as host and suspected hosts the Red-winged, Red-faced and Yellow-winged Pytilias.
Food and Feeding. Small grass seeds, taken from ground. In cultivated upland Guinea and Sierra Leone, feeds on fonio grass (*Digitaria exilis*) when seeds are ripe and harvested in Sept–Oct. Feeds on ground, alone or in small groups. Occurs in flocks in non-breeding season.
Breeding. Lays early dry season through period of bush fires to period when grass and woody vegetation come into leaf; males in breeding plumage Jul–Nov/Dec in Gambia, Guinea and Nigeria, and courting males Aug–Sept in Zaria (NC Nigeria). Display arena has trees and shrubs, used by male as song perches and launch pads for display-flights, in courtship male flies around territory in a fore-and-aft rocking flight, tail trailing, with bursts of wingbeats, he circles 50 m above ground, moves from tree to tree, then perches in treetop and sings; chases intruding male whydah out of territory, flying below intruder. Male courts perched female in frontal display; he turns c. 90° to each side, throws back head, gives song, and hovers in front of and over her. Brood-parasitic, lays in nests of Red-winged Pytilia and (E from Nigeria) probably Yellow-winged Pytilia (which has nestling mouth patterns and colours nearly identical to those of Red-winged Pytilia; alleged record of brood parasitism by *V. togoensis* on Yellow-winged Pytilia in SE Nigeria refers to present species, the only paradise-whydah known in region); in Ethiopia perhaps lays in Red-faced Pytilia nests. No information on number of eggs laid in a season; three documented parasitized nests held, respectively, 3 whydah eggs and 4 pytilia eggs, 1 whydah and 3 pytilia eggs, and 2 whydah and 4 pytilia eggs; eggs white, unmarked, 17·2 × 13·3 mm (large eggs in nest of Yellow-winged Pytilia in Nigeria; host eggs smaller); incubation period 11–12 days. Hatchling has skin dark, down on upperparts thick and grey, gape swellings purplish-white, palate whitish-pink with purplish lateral patches (no central black spot), feathered nestling like young *Pytilia* hosts but without barring or red rump, mouth like that of host species (all three of which have reddish palate, black lining bill tip, and whitish tip of tongue) but has small central black spot on palate (missing in all three *Pytilia*), palate lateral to median fissure has large pair of elongate blue-violet patches as in Red-winged and Red-faced Pytilias (not small and rounded as in Yellow-winged Pytilia); on leaving nest has bill short, stubby and deep at level of nostrils, and head large and broad (small and narrow in *Pytilia*); nestling period in captivity 14 days. Feeds independently by 26 or 27 days (11–12 days after leaving nest), whereas pytilia young do so by day 36; gives adult-like chatter by day 30. In captivity, male gains full breeding plumage in 13·5 months.
Movements. No information.
Status and Conservation. Not globally threatened. Locally common to uncommon. Distribution in some parts of range not well known. In Gambia, records from Kaur, Kiang West National Park, and Bansang. In Ethiopia, recorded at Borraga-Kokolata, Baro-Bonga fork, Gambela, and Bahar Dar.
Bibliography. Barlow *et al.* (1997), Chapin (1922, 1929a, 1929b, 1954), Dowsett-Lemaire & Dowsett (2008b), Elgood *et al.* (1994), Friedmann (1960), Green & Sayer (1979), Klein & Payne (1998), McCarthy (2006), Morel & Morel (1990), Nicolai (1964, 1968b, 1968d, 1977), Payne (1985c, 1991, 1997a, 1997b, 2004, 2005a), Serle (1957), Sorenson *et al.* (2004), Wilkinson (2008).

8. Togo Paradise-whydah

Vidua togoensis

French: Veuve du Togo **German**: Togowitwe **Spanish**: Viuda Togolesa
Other common names: Togo Paradise Widow

Taxonomy. *Steganura paradisea togoensis* Grote, 1923, Kete, Ghana.
Formerly considered conspecific with *V. paradisaea*, *V. obtusa*, *V. orientalis* and *V. interjecta*, and all sometimes placed in a separate genus *Steganura*. Recent molecular-genetic data indicate that present species is sister to *V. orientalis* and *V. interjecta*. Monotypic.
Distribution. Guinea, Sierra Leone, Ivory Coast, Ghana and Togo.



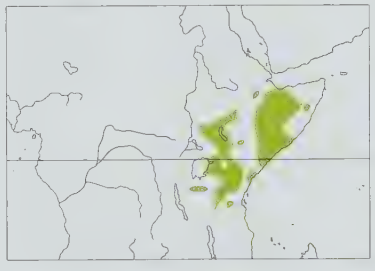
Descriptive notes. c. 12·5 cm, breeding male 40–43 cm. Male breeding has top and side of head black, nape yellow, upperparts black, throat black, upper breast light rust-coloured, lower breast and belly yellowish; tail black, elongated central two feather pairs (T1 and T2) twisted vertically to form a flag, T2 exceptionally long and narrow and with width nearly uniform throughout its length; iris dark brown; bill black; legs dark brown-grey to grey. Differs from *V. interjecta* and *V. orientalis* mainly in having long tail narrower than depth of body (not as broad as, or broader than, body), nape yellow (not red-brown), extent of uniform yellow of underparts generally more extensive. Non-breeding male poorly known, has pale and dark head stripes, black mark around rear ear-coverts, dark-streaked brown upperparts, whitish below, buff breast; similar to non-breeding male *V. interjecta*. Female apparently undescribed, probably similar to non-breeding male. Juvenile is plain grey above, paler below, tail rounded to slightly graduated; bill reddish at base, tip dark. Voice. Song mimics that of Yellow-winged Pytilia (*Pytilia hypogrammica*), a two-part trill, first slow and then fast, with no change in pitch, rather than buzz-trill of Red-winged Pytilia (*Pytilia phoenicoptera*). Gives chatters and non-mimetic calls like those of *V. interjecta*.
Habitat. Open woodland and cultivation.
Food and Feeding. Small grass seeds, taken from ground.
Breeding. Little known. Males in breeding plumage and courting females in Oct in Ghana, and in breeding plumage in Oct in Guinea and Dec in Sierra Leone. Presumably brood-parasitic, but no field observations; distribution and song mimicry suggest that host would be Yellow-winged Pytilia; report of brood parasitism of latter by present species in SE Nigeria, however, is referable to *V. interjecta*. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Scarce throughout its range. Estimated global area of occurrence said to be 420,000 km², but this based on a questionable range map. Recent sightings (1973–2000) in Dalaba, in S Guinea, at Kabala, in Sierra Leone, and at Gambaga, Kyabobo and Mole National Park, in Ghana; at last-mentioned site, sympatric with *V. interjecta* and with possible hosts Yellow-winged and Red-winged Pytilias. Paradise-whydahs seen at Wologezi, in N Liberia, likely to be of present species; further fieldwork required. Reports from Mali and Cameroon considered of questionable validity.
Bibliography. Anon. (2009b), Dowsett & Dowsett-Lemaire (1993a, 1993b), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (2007, 2008b), Friedmann (1960), Fry & Keith (2004), Gatter (1997), Languy *et al.* (2005), Neunzig (1929b), Nicolai (1964, 1977), Payne (1985c, 1991, 1997b, 2004), Sorenson *et al.* (2004).

9. Straw-tailed Whydah

Vidua fischeri

French: Veuve de Fischer **German**: Strohwitwe **Spanish**: Viuda de Fischer
Other common names: Straw-tailed Widow, Fischer's Whydah

Taxonomy. *Linura Fischeri* Reichenow, 1882, Useguha, east Tanzania.
This species and *V. regia* are sometimes placed together in a separate genus *Tetraenura*; the two have been thought to form a superspecies. Monotypic.
Distribution. Extreme S Sudan (E side of Dongotona Mts, E side of Didinga Mts, Kapoeta and Kenyan border), Ethiopia, Somalia, NE Uganda, Kenya, and Tanzania (dry C plateau from Serengeti and Masai steppe S to Tabora, Morogoro and Iringa region).



Descriptive notes. 10–11 cm, breeding male 30–32 cm; 9–17·8 g. Male breeding is distinctive, has forehead and crown yellow, rest of head and entire upperparts black, becoming browner on wing, black continuing down to upper breast, rest of underparts yellowish-buff; underwing-coverts dark grey; tail short, brown (tips and edges buff when fresh), central two pairs of rectrices (T1 and T2) greatly elongated (more than 20 cm long), narrow (2–3 mm wide, with fine barbs along shafts) and straw-coloured; iris dark brown; bill orange to coral-red; legs orange. Non-breeding male similar to female, but upperparts more boldly marked. Female has head nearly unstreaked dark rufous to pale chestnut, nape buff with darker streaks, face plain pale buff, indistinct pale superciliary stripe, upperparts dark-streaked rusty brown, upperwing brown with paler brown edgings, tail brown (tips and edges buff when plumage fresh); throat whitish, breast sandy buff, belly whitish, underwing-coverts brownish-grey; bare-part colours much as for male. Female and non-breeding male differ from Red-billed Quelea (*Quelea quelea*) in having orange-red (not pinkish-red) bill and legs, nearly unstreaked head with rufous wash, and brown (not yellow) wing edgings. Juvenile is mostly rusty brown, paler below, unmarked or with indistinct streaks on back, tail brown; iris dark brown, bill black, legs brown; bill and legs change to orange when bird begins to moult into streaked plumage. Voice. Mimics songs and calls of host, Purple Grenadier (*Granatina ianthinogaster*): (1) loud song a series of short notes ending with 4–5 high, rising whistles, "cheerer cheet tsee-tsee sur-chit-cheet-chit-tsereea", the long whistle ("tsereea") gliding up or down in pitch (varying regionally; (2) trill song, introduced by whispers, has short trills in middle, and ends with short trill or single whistle on one pitch; (3) contact call a thin "wis-wis"; (4) contact trills (c. 10 notes per second); (5) excitement trills, "chay-chay-chay"; (6) sharp "tsek" in alarm, with notes often run together in a chatter; also nest calls and begging calls. Male gives medley of these songs and short chatters when displaying to visiting female, also when alone. Non-mimetic song different, a variable repertoire of chatters, whistles and harsh notes. Non-mimetic song irregularly alternates with bouts of mimicry, and given when male chases another, or when male gives "wing-whir" or "hover-hold" display to female. Non-mimetic calls include chatters, rapid (30 notes per second) or slow (15–16 notes per second), and buzzy "chuz" singly or in series, the phrases delivered in different combinations and not in standard song themes. Individual gives chatters from age of 32–35 days, songs within first year.
Habitat. Short-grass plains with patches of open ground in arid and semi-arid dry thorn-scrub and bush country; below 1600 m.
Food and Feeding. Small grass seeds, also larval and adult insects, taken from ground. Breeding male forages within his territory; female often feeds with male. Occurs alone or in flocks in breed-

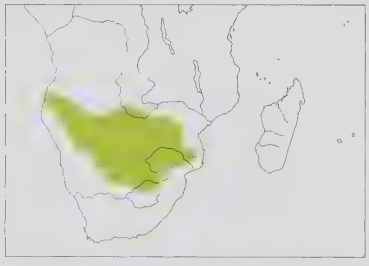
ing season; in non-breeding season mainly in flocks, sometimes with other species, including Purple Grenadier host.
Breeding. Males in breeding plumage in Dec and May in Sudan and May–Dec in Somalia; breeding plumage in Apr–Jun and Dec and juveniles in Aug–Nov in Ethiopia; in Kenya, laying Feb–Jun in S and copulation observed Aug–Sept in W; lays Mar–Jun in Tanzania. Male sings from sunrise through heat of mid-day to sunset (song bouts as long as 60 minutes), in top of bush in display arena of c. 2500 m²; flies from bush to bush, tail jerking, chases off intruding male by flying below and behind until intruder leaves territory. In courtship display, male sings from perch, beats a rhythm with wings as he holds on to perch with legs extended for up to a minute, looks around; when female visits, he displays and takes her to ground, where pair feeds on seeds, pair then returning to copulate on a call-site bush. When female visits, he chatters and then directs "hover-hold" display to her, and bows head, showing his yellow cap and breast; if she stays on perch, he flies to her and hovers, bobs up and down, and quivers and flops long tail; female may crouch and quiver wings, he mounts, but more often he flies to ground and sings, she joins him, and the two forage while he continues to sing; she then flies away and visits other males. Brood-parasitic, lays in nests of Purple Grenadier, perhaps also in those of Blue-capped Cordon-bleu (*Uraeginthus cyanocephalus*), latter the only estrildid breeding at Kapoeta and Sudan–Kenya border when present species active (in Dec); in Tanzania, 11 of 15 nests of grenadiers were parasitized by this species; eggs laid one per day for 3 days, then a few days before next set, eggs white, unmarked, 15·5 × 12·5 mm; no information on incubation period. Hatchling has skin purplish-black, down grey, palate centre whitish with three black spots, tip dark grey, medial area behind spots orange, grading to whitish and pale blue on sides, rest of palate black, oral surface of gape black, dorsal gape swelling large and blue, ventral one small and pale blue, band around gape dark blue to purplish-black, tongue black with white edges, lower mandible black; mouth pattern orange and blue, similar to that of nestling Purple Grenadier; by time of fledging is rusty brown, like host's young but without blue rump and uppertail-coverts and black tail; nestling period c. 18 days. Female breeds in first year; male in full breeding plumage and song when 1 year old.
Movements. Resident; no seasonal movements known, but numbers fluctuate wildly at L Baringo, in Kenya.
Status and Conservation. Not globally threatened. Locally fairly common. Population density at L Baringo, in W Kenya, c. 3 singing males/km².
Bibliography. Archer & Godman (1961), Ash & Atkins (2009), Benson (1947a), Brown & Britton (1980), Cunningham-van Someren (1973), Erlanger (1907), Neunzig (1929b), Nicolai (1964, 1968c, 1968d, 1969, 1973a, 1973b), Nikolaus (1979, 1987, 1989), Payne (1977a, 1997a, 1998b, 2004), Payne, Parr & Payne (2003), Payne, Woods *et al.* (2000), van Someren (1922), Sorenson *et al.* (2004), Stevenson (1981), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

10. Shaft-tailed Whydah

Vidua regia

French: Veuve royale **German**: Königswitwe **Spanish**: Viuda Real
Other common names: Queen Whydah, Shaft-tailed Widow

Taxonomy. *Emberiza regia* Linnaeus, 1766, Africa = southern Angola.
This species and *V. fischeri* are sometimes placed together in a separate genus *Tetraenura*; the two have been thought to form a superspecies. Occasionally hybridizes with indigobirds (species undetermined) in the wild. Birds in S Mozambique described as race *woltersi*, but do not differ constantly in plumage colour from those elsewhere in species' range. Monotypic.
Distribution. S Angola, S & W Zambia, N & E Namibia, Botswana, Zimbabwe, S Mozambique, and N South Africa (Limpopo Province S to extreme N Northern Cape, N & W Free State and N Mpumalanga).



Descriptive notes. 10–11 cm, breeding male 27–30 cm; 12–17 g. Male breeding has forehead and crown black, throat, broad collar and most of underparts pale rusty brown, mantle to rump black, upperwing dark brown, flight-feathers edged pale, lower flanks, thighs and undertail-coverts black, underwing-coverts buff; tail short, dull brown with whitish edges, much broader whitish tips on inner web of outer rectrices, two central feather pairs (T1 and T2) black, greatly elongated (20 cm) and slender (shafts less than 2 mm wide), with a flag at tip; iris dark brown; bill and legs bright reddish-orange. Non-breeding male has bill paler orange and brown, legs pale, plumage like that of female, with upperparts streaky brown, but head more boldly marked, with more distinct crown streaking, supercilium and eyestripe. Female has crown streaked rusty, with darker brown stripe on side, paler face and superciliary stripe, upperparts light rusty or buff with dark brown streaks, wing blackish, edges of flight-feathers brown, tail dark brown, edged buff, underparts light buff to whitish and unstreaked; bill orange and brown. Female and non-breeding male distinguished from other, sympatric whydahs mainly by orange bill and legs, light rusty crown and back with dark streaks, short tail, buffy breast, and lack of bold head stripes (female face nearly plain, line of dull brown streaks on side of crown); from Red-billed Quelea (*Quelea quelea*) by brown (not yellow) edges of flight-feathers; from similar female and non-breeding male *V. chalybeata* (of race *amauropteryx*) by larger bill, shorter tail, less distinct head markings. Juvenile is brown above, head unstreaked, upperparts with indistinct streaks, paler edges of feathers, underparts rich buff, whiter posteriorly, bill black, legs brown; bill and legs change to orange and brown at start of moult into streaked plumage. Juvenile differs from that of Violet-eared Waxbill (*Granatina granatina*) host in dull brown crown, brown rump and tail (not blue rump and dark grey-brown tail), streaked back, paler underparts with white undertail-coverts, square (not pointed) tail, brown legs. Voice. Mimics song and calls of Violet-eared Waxbill. Mimetic song a warbled series of rapid sharp "chay" notes and fluting "tiu-woo-wee" or "seeeoo-woy" whistles, with buzzy "zhwee" or "ke'jeezy", high, thin "sssseee" and rapid sharp chippering notes, often in same phrase, e.g. "zee, jazeechew", "zeeeee-chaa-ja", "seeoo-chaweechew-wawjy"; phrase often ends with upslurred, slightly nasal whistle, "woy". Also has non-mimetic songs, a set of sharp notes like those of a canary (*Serinus*), "tsip-tsreepy-tsri-trri-trripy-tsreepy", song themes often repeated in pairs; also harsh buzzy chatters. Of the male's c. 20 kinds of song, many are non-mimetic themes without variation and repetition of elements between songs. Songs of neighbouring males alike; songs differ regionally.
Habitat. Semi-arid grassy thorn-scrub and acacia savanna, especially in umbrella thorn (*Acacia tortilis*) and camel thorn (*Acacia erioloba*) woodland on Kalahari sands, fallow croplands with sickle-bush (*Dichrostachys cinerea*), in regions with seeded grass and wooded habitat, and with more than 150 mm annual rainfall. Generally absent from miombo (*Brachystegia*) and *Terminalia* woodland with thickets, *Bauhinia* scrub and *Cryptosepalum* forest thickets, even when its host species, Violet-eared Waxbill, occurs there.
Food and Feeding. Small grass seeds, taken from ground. Breeding female eats eggs of host. Forages for seeds by "double-scratching": kicks sand and leaves away by jumping forwards and then backwards with both legs, uncovers seeds in dust, then pecks exposed seed. Drinks at open water when available. Breeding male forages on his display arena. Occurs alone or in flocks in breeding season; mainly in flocks in non-breeding season.
Breeding. Laying Feb–Apr in Namibia, Feb–Mar in Botswana and Dec–May in South Africa; males in breeding plumage Dec–Apr in Zambia and Zimbabwe. Territorial, male sings at call-site on thorn trees, excludes other males from song area, singing males near Windhoek (Namibia) only 50 m apart; male defends area of seeded grasses and attracts many females, males in spatially clumped sites attract intruding males; within breeding season, males move from site of low female activity to one of higher activity in effort to increase mating success. Female visits male and copulates at call-site, several females for one male; in courtship display, male hovers over perched female, or holds on to perch while he flaps wings, tail jerking much as he hovers, this "hover-hold" display lasting as long as 5 minutes. Brood-parasitic, lays in nests of Violet-eared Waxbill, occasionally in those of other estrildids, including Blue (*Uraeginthus angolensis*) and Black-faced Waxbills (*Estrilda erythronotos*); once a female perched near nest with incubating male Violet-eared Waxbill, latter's mate arrived, whydah entered nest, female waxbill followed and then left, whydah remained in nest for 45 seconds, another female whydah arrived and entered nest for a minute, followed by female waxbill, two whydah eggs subsequently found in nest; female removes and eats eggs of host (observed both in field and in aviary); of 15 Violet-eared Waxbill nests in South Africa, five were parasitized, four with 1 whydah egg and another with 5 (and 4 waxbill eggs), and one nest in Zambia had 3 whydah eggs; eggs develop in graded sets of 3 or 4, laid one per day, a few days between sets, eggs white, unmarked, 15 × 13 mm; incubation period 12–13 days. Hatchling has skin blackish, palate orange with three black spots (sometimes also two smaller posterior spots), tongue orange or yellow with black band, gape papillae light blue, black U-shaped mark on floor of mouth, nestling similar to that of waxbill but larger and with head broader; chicks reared together and fledge in mixed brood with waxbill young; nestling period c. 20 days.
Movements. Generally resident; partially nomadic in non-breeding season. Numbers fluctuate locally from year to year; abundant in some years and nearly missing in others in Kalahari region; waxbill host also locally seasonal in numbers. Local movement; one marked male in Namibia moved 150 km from Windhoek N to Etosha. Perhaps sedentary in less arid areas in E Botswana, with more seasonal nomads in drier W Botswana.
Status and Conservation. Not globally threatened. Locally common; abundance variable both regionally and annually. Estimated population in S Mozambique c. 500 individuals; in South Africa, 1000 birds in Kruger National Park and 2000 birds in Kgalakgadi Transfrontier Park (Gemsbok National Park). Population density 4 singing males/km of roadside S of Bulawayo, in Zimbabwe; only 1 call-site in 12 km² in NE South Africa.
Bibliography. Andersson, M. (1994), Barnard (1989, 1990, 1995), Curtis (1997), Dowsett *et al.* (2008), Everitt (1959), Friedmann (1960), Harrison *et al.* (1997), Hockey & Brooke (1987), Hockey *et al.* (2005), Hoesch (1934, 1939), Hoesch & Niethammer (1940), Immelmann (1969b), Maclean (1993), McCarthy (2006), Mörs (1925), Nicolai (1964, 1968d), Payne (1977a, 1997a, 2004, 2005a), Roberts (1930, 1935, 1939), Skead (1975), Sorenson *et al.* (2004), Tarboton *et al.* (1987), Tyler (2001a), Weeks (1968b), Winterbottom (1965, 1967).

PLATE 13 ➤

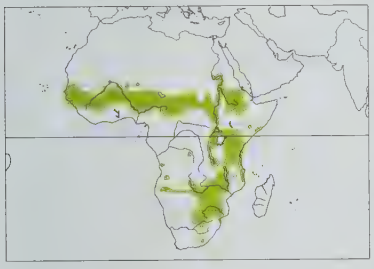

inches 2
cm 5
PLATE 13
ssp chalybeata
ssp neumanni
11
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ssp amauropteryx
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ssp funerea
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ssp nigerrima
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11. Village Indigobird

Vidua chalybeata

French: Combassou du Sénégal **German**: Rotfußwitwe **Spanish**: Viuda Senegalesa
Other common names: Common Indigobird, Indigofinch, Steel-blue/Village Widowfinch, Dull Blue-black Finch, Red-billed Firefinch Indigobird, Senegal Indigofinch/Combassou; Green Indigobird (*chalybeata* and *neumanni*); Purple Indigobird(!) (*ultramarina*); South African Indigobird (*okavangoensis*, *centralis* and *amauropteryx*); Zaire Indigobird (*centralis*)

Taxonomy. *Fringilla chalybeata* Statius Müller, 1776, Brazil; error = Senegal.
Formerly considered conspecific with *V. wilsoni*, *V. nigeriae*, *V. camerunensis*, *V. funerea*, *V. purpurascens* and *V. codringtoni*. These species differ, however, in breeding plumage of male, in bill and leg colours and, usually, in song, and in some cases also in nestling mouth pattern and colours; up to four species occur sympatrically, with no morphological evidence of interbreeding. Present species interbreeds with *V. funerea* in E DRCongo and with *V. purpurascens* in Tanzania. Races sometimes thought to form three groups, W & NC group (nominate and *neumanni*), NE group (*ultramarina*), and C & S group (*okavangoensis*, *centralis* and *amauropteryx*), possibly representing three separate species. Race *amauropteryx* has in the past been treated as a distinct species, having a red bill, but in SW Zambia, NW Zimbabwe and N Botswana red-billed and white-billed individuals occur together in mixed populations having same songs and competing for same call-sites and breeding females. Races *neumanni* and *centralis* intergrade in NE Africa. Green-glossed birds in Senegal sometimes separated as race *aenea*, but occur together with blue and greenish-blue birds; proposed taxon *incognita* (from SE DRCongo) is regarded as a synonym of *centralis*. Six subspecies recognized.
Subspecies and Distribution.
V. c. chalybeata (Statius Müller, 1776) – S Mauritania and Senegambia E to C Mali (Mopti), S to N Sierra Leone and Guinea.
V. c. neumanni (Alexander, 1908) – E Mali and N Ivory Coast E to S Chad, N Central African Republic and Sudan.
V. c. ultramarina (J. F. Gmelin, 1789) – Ethiopia and N Eritrea.
V. c. centralis (Neunzig, 1928) – S & E DRCongo (Kasai, Katanga, and around lakes Albert, Edward, Kivu and Tanganyika) E to Uganda, inland Kenya and inland Tanzania.
V. c. okavangoensis Payne, 1973 – W & S Angola, N Namibia, W Zambia (upper R Zambezi) and N Botswana.
V. c. amauropteryx (Sharpe, 1890) – coastal E Africa from S Somalia S to S Tanzania, Mozambique, and inland from S & E Zambia, Malawi and Zimbabwe (R Zambezi below Kazungula) S to N South Africa (S to North West Province, Free State, and N KwaZulu-Natal at Ndumu and Hluhluwe; also S Eastern Cape and Swaziland.



Descriptive notes. 10–11 cm, 11·3–15 g. Male nominate race breeding is black with green to steel-blue gloss, concealed white flank patch; upperwing and tail black to dark brown, inner three secondaries and their coverts black with gloss, other secondaries and primaries and their coverts black; sometimes central two feather pairs (T1 and T2) longer (by 2–10 mm) and more pointed than rest, variable both individually and annually; underwing-coverts light grey and black (sometimes all black); iris dark brown; bill white; legs light orange to bright reddish orange, becoming pale at end of breeding season. Best distinguished from other indigobirds by song, from some (e.g. *V. wilsoni*) also by darker (red-orange) legs. Non-breeding male is similar to female, but upperparts more distinctly streaked, legs light orange. Female has pale brown central crownstripe streaked with black, bordered by dark brown stripe, pale face with whitish supercilium and dark stripe from eye to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked, tail dark brown, upperwing brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to belly and undertail-coverts unstreaked whitish-grey, side of breast and flanks buffy grey, small concealed white flank patch, grey underwing-coverts; bill horn-brown with whitish base of lower mandible, legs light orange to flesh-coloured. Juvenile is brownish above, with indistinct buffy supercilium, indistinct darker grey streaks on back (pattern less distinct than on adult female), buffy below, becoming whitish on belly and undertail-coverts, iris dark brown, bill black, legs pinkish-grey, gape with white papillae, mouth with yellow palate (as in nestling); post-juvenile moult at 3–4 months, male develops breeding plumage when 1 year old. Races differ mainly in colour of plumage gloss of breeding male: *neumanni* is glossed purplish-blue; *ultramarina* has gloss bluish-purple to purple; *centralis* is glossed blue, wings dark brown; *okavangoensis* is like previous, but on average smaller; *amauropteryx* has gloss steely green-blue, female more streaked than nominate, both sexes with bill reddish. Voice. Song of breeding male a mix of dry rapid chatters, scratchy notes and rustling churrs, and imitations of songs and calls of Red-billed Firefinch (*Lagonosticta senegala*). Each male has a set repertoire of 24 distinct song themes, some mimicking firefinch host, others non-mimetic. Non-mimetic song themes of male are a prolonged chatter (10–12 notes), often with flourish at end, as female flies towards him, and a rapid chatter (12 notes per second) followed by slower chatter (6 notes per second), with flourish at end, when he hovers in front of her; gives two other song themes in a chase, and on returning from chase he repeats song in long series; also gives slow chatter, "cha-cha-cha-cha...", and rapid one, "chachachachacha...", alone or interspersed with complex songs. Song rate varies among individuals and with time of day, e.g. ten males delivered 4–76 songs (average 28) in 10 minutes, and sing on call-site for up to an hour. Male and female chatters have same structure. Mimicry of host includes "chick-pea-pea-pea" songs ("chick" the alarm note and "pea" a rising whistle), also begging calls of young firefinch, repeating a short call and a clear upslurred whistle; also alarm and begging calls of young firefinch, and song includes non-mimetic begging calls of young indigobird (which differ from those of young firefinch). In E & S Africa, nearly all males recorded (721 of 734) mimicked songs of their common host species, Red-billed Firefinch; occasional males mimic songs of another host, e.g. in 1967 a male at Merensky Nature Reserve (in South Africa lowveldt) imitated songs and calls of Jameson's Firefinch (*Lagonosticta rhodopareia*), in 1972 one at Lochinvar National Park (Zambia) mimicked Jameson's Firefinch, and in 1991 a male at Limbe (Malawi) imitated African Firefinch (*Lagonosticta rubricata*); of 309 males in localities where two or more indigobird species present, only three (c. 1%) had songs of the other host species; in localities where it does not occur with another host species, all 306 males mimicked songs of Red-billed Firefinch; along upper R Zambezi 28 males mimicked songs of Red-billed Firefinch and eight mimicked songs of Brown Firefinch (*Lagonosticta nitidula*), and in W Africa all 40 males recorded had mimetic songs of Red-billed Firefinch. In captivity, when reared by another foster species, male learns its songs (female imprints on its foster species and later parasitizes it).
Habitat. Thornbush savanna and brush along rivers, roadsides, edges of cultivated land, citrus orchards with annual grasses, mopane (*Colophospermum mopane*) woodland near water, gardens, towns, villages and cultivation. Often close to human habitation, foraging in sites with abundant *Echinochloa* and similar grasses. In *Acacia tortilis* savanna in South Africa; in SC Africa found in miombo (*Brachystegia*), Zambezi teak (*Baikiaea plurijuga*) and mopane open woodland, and in fallow and lightly cultivated habitats. From sea-level (in W & E Africa) to over 1600 m in Kenya (Nairobi) and 2000 m in Ethiopia (Addis Ababa). Roosts in dense trees.
Food and Feeding. Mostly small grass seeds, taken on ground. Also small termites (Isoptera), taken when these emerge in rains; female eats host's eggs. In uplands of Guinea and Sierra Leone, sometimes takes seeds of cultivated fonio (*Digitaria exilis*) before harvest, when seeds still on stem; in Mali small seeds of another cultivated cereal, finger millet (*Eleusine coracana*), and in Zambia mainly annual grasses *Echinochloa colonum*, *Setaria*, *Urochloris* and *Dactycynodon*, also seeds of herb *Amaranthus* around old cattle pens; same seeds as those taken by host species and by other *Vidua* species. Steals grass seeds at hole entrances of small seed-storing ants (*Pheidole*); takes crushed seeds and manioc (*Manihot esculenta*) meal in villages. Most seeds obtained from surface of ground, rather than by perching on erect stems; scratches earth with both legs to uncover seeds, hops backwards and then seizes food item. Dehusks grass seeds in bill; using tongue, rolls seeds one at a time forwards and back against ridge of palate. Foraging bouts last 1–24 minutes, and feeding most intense before flying to evening roost; one laying female had 340 small grass seeds in crop. Breeding male feeds on his territory, often within 15 m of song tree; females feed there with male. Flocks of more than 100 individuals in non-breeding season; associates also with congeners.
Breeding. Lays in late rains and early dry season, season longer in areas with permanent water: Jul–Dec in Senegal and Gambia, and Jun–Aug in Nigeria; in Kenya, May–Jun at L Victoria, Apr–Sept at L Baringo and May on coast; males in breeding plumage Dec–Mar at L Kivu; mainly Feb–Jun in Zambia (some males in breeding plumage late Jan to late Jul), but Jan to as late as Sept at Victoria Falls; mainly Dec–Apr in S Africa. Singing males separated by as little as 100 m, or as much as 1 km (out of hearing range of each other); male defends song perch from conspecific males and from those of congeners which interfere with his mating; if he disappears or is removed from active call-site another male replaces him; competing males, after resident displaced, sometimes chase for hours around call-site, flying far and wide from site, then focusing again on call-site, sometimes stop chase and feed together for several minutes before resuming chase. Male courtship centred on display-tree call-site, song begins a few minutes to an hour after sunrise, continues through day, sometimes until sunset, rate 4–76 songs (mean 28) per 10 minutes; male perches in erect posture, turns head slowly from side to side, hops around to broadcast song in all directions; female visits singing male and copulates as late as mid-afternoon, male hovers in front of her, his plumage fluffed and body bouncing, then flies to ground, feeds on seeds and gives mimicry songs, female often joins him and the two feed for a few minutes; female then flies to singing male at another site, often visits several males in succession as they court her in turn. Female active within song neighbourhood of several males within area of up to 10 km²; a successful male attracts 9–13 female visits in 10 hours, a less successful one only one or two, and many males attract none; successful male copulates once or twice in 10 hours, less successful males spend more time near a successful male, watch him and listen to his songs, then return to own call-sites and sing (they also watch resident male and attempt to move on to his site, but resident hops up to intruder and chases him); male displays also to other birds in his tree, most ill-targeted displays being given by males receiving no visits from female conspecifics; occasionally a female of another indigobird species perches on male's call-site, and two males of different species have been seen to court a female at same time and place. Brood-parasitic, normal host Red-billed Firefinch, also Brown Firefinch; female shows interests in nests during building stage, visits them before and during laying period, is attracted by firefinch calls and songs; she watches firefinch and follows it to nest, also searches vegetation and thatch houses for nests; female hovers in front of nest opening, and sometimes perches on top of nest and peers down into opening, enters nest and lays while firefinch away, or enters while latter on nest (even when she meets resistance by nesting pair); female sometimes removes firefinch egg from nest. Female lays sets of 1–4 (average 3) eggs, one egg per day, a few days between sets, total c. 22–26 in a season, sometimes lays more than one egg in a nest and more than one female may lay in same nest (nearly half of parasitized nests have more than one egg of parasite), eggs white, unmarked, c. 15·5 × 12 mm, larger, broader and rounder than those of host; incubation period 11–12 days. Hatchling has skin light orange-pink, down on crown, back and thighs whitish-grey, gape with large dorsal and ventral white papillae with blue base at side of mouth, corner of mouth dark blue, palate yellow with three black spots (behind these sometimes two tiny spots c. 0·1 mm in diameter), gullet pink, tongue yellow and unmarked (sometimes two black spots), lower mouth pink with black sublingual crescent, differs from nestlings of congeners in mouth pattern and colours (which are like those of young Red-billed Firefinch); young of present species and those of host are reared together; nestling period 17–18 days. Young fed by foster parents for 10–12 days after leaving nest, natal down worn away within a day or two after fledging, yellow palatal colour fades and gape papillae lose blue base and regress from age of independence; in mixed brood of young attended by firefinch pair, fledglings of present species repeat a single kind of begging call whereas firefinches irregularly alternate short and long notes (both are fed), in mixed brood or single-species brood attended by another foster species young give same calls as when reared by normal host (Red-billed Firefinch); fledglings huddle, are preened by foster parents and foster siblings (but do not allopreen in return), remain in family group for 10–14 days, then join flocks of other indigobirds; juveniles appear at call-sites c. 6 weeks after first copulations of season (a period that matches time from egg to independence), juvenile approaches song-mimicking male, latter chases it from site; flocks of juveniles and post-breeding adults form around call-sites, feed and roost together. Parasitized nest can produce up to 3 indigobird fledglings, and in mixed brood can fledge up to 4 firefinches and 1–2 parasite chicks; in Senegal 30% of 379 firefinch nests were parasitized (40% of parasite's eggs produced fledglings), and in Zambia 42% of 31 nests were parasitized; parasitized nests produce on average 26% fewer young firefinches than unparasitized nests, and overall impact on host of brood parasitism is relatively low. Female

On following pages: 12. Wilson's Indigobird (*Vidua wilsoni*); 13. Quailfinch Indigobird (*Vidua nigeriae*); 14. Jos Plateau Indigobird (*Vidua maryae*); 15. Jambandu Indigobird (*Vidua raricola*); 16. Barka Indigobird (*Vidua larvaticola*); 17. Cameroon Indigobird (*Vidua camerunensis*); 18. Dusky Indigobird (*Vidua funerea*); 19. Purple Indigobird (*Vidua purpurascens*); 20. Green Indigobird (*Vidua codringtoni*).

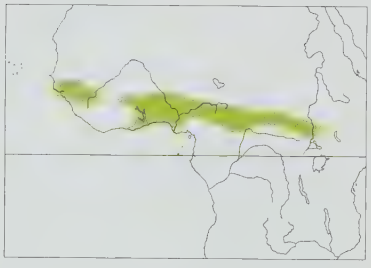
first lays at 1 year of age; male first courts female at 12 weeks after fledging, attains breeding plumage and sings at 1 year of age (or 2 years if fledged late in season). In captivity, males live for up to 10 years, both sexes breed successfully for five years; annual adult survival in the wild c. 55%, a ringed adult male last seen five years later.
Movements. Resident. In seasonal habitats, will move a few kilometres to surface water. One ringed individual recovered c. 25 km from ringing site.
Status and Conservation. Not globally threatened. Fairly common. Locally numerous in W Africa in cities, e.g. Dakar (Senegal), Banjul (Gambia), Bamako (Mali), Kano (Nigeria), towns and villages, and along R Benue in Cameroon; not seen in some localities where its host species occurs, e.g. Freetown, in Sierra Leone. Locally common on upper R Zambezi in Zambia and Zimbabwe. In S edge of range sporadic in occurrence; increasing in recent years at Grahamstown (S Eastern Cape), in South Africa. Total population in S Mozambique estimated at more than 2000 individuals, in Swaziland 400, in Kruger National Park (NE South Africa) 4000. Breeding density 1·2 males in 1 km² in SE Niger; in 1970s, in Zambia, 20 singing males in 10 km² in Lochinvar National Park (host Red-billed Firefinch about ten times more numerous); 2 males/km along R Thamalakane, in NW Botswana; in South Africa, c. 2 males/km² along R Letaba (Limpopo Province), fewer away from river.
Bibliography. Aldrovandi (1600), Andersson, M. (1994), Barlow *et al.* (1997), Bates (1930), Boyd (1914), Carswell *et al.* (2005), Chapin (1954), Delacour & Edmond-Blanc (1933, 1934), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Dowsett-Lemaire & Dowsett (2006), Friedmann (1960), Fry (1976), Grote (1928), Harrison (1963), Heuglin (1862, 1867, 1870–1871), Hockey *et al.* (2005), Jackson (1938), Jensen *et al.* (2008), Jourdain & Shuel (1935), Klein & Payne (1998), Koenig (1910), Lynes (1924), Mackworth-Praed & Grant (1949a), McCarthy (2006), Meise (1937), Moltoni (1925), Morel, G.J. (1959), Morel, G.J. & Morel (1955), Morel, M.Y. (1966, 1973), Neunzig (1929b, 1931), Nicolai (1961, 1964, 1972), Payne, R.B. (1967a, 1968a, 1968b, 1973a, 1977a, 1977b, 1979, 1980a, 1980c, 1982, 1985a, 1985b, 1985c, 1987b, 1990, 1996, 1997b, 1998b, 2004, 2005a), Payne, R.B. & Payne, K. (1977), Payne, R.B. & Payne, L.L. (2002), Payne, R.B. & Sorenson (2004), Payne, R.B., Barlow *et al.* (2005), Payne, R.B., Hustler *et al.* (2002), Payne, R.B., Payne, Nhlane & Hustler (1993), Payne, R.B., Payne & Woods (1998), Payne, R.B., Payne, Woods & Sorenson (2000), Payne, R.B., Woods & Payne (2001), Pooley & Dixon (1966), da Rosa Pinto & Lamm (1960), Sefc *et al.* (2005), van Someren (1916), Sorenson & Payne (2001b), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003), Stefani (1931), Strahan (1957), Sullivan (1976), Vincent (1936), White (1963), Wolters (1943), Yealland (1959).

12. Wilson's Indigobird

Vidua wilsoni

French: Combassou de Wilson **German**: Wilsonwitwe **Spanish**: Viuda de Wilson
Other common names: Bar-breasted Firefinch Indigobird, Wilson's Widowfinch; Pale-winged Indigobird (when treated as conspecific with *V. nigeriae*, *V. larvaticola* and *V. camerunensis*)

Taxonomy. *Hypochera wilsoni* E. J. O. Hartert, 1901, Yelwa, in Borgu, middle Niger River, Nigeria.
Formerly considered a race of *V. chalybeata*; often treated as conspecific with *V. nigeriae*, *V. larvaticola* and *V. camerunensis*; has been regarded as a race of *V. funerea*, but differs from that species in size, plumage and song mimicry. Proposed taxon *lorenzi* (described from Nigeria) is considered a synonym of present species. Monotypic.
Distribution. S Senegal, Guinea-Bissau, S Mali, Guinea, N Ivory Coast, S Burkina Faso and Ghana E to Nigeria, Cameroon, S Chad, Central African Republic, S Sudan (Nimule, Rimo, Sheikh Tombe, Torit), NE DRCongo (Uele), and W Ethiopia (Gambela).



Descriptive notes. 10 cm; 11–14 g. Male breeding is black with purple to bluish-purple gloss, concealed white flank spot; upperwing and tail brown, inner three secondaries and their coverts black with blue gloss, other secondaries and primaries and upperwing-coverts brown, underwing-coverts light grey (sometimes black); iris dark brown; bill white; legs light purplish, pinkish grey-flesh or pinkish-white. Distinguished from most other indigobirds by combination of purplish (not blue or green) gloss, contrasting brown wings, and pale purplish-grey to pinkish-grey legs; from *V. chalybeata* in W Africa by purple plumage, pale legs, and brown wings and tail. Non-breeding male and female have pale brown central crownstripe streaked black, bordered by dark brown stripe, pale face with whitish supercilium and dark stripe from eye back to lighter brown unstreaked nape, ear-spot blackish and indistinct; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, wings brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts unstreaked whitish-grey, side of breast and flanks buffy grey, underwing-coverts grey; bill grey or grey-brown, culmen darker. Juvenile is similar to female but pattern less distinct, has pale supercilium extending to nape, brownish upperparts with indistinct darker grey streaks (rump plain brown), chin to upper breast grey, lower breast buffy grey, flanks buffy, belly and undertail-coverts buffy white; iris dark brown, bill black, legs grey; gape structure and colours and palate colours initially as for nestling, regress with independence. Voice. Song mixed with infrequent imitations of songs and calls of Bar-breasted Firefinch (*Lagonosticta rufopicta*). Each male has c. 20 different song themes, of which a third mimic songs of host, thin squeaky little jingles with short notes that jump around in pitch, a few short whistles and high and low nasal notes, given in rapid and irregular pattern (this pattern repeated from time to time). Also mimics firefinch alarm, a sharp "pik" (1 or 2 notes or an irregular chatter) and begging calls, high "wiswis...". Other song themes are non-mimetic, two given to approaching female and in hover display, two when chasing other males. Also has hard, raucous chatter, slow ("cha-cha-cha-cha...") or fast ("chachachachacha"), interspersed with complex non-mimetic songs. Males within a few kilometres of each other match their song themes; males farther apart differ in details of song.
Habitat. Overgrown cultivation, grassland with scattered bushes, tall grass, edges of riverine vegetation and floodplains, from lowlands to plateaux. Common around chicken farms and cultivated areas, fish farms, gardens and houses, northern woodland savanna, and grassy areas around fish ponds and streams.
Food and Feeding. Small grass seeds, including cultivated fonio (*Digitaria exilis*). Feeds on seeds scattered on ground, often accompanied by other small seed-eating passerines; takes chicken feed with domestic fowl on chicken farms. Breeding male forages mainly on display territory.
Breeding. Lays in late rains and early dry season; breeds in Jul–Sept in S Ghana, Aug–Sept in N Nigeria and Nov–Jan in SE, and Oct to early Dec in N Cameroon. Male territorial, defends song perch from own and other species of indigobird, sings on call-site; female attracted to mimetic song, male displays by hovering over her and in front of her and flies to ground, where he forages and gives mimetic songs; female often joins him, and the two feed for a few minutes. Female solicits copulation by crouching and quivering wings, as male hovers and then mounts. Brood-parasitic, lays in nests of Bar-breasted Firefinch; eggs laid in sets of 3–4, one per day, a few days between sets; eggs white, unmarked, 15 × 12 mm; no information on duration of incubation period. Hatchling has down on head and back light grey, no information on skin colour, gape with swollen flange (rather than distinct papillae), white to light bluish on outer corner (constricted at corner), mouth-lining pink to reddish-lilac, five black palatal spots, tongue pink with two black spots, gullet pink, floor of mouth pink with black sublingual chevron; like nestling Bar-breasted Firefinch, but latter has three palatal spots; chicks of both species reared together in nest, nestling period 17–19 days. Fledglings (of both species) fed by adult firefinches, independent at c. 29 days (at 14 days in captivity after leaving nest prematurely). Of six firefinch-attended family groups with present species in Ghana, two also had firefinches; in Nigeria, one fledged brood of four individuals contained two young of each species.
Movements. Apparently resident.
Status and Conservation. Not globally threatened. Uncommon in W & C parts of range; little known in E but probably similarly uncommon.
Bibliography. Dowsett & Dowsett-Lemaire (2005), Macdonald (1980a), Nicolai (1972, 1987), Payne (1976, 1977a, 1982, 1996, 1997b, 1998a, 2004), Payne & Groschupf (1984), Payne & Payne (1994, 2002), Sclater (1930), Sefc *et al.* (2005), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003).

13. Quailfinch Indigobird

Vidua nigeriae

French: Combassou du Nigéria **German**: Grünschwanzwitwe **Spanish**: Viuda Nigeriana
Other common names: Alexander's Indigobird; Pale-winged Indigobird (when treated as conspecific with *V. wilsoni*, *V. larvaticola* and *V. camerunensis*)

Taxonomy. *Hypochera nigeriae* Alexander, 1908, Kiri, Gongola River, northern Nigeria.
Formerly considered a race of *V. chalybeata*; often treated as conspecific with *V. wilsoni*, *V. larvaticola* and *V. camerunensis*; has been regarded as a race of *V. funerea*, but differs from that species in size, plumage and song mimicry. Monotypic.
Distribution. Gambia (old records), S Mali (Kara), Ghana (Sung, R Yombaba), NC & E Nigeria, NC Cameroon, and S Sudan (Yei).



Descriptive notes. 10–11 cm; 10–14 g. Male breeding is black with dull green gloss (under mid-day sun may appear black, blue or purplish), concealed white flank spot; tail brown, inner three secondaries and their coverts glossy black, other secondaries and primaries and upperwing-coverts pale brown, underwing-coverts light grey (sometimes some coverts black); iris dark brown; bill white; legs light purplish. Distinguished from *V. maryae* and *V. raricola* by less glossy plumage; best separated by song. Non-breeding male and female have pale brown central crownstripe streaked black, bordered by dark brown stripe, pale face with whitish supercilium and dark stripe from eye back to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks (rump unstreaked brown), tail dark brown, wings brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts unstreaked whitish-grey, side of breast and flanks buffy grey, underwing-coverts grey; bill grey or grey-brown, culmen darker. Female and non-breeding male distinguished from *V. chalybeata* by pale purplish (not orange) legs; indistinguishable from other indigobird species in range. Juvenile has less distinct pattern than that of adult female, brownish above, faint buffy superciliary stripe, upperparts with indistinct darker grey streaks (rump unstreaked), breast buffy, belly and undertail-coverts white, iris dark brown, bill black, legs grey; mouth similar to that of host, African Quailfinch (*Ortygospiza atricollis*), gape with two distinct papillae on each side (one above, one below), papillae dark blue at base and light grey in front and joined by magenta base, dorsal papilla extending forwards to base of light grey anterior part of ventral papilla, palate pink to lilac with three black spots in front (anterior spot chevron-shaped, open posteriorly) and two smaller black spots behind (the five spots forming a ring), tongue pink with two small black spots, gullet pink, floor of mouth pink with black sublingual chevron; gape structures and colours and palatal colours regress with independence. Voice. Song churring and scratchy, mixed with imitations of songs and calls of African Quailfinch. Reproduces with remarkable fidelity songs of quailfinch with bamboo wind-clapper quality, staccato "klik klak klooik" and soft, burbling "gru grie gitty" sexual song, also mimics African Quailfinch contact phrases that descend in pitch, harsh "klek" contact call, "tink" flight call, and begging call of fledglings ("sisi..."). Each male has c. 20 distinct song themes, a third of which are mimetic. Non-mimetic songs include slow and fast chatters, "cha-cha-cha-cha..." and "chachachachacha...", two complex themes used in calling approaching female and in hover display, and two others in aggressive chases with other males. Males within a few kilometres of each other match all their song themes; males farther apart have different song details.
Habitat. Open grassy areas with scattered bushes or trees, open ground, grassy floodplains, rice fields, fish farms and cultivation. In N Nigeria, common around agricultural areas where old dams (built during tin-mining in first half of 20th century) now used for irrigating dry-season fields of peas, beans, tomatoes and peppers and to supply fish ponds.
Food and Feeding. Small grass seeds, taken from surface of ground. Breeding male feeds in his breeding territory; family group of hosts and young feed together in cultivated lands. Occurs in small flocks of males, females and juveniles at end of breeding season.
Breeding. In N Nigeria, males in breeding plumage, song and courtship and mating in Jul and Sept–Nov, females with egg in oviduct Oct–Nov and fledged young mid-Oct, all indicative of breeding in Sept–Nov; in Cameroon, males in breeding plumage, song and courtship and mating recorded in Sept–Oct and Jan. Territorial male defends song perch as a mating site, sings repeatedly from tree or bush in territory for several weeks, attracting females; courts visiting female by hovering over her as she perches on call-site, mates with several visiting females; after each courtship display, successful or not, he flies to seeded grasses a few metres from call-site and gives mimetic songs to call female, which then forages with him on ground. Brood-parasitic, lays in nests of African Quailfinch, eggs white, unmarked, 15·6 × 12·3 mm (egg in oviduct of female caught at call-site of singing male in Nigeria); no information on incubation and nestling periods, nestling undescribed; family parties include foraging adult pair and young of African Quailfinch and one or two young of parasite.

Movements. Presumed resident.
Status and Conservation. Not globally threatened. Distribution extremely local; species perhaps widely overlooked. Known from very few sites, widely scattered; these include type locality on Gongola–Benue floodplains, where its host species African Quailfinch is locally common. Apparently no recent records from Gambia. African Quailfinch occurs over much wider range, including E & S Africa, where present species not known to be present.
Bibliography. Alexander (1908), Dowsett & Dowsett-Lemaire (2005), McCarthy (2006), Payne (1973a, 1996, 1998a, 2004, 2005a), Payne & Payne (1994, 2002), Payne & Sorenson (2007), Sorenson *et al.* (2004).

14. Jos Plateau Indigobird

Vidua maryae

French: Combassou du Jos **German**: Jos-Plateau-Witwe **Spanish**: Viuda del Jos

Taxonomy. *Vidua funerea maryae* Payne, 1982, Panshanu, 30 miles [c. 50 km] east of Jos, Nigeria.
Originally described as a race of *V. funerea*, but recent research suggests that it is not closely related to latter and is a distinct species. Monotypic.
Distribution. On and near Jos Plateau, in N Nigeria; also N Cameroon.
Descriptive notes. 10–11 cm; 12–14·5 g. Male breeding is black with green to blue-green gloss, concealed flank spot white; tail brown, upperwing with inner three secondaries and their coverts glossy black, other secondaries and primaries and upperwing-coverts brown, underwing-coverts light grey (some can be black); iris dark brown; bill white; legs light purplish. Differs from other W African indigobirds in combination of bluish-green gloss, brown wings, pale purplish legs; wing length greater than that of *V. larvaticola*; best distinguished by song. Non-breeding male is like female, but slightly more distinctly streaked above. Female is grey-brown above, has dark streaks along side of crown and dark streak through eye, back indistinctly streaked, wings brown, buffy wingbars formed by tips of upperwing-coverts, underwing-coverts grey; bill grey or grey-brown, darker above. Female and non-breeding male indistinguishable from other indigobirds in range. Juvenile undescribed. Voice. Song churring and scratchy, much as those of other indigobirds, mixed with imitations of songs and calls of Rock Firefinch (*Lagonosticta sanguinodorsalis*); each male has c. 20 distinct song themes, some mimetic, others not, two song themes used in calling to approaching female and in hover display, two others in chasing other males. Slow and fast chatters like those used in song are used also in aggressive contexts, interspersed with complex songs. Birds within a few kilometres of each other match the full set of songs; those farther away have different songs. Most distinctive mimicked vocalization is descending trill, "treeeee"; others are a downslurred whistled "chew" in paired notes and in a slow upslurred whistle, a "chwee" repeated in slow trill, a long unmodulated high-pitched whistle "feeew" lasting over 0·5 seconds (and variant, a slurred whistle "feeee-eeeee" whistle), a slow trill, "too-too-too-too, a short "pit" alarm call repeated as chatter (14–18 "pit" notes per second), and begging call of young.



Habitat. Base of rocky outcrops in semi-arid Guinean savanna in relatively undisturbed land, at 800–1200 m; lightly farmed land and pasture; scattered bush and grass grazed by cattle, goats and sheep. Mean annual rainfall near Jos 1411 mm, drier in E part of range.
Food and Feeding. Small grass seeds, taken from ground. Male and females feed in male territory in breeding season.
Breeding. Breeding season probably Sept/Oct–Dec, inferred from observation of birds in breeding plumage, song, courtship behaviour and mating. Territorial, breeding male sings persistently from conspicuous perch on tree or bush, attracts several females in a day and mates with some of them, gives mimicry begging calls in copulation; after courtship display, whether successful or not, male flies to ground a few metres away, where he gives mimetic songs, female flies to him and the two forage together. Brood-parasitic; mimics songs and calls of Rock Firefinch, the apparent host species. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Occurs in a restricted range in N Nigeria on and near Jos Plateau: observed at Kagoro, Jos (Taboru, Bukuru), Panshanu Pass, and Dok-Pai hills (near Tipap). No population estimates available. At Panshanu Pass, a singing male appeared in a call-site tree in 1968 and another was noted singing in same tree 28 years later.
Bibliography. Alexander (1907), Anon. (2009b), Elgood *et al.* (1994), Mills (2010), Payne (1968b, 1976, 1982, 1996, 1998a, 2004), Payne & Payne (1994, 2002), Sorenson *et al.* (2004).

15. Jambandu Indigobird

Vidua raricola

French: Combassou jambandou **German**: Jambanduwitwe **Spanish**: Viuda de Jambandú
Other common names: Goldbreast Indigobird

Taxonomy. *Vidua raricola* Payne, 1982, Banyo, Cameroon.
Species named "*raricola*" because song was considered to mimic that of Black-bellied Firefinch (*Lagonosticta rara*); however, type series included material of two species; specimen chosen as holotype of "*Vidua raricola*" proved to be of the form that instead is song mimic of Zebra Waxbill (*Amandava subflava*), whereas species that mimics song of *L. rara* now known to be *V. camerunensis*. Monotypic.
Distribution. Sierra Leone, Ghana, Nigeria, Cameroon, W & S Sudan, NE DRCongo, and W Ethiopia (Jimma).
Descriptive notes. 10 cm; 10·5–15 g. Male breeding is black with bright green gloss, concealed white flank spot; tail brown, upperwing with inner three secondaries and coverts glossy black, other secondaries and primaries and upperwing-coverts brown, underwing-coverts light grey; iris dark brown; bill white; legs light purplish. Distinguished from other pale-winged indigobirds by bright green gloss; best recognized by voice, with imitations of songs and calls of Zebra Waxbill (*Amandava subflava*). Non-breeding male, late-hatched first-year breeding male and female have pale brown central crownstripe streaked black, bordered by dark brown stripe, pale face with whitish superciliary stripe, and dark stripe from eye to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, upperwing brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts unstreaked whitish-grey, side of breast and flanks buffy grey, underwing-coverts grey; upper mandible grey or grey-brown, lower mandible whitish. Female and non-breeding male are indistinguishable from other pale-winged indigobirds in range. Juvenile has less distinct pattern than adult female, is brownish above with faint darker grey streaks (more uniform than non-breeding male and female), rump brown, crown nearly uniformly grey-brown and unstreaked, buffy supercilium indistinct, breast buffy, throat and underparts white, bill black, legs grey; gape with two papillae on each side, one above and one below, papillae dark blue at base and light blue in front, joined by magenta base, dorsal papilla extends forwards to base of light blue front part of ventral papillae, blue papillae smaller than black base (suggesting blackish oral flange of Zebra Waxbill), palate pink with ring of five black spots, base of palate bright pink (mouth pattern unlike that of young Zebra Waxbill). Voice. Song churring, grating and scratchy, like those other indigobirds, mixed with imitations of songs and calls of host species, Zebra Waxbill; each male has c. 20 distinct song themes, a third of which are mimetic, others not. Slow and fast chatters like those used in songs are given in aggressive contexts, interspersed with complex songs. Birds within a few kilometres of each other match full set of non-mimetic songs, and mimicry songs and calls; distant populations have different songs. Vocalizations of host waxbill mimicked include strident chirps and weak twittering, "chip chit cheet chink cheup chink"; "chit", repeated one or two times per second; "trip" flight call; "chink" alarm call, often given in repeated series with harsh "chur" and short descending "ink"; wavering begging calls of young, "chee-chee-cheew-cheeze..." and "tyew-tyit-tyit", notes high-pitched (6–8 kHz), unlike those of other African estrildids. Except for mimicry alarm calls, mimetic calls of present species have a simple harmonic structure with single frequency band, unlike complex harmonic bands of *V. nigeriae* vocalizations.



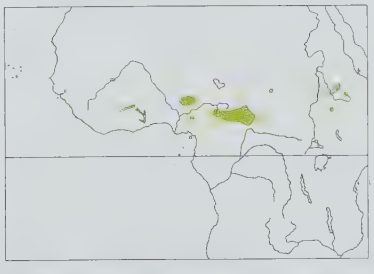
Habitat. Floodplains and edges of cultivation and grassy wetlands; rice fields, manioc (*Manihot esculenta*) fields, marshes, and tall grass in marshy areas.
Food and Feeding. Small grass seeds, taken from ground. Male feeds on his display territory, as also do females and juveniles. In mixed flocks with other seed-eating passerines after breeding season.
Breeding. Oviduct egg in Dec in Sierra Leone; males in breeding plumage, song, courtship and mating in Sept–Jan in Nigeria and Cameroon; male in breeding plumage in Nov in W Ethiopia. Territorial, male defends song perch as a mating site; interspecifically territorial with *V. camerunensis* in Sierra Leone and Cameroon. In courtship, male sings persistently from conspicuous perch in tree or bush, attracts several females in a day, courts each in hovering flight display, copulates on perch while giving mimetic begging calls; after display, whether successful or not, he flies to grassy place a few metres away, where he gives mimetic songs, calling female, which joins him and forages with him. Brood-parasitic, lays in nests of Zebra Waxbill (which either builds own nest, a ball of grass placed low in grass or reeds, or uses old nests of *Amblyospiza* and *Ploceus* weavers, *Cisticola* warblers, and other grassland and marsh birds); eggs develop in sets of 3, laid one per day, a few days between sets, eggs white, unmarked, 15 × 12 mm (egg in oviduct of female caught with singing male at Kabala, in Sierra Leone); host rears parasite's young successfully, even though mouth pattern of latter does not match that of own young; no information on incubation and nestling periods, and nestling undescribed. A fledged young of present species observed to accompany family group of Zebra Waxbill at Jos, Nigeria.
Movements. Resident, so far as known.
Status and Conservation. Not globally threatened. Distribution appears to be very localized; species perhaps overlooked. Generally rather uncommon; locally common in manioc cultivations in N Cameroon.
Bibliography. Ash & Atkins (2009), Balakrishnan & Sorenson (2006), Balakrishnan, Sefc & Sorenson (2009), Immelmann *et al.* (1965), McCarthy (2006), Payne (1976, 1977a, 1982, 1996, 1998a, 2004, 2005a), Payne & Groschupf (1984), Payne & Payne (1994, 2002), Sorenson *et al.* (2004).

16. Barka Indigobird

Vidua larvaticola

French: Combassou barka **German**: Barkawitwe **Spanish**: Viuda de Barka
Other common names: Black-faced Firefinch Indigobird, Bakra/Baka Indigobird; Pale-winged Indigobird (when treated as conspecific with *V. wilsoni*, *V. nigeriae* and *V. camerunensis*)

Taxonomy. *Vidua larvaticola* Payne, 1982, Zaria, Nigeria.
Often treated as conspecific with *V. wilsoni*, *V. nigeriae* and *V. camerunensis*. Precise geographical distribution uncertain; population in Chad and Central African Republic may consist of this species, *V. camerunensis* or both, and those in Ethiopia, currently treated within present species, may be referable to *V. camerunensis*; further study required. Monotypic.
Distribution. Guinea-Bissau, S Mali, NE Ivory Coast, NW Ghana, Nigeria, C Cameroon, S Chad, N & NW Central African Republic, W & E Sudan, and NW & W Ethiopia (adjacent to Gallabat area of Sudan, L Tana region, and Gambela).



Descriptive notes. 10–11 cm; 12–14 g. Male breeding is black with blue to green-blue gloss, concealed white flank spot; tail brown, inner three secondaries and their coverts glossy black, other secondaries and primaries and upperwing-coverts dark brown, underwing-coverts light grey (or some coverts black); iris dark brown; bill white; legs pinkish-white to light purplish to whitish-mauve. Differs from other W African indigobirds in having blue to bluish-green gloss, darkish brown wings (in fresh plumage, darker than those of *V. camerunensis*), pale purplish legs; best identified by voice. Non-breeding male, late-hatched first-year male and female have pale brown central crownstripe streaked black, bordered by dark brown stripe, pale face with whitish supercilium, dark stripe from eye back to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, upperwing brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts unstreaked whitish-grey, side of breast

and flanks buffy grey, underwing-coverts grey; bill grey or grey-brown, darker above, legs purplish-grey to flesh-grey or whitish. Female indistinguishable from other pale-winged indigobirds in its range. Juvenile is less distinctly patterned than adult female, brownish with indistinct darker grey streaks above, rump brown, crown nearly uniformly grey-brown, indistinct buffy superciliary stripe, breast buffy, belly and undertail-coverts white, bill black, legs grey; two blue papillae at each side of gape, papillae paler blue in front, short pinkish ridge behind them, palate yellow with ring of five black spots (posterior two spots small), gullet orange, two spots on tongue, gape and mouth patterns like those of young of Black-faced Firefinch (*Lagonosticta larvata*) host. Voice. Song churring and scratchy, like those of other indigobirds, mixed with imitations of songs and calls of host, in most of range mimics Black-faced Firefinch, in Mali mimics Mali Firefinch (*Lagonosticta virata*); each male has c. 20 distinct song themes, a third of which mimic songs and calls of host, the others non-mimetic, some a canary-like twitter, others a grating "chuck-chucker", some non-mimetic except for introductory note (which is same as firefinch's alarm). Slow and fast chatters like those used in songs are given in aggressive contexts and interspersed with complex songs. Males within a few kilometres of each other match their song themes; those farther apart have different songs. Mimicked vocalizations of Black-faced Firefinch include 3–5 slow slurred whistles, "weet-weet-weet-weet", a "tuu-ii, tuu-ii", falling and then rising in pitch, a blow-and-suck sound, "whee-hew, whee-hew", rising and then falling (accent on falling note), a shrill "seesee" contact call, and a sharp repeated "dwit-it-it" alarm call; mimicked vocalizations of Mali Firefinch are a rattling trill "churrrrrrrr, choorrrrrrr..." as alarm, plaintive "feeeeeeeeeeeeee" and "feeu" whistles, slow "wee-wee-wee-wee-wee..." trills, and low wheezing "kyah".

Habitat. Overgrown grassy cultivation, riverine thickets, wooded savannas and grassland with scattered bushes.

Food and Feeding. Small grass seeds, taken from ground. Forages alone, or in small flocks and with estrildid finches.

Breeding. Limited information. Season Aug–Oct in Nigeria. Territorial, male defends song perch as a mating site and forages in territory; interspecifically territorial with *V. wilsoni*. Sings persistently from conspicuous perch in tree or bush, attracts several females in a day, courts each in hovering flight display, copulates at perch while giving mimetic begging calls; after hover display, whether successful or not, male flies to grassy place a few metres away, gives more mimicry songs, female joins him and the two feed together on ground. Brood-parasitic on Black-faced Firefinch (fledglings in mixed-species family groups in N Nigeria), suspected brood parasite also of Mali Firefinch (based on song mimicry); eggs white, unmarked; no information on incubation and nestling periods, and nestling undescribed.

Movements. Resident.

Status and Conservation. Not globally threatened. Distribution appears to be very localized; species perhaps overlooked. Generally uncommon.

Bibliography. Dodman *et al.* (2004), Dowsett & Dowsett-Lemaire (2005), Kraft & Kirk-Greene (1973), Newman & Newman (1977), Nicolai (1968a, 1972), Payne (1968b, 1973a, 1976, 1977a, 1982, 1996, 1998a, 2004), Payne & Barlow (2004), Payne & Payne (1994, 2002), Skinner (1972), Sorenson *et al.* (2004).

17. Cameroon Indigobird

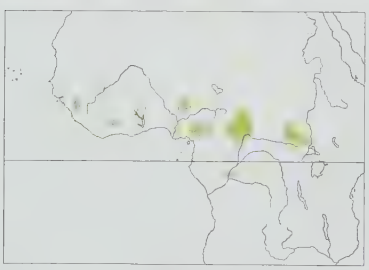
Vidua camerunensis

French: Combassou du Cameroun **German**: Kamerunwitwe **Spanish**: Viuda Camerunesa
Other common names: Fonio Indigobird; Pale-winged Indigobird (when treated as conspecific with *V. wilsoni*, *V. nigeriae* and *V. larvaticola*)

Taxonomy. *Hypochera chalybeata camerunensis* Grote, 1922, between Nola and Mbaika = Central African Republic.

Formerly considered a race of *V. chalybeata*; often treated as conspecific with *V. wilsoni*, *V. nigeriae* and *V. larvaticola*, and sometimes also with *V. funerea*. Described taxa *Hypochera chalybeata sharii* and *V. funerea sorora* are synonyms of present species. Precise geographical distribution uncertain; population in Chad and Central African Republic may consist of this species, *V. larvaticola* or both, and those in NW & W Ethiopia, currently treated within *V. larvaticola*, may be referable to present species; further study required. In W Africa, no difference in plumage colour or size among males mimicking different species of estrildid finch. Monotypic.

Distribution. Guinea-Bissau, S Mali, Guinea, N Sierra Leone, Ivory Coast, Ghana, Togo, Nigeria, W & C Cameroon, S Chad, Central African Republic, S Sudan, NE & W DRCongo (Uele, Equateur, Bandundu), and E PRCongo (N'gabé).



Descriptive notes. 10–11 cm; 11–14 g. Male breeding is black with blue to bluish-green gloss, concealed white flank spot; tail brown, wing with inner three secondaries and their coverts glossy black, other secondaries and primaries and upperwing-coverts brown, underwing-coverts light grey (or some coverts black); iris dark brown; bill white; legs light purplish. Non-breeding male, late-hatched first-year male and female have pale brown central crownstripe streaked black, bordered by dark brown stripe, pale face with whitish supercilium, dark stripe from eye back to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, upperwing brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts unstreaked whitish-grey, side of breast and flanks buffy grey, underwing-coverts grey; bill grey or grey-brown, upper mandible darker, legs light purplish to pinkish (not orange). Female is not distinguishable from those of other pale-winged indigobirds in range. Juvenile is more uniform in appearance than adult female, is brownish above, crown nearly uniformly grey-brown, indistinct buffy supercilium, back with indistinct darker grey streaks, rump plain brown, breast buffy grey, belly white, bill black, legs grey. Voice. Song churring and scratchy, mixed with imitations of songs and calls of hosts. Each male uses repertoire of c. 20 distinct song themes, a third of which are host-mimetic, the others not; slow and fast chatters given in aggressive contexts, interspersed with complex songs in song bouts. Males within a few kilometres of each other match the full set of songs; those farther away have different set of songs. Male mimics songs of one of several estrildid hosts, namely African Firefinch (*Lagonosticta rubricata*), Black-bellied Firefinch (*Lagonosticta rara*), Brown Twinspot (*Clytospiza monteiri*) and Dybowski's Twinspot (*Euschistospiza dybowskii*), each male copying only one species; mixed song populations occur in some localities, certain males mimicking one species and others another. Vocalizations mimicked include: of African Firefinch, "pit pit pit" alarm call (10–20 notes per second, sometimes slower), also "too-too..." whistles, and slurred "tsee wee wee" whistles; of Black-bellied Firefinch, four or more low, slow whistles, "tew-tew-tew-tew", a low whistled contact "squeer" rising and falling in pitch, and a sharp "chek" alarm call; of Brown Twinspot, "vay, vay" contact call, a short "keeha", a sharp "tek tek tek" alarm, and complex song combining these calls and whistles; of Dybowski's Twinspot, a "zet" alarm, "kek" and "churr" contact calls, and complex songs with varied phrases including canary-like whistled trill, "rrrrrrr", and buzzy whistle, "vweee". In W Africa, several "song races": of 207 males, 108 mimicked Black-bellied Firefinch, 79 African Firefinch, 17 Dybowski's Twinspot, and two mimicked Brown Twinspot; birds of two song races occur together in Sierra Leone and Guinea (where some males mimic African Firefinch songs and others mimic Dybowski's Twinspot songs), in Guinea-Bissau (some mimic African Firefinch, others Black-bellied Firefinch), and in N Cameroon (some imitate African Firefinch, others Black-bellied Firefinch), in SE Nigeria mimics Brown Twinspot, and near type locality in Central African Republic occurs with Black-bellied Firefinch.

Habitat. Wooded or shrubby edges of rivers, roads and grassy cultivated lands, especially fonio (*Digitaria exilis*) on rocky slopes with thin soil, where annual rainfall exceeds 400 mm, as in upland Fouta Djalon (Guinea and Sierra Leone), and similar habitat (though no fonio) in N Nigeria and Cameroon. Mainly at 800–1200 m in Guinean woodlands; also in wet lowland with more than 2000 mm rainfall in SE Nigeria and where Brown Twinspot present.

Food and Feeding. Small grass seeds, taken from ground. Especially fond of fonio (known also as "hungry rice") when this harvested in Sept–Oct in upland Guinea and Sierra Leone. Flocks together at end of breeding season, sometimes with other members of genus.

Breeding. Males in breeding plumage and courting in Oct in Guinea-Bissau and (also with mating) in Guinea, and males in breeding plumage courting and mating in Sept and Oct in Sierra Leone and Sept to early Dec in Cameroon. Territorial, spacing call-site equally between males of same and different song races, and males of other species (*V. wilsoni*, *V. raricola*). Male sings persistently from conspicuous perch in tree or bush, defends tree and area around singing site, courts visiting females in hovering flight display, copulation at his perch during which he gives mimicry begging calls; after courting, whether successful or not, male flies to grassy place a few metres away, where he gives mimicry songs, calling female, which approaches and forages with him on ground. Brood-parasitic, thought to parasitize Black-bellied and African Firefinches and Brown and Dybowski's Twinspots, evidence for which mostly song mimicry, except for one Black-bellied Firefinch nest in Cameroon containing chick of present species; eggs white, unmarked, 15 × 12 mm, laid one per day, incubation period 11–12 days. One documented hatchling (in Black-bellied Firefinch nest) had skin dark pinkish-grey, down grey on crown, back and thighs, long on crown, gape with pair of small rounded white papillae, one above and one below, base of papillae blue-black on posterior side, gape between papillae mauve-pink, inner lining of gape-flange cherry-red, palate pinkish-white with ring of five black spots (anterior three spots large, posterior two small), tongue pink with two black spots, lower mouth pinkish with black crescent, like mouth of nestling Black-bellied Firefinch; nestling period 17–18 days. Two nestling indigobirds can survive and fledge in same nest.

Movements. Resident. Possibly a seasonal migrant in NE DRCongo (Uele), where flocks not seen in non-breeding season (breeds in late rains).

Status and Conservation. Not globally threatened. Locally common. In most of its range, occurs with African Firefinch and Black-bellied Firefinch. Has been observed continuously at Tibati, in Cameroon, during many decades.

Bibliography. Balakrishnan & Sorenson (2006, 2007), Balakrishnan, Sefc & Sorenson (2009), Bannerman & Bates (1924), Bates (1924, 1930), Chapin (1954), Dodman *et al.* (2004), Dowsett & Dowsett-Lemaire (2005), Nicolai (1968a, 1972), Payne (1968b, 1973a, 1976, 1982, 1996, 1998a, 2004, 2005a), Payne & Groschupf (1984), Payne & Payne (1994, 1995, 2002), Payne *et al.* (2005), Sefc *et al.* (2005), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003), Wilkinson (2008).

18. Dusky Indigobird

Vidua funerea

French: Combassou noir **German**: Mohrenwitwe **Spanish**: Viuda Sombría
Other common names: African Firefinch/Brown-backed Firefinch Indigobird/Widowfinch; Variable Indigobird (mainly when treated as conspecific with *V. camerunensis* and *V. codringtoni*); Black Indigobird (*nigerrima*)

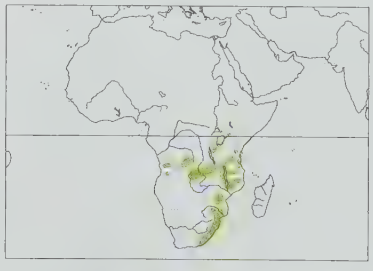
Taxonomy. *Fringilla funerea* Tarragon, 1847, Natal, South Africa.

Has been thought to form a superspecies with *V. purpurascens*, and has been treated as conspecific. Formerly considered conspecific with *V. chalybeata*. Has been treated as conspecific with *V. wilsoni*, *V. nigeriae*, *V. camerunensis* and *V. codringtoni*; differs from first two in size, plumage and song mimicry; differs from *V. camerunensis* in morphology, and molecular-genetic studies indicate no recent common ancestor; sympatric with *V. codringtoni* without interbreeding, and the two parasitize different host species. Interbreeds with *V. chalybeata* in E DRCongo and with *V. purpurascens* in SE DRCongo. Race *nigerrima* has sometimes been treated as a full species. Indigobirds with green to blue breeding plumage in W DRCongo (Kwamouth, Bandundu) may be of this species; field studies needed. Two subspecies recognized.

Subspecies and Distribution.

V. f. nigerrima (Sharpe, 1871) – W Kenya, Tanzania, S & SE DRCongo, N Angola, Zambia, Malawi, Mozambique (except extreme S) and E Zimbabwe.

V. f. funerea (Tarragon, 1847) – N & E South Africa, Swaziland and extreme S Mozambique (S of R Limpopo).



Descriptive notes. 10–11 cm; 11–19 g. Male nominate race breeding is black with dull bluish-purple to purplish-blue cast (plumage not very glossy, even when fresh), concealed white flank spot; tail brown, wing with inner secondaries and their coverts glossy black, rest of secondaries and primaries and upperwing-coverts dark brown, underwing-coverts light grey (or some black); iris dark brown; bill white; legs red-orange. Distinguished from almost identical *V. purpurascens* by sometimes more bluish plumage tone (and none as purple as the most purple of latter); best identified by song. Non-breeding male and female have black-streaked pale brown central crownstripe bordered at side by dark brown stripe, pale face with whitish supercilium and dark stripe from eye back to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, upperwing brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts whitish-grey, side of breast and flanks buffy grey, underwing-coverts grey; bill

grey-white, grey or grey-brown, upper mandible darker, legs light pinkish-grey to pale orange. Female and non-breeding male are indistinguishable from female *V. purpurascens*. Juvenile is brown with indistinct darker streaks above, crown nearly uniformly grey-brown, indistinct buffy superciliary stripe, breast buffy, belly and undertail-coverts white; juvenile at Lilongwe (Malawi) had yellow palate with three black spots, gape with two pairs of papillae on each side, each papilla with dark blue tip and paler base, and narrow pinkish-violet band between them, mouth pattern matching that of young African Firefinch (*Lagonosticta rubricata*). Race *nigerrima* differs from nominate in having legs light purplish-grey to pale pink. Voice. Song with metallic chatters, dry churrs and grating notes (like those of other indigobirds) mixed with imitations of lilting whistled songs and calls of African Firefinch (recorded songs of 80 males all mimicked this firefinch). Male has c. 20 distinct song themes, a third of which are host-mimetic, the others not so; slow and fast chatters (like those in non-mimetic songs) are given in aggressive contexts, interspersed with complex songs. Males within a few kilometres of each other have matching songs; those farther away have different songs. Distinctive mimetic songs include African Firefinch's "pit pit pit" alarm call, 10–20 notes per second, slurred "tsee wee wee", and "too-too-too..." whistles.

Habitat. Moist woodland and edges of montane and riverine forests, inhabiting roadsides, orchards with annual grasses, grassy areas with ferns, weeds or rank vegetation, lightly cultivated land; locally in villages and gardens. In Malawi, occurs to 2000 m (host firefinch to 2500 m).

Food and Feeding. Small grass seeds, taken from ground. Laying female eats eggs of host. Breeding male forages within his territory, female feeds with him near call-site. Uncovers seeds by rapid "double-scratch", rapidly kicking aside top soil with one foot and then the other, hopping back, and pecking at exposed seeds.

Breeding. Males in breeding plumage in Mar–May in Malawi; in South Africa, males in breeding plumage, song, courtship and mating Jan–Mar and females with egg in oviduct in Jan. Territorial, male sings from conspicuous perch in tree or bush or telephone wire, defends tree and area around singing site; courts visiting females in hovering flight display and the two copulate at his perch, he giving mimetic begging calls; after courting, whether consummated or not, male flies to grassy place nearby and gives mimetic songs, a female approaches and feeds with him on ground. Brood-parasitic on African Firefinch, as determined mainly by observations of parasitized nests and brood (in Malawi), by distribution and song mimicry (Zambia, Malawi, E Zimbabwe and South Africa), by mixed-species party of fledglings (KwaZulu-Natal), and by geographical distributions (Angola). Eggs develop in ovary in sets of 3–4, laid one per day, a few days between sets, eggs immaculate white, 15 × 12 mm; nestling skin colour undescribed, natal down on crown, humeral/alar, spinal and femoral regions, chicks in mixed broods reared together with those of host; no information on incubation and nestling periods. Family group with one fledgling of present species and four firefinch fledglings responded to adult firefinch calls.

Movements. Mainly resident. Reported movements of ringed individuals covering 4 km, 15 km and, in E South Africa, 87 km (Pietermaritzburg W to Himeville in 2 months) and 190 km (Richard's Bay S to Pietermaritzburg in 10 months).

Status and Conservation. Not globally threatened. Locally common. Singing male conspicuous when perched on treetop or telephone wire, otherwise easily overlooked. Estimated population in S Mozambique minimum of 200 individuals, in Swaziland 15,000, and in Kruger National Park (NE South Africa) 2000. In S part of range where firefinch host is regular, present species first noted in 1923; now appears in some years but not in others (Transkei, King William's Town, Grahamstown, Amanzi).

Bibliography. Clancey (1996), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Elliott & Jarvis (1970), Friedmann (1960), Godfrey (1923), Günther & Feiler (1986), Hockey *et al.* (2005), Kemp *et al.* (2001), Manson & Manson (1984), Markus (1970), McCarthy (2006), McCulloch *et al.* (1970), Meise (1937), Nicolai (1967), Niven & Niven (1966), Payne (1968a, 1973a, 1977a, 1982, 1996, 2004), Payne & Payne (2002), Payne, Payne & Nhlane (1992), Payne, Payne, Nhlane & Hustler (1993), Quickelberge (1989), Ripley & Bond (1979), Schorkopf (1937), Skead (1964, 1965a, 1995), Sorenson *et al.* (2004), Traylor (1966), Vernon (1967).

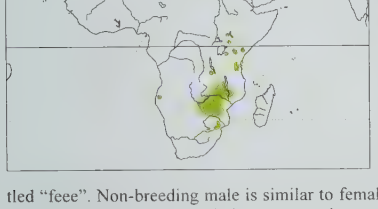
19. Purple Indigobird

Vidua purpurascens

French: Combassou violacé **German**: Purpurwitwe **Spanish**: Viuda Purpúrea
Other common names: Purple Widowfinch, Dusky Indigobird(!), Jameson's Firefinch Indigobird

Taxonomy. *Hypochera purpurascens* Reichenow, 1883, Useguha, east Tanzania.
Has been thought to form a superspecies with *V. funerea*. Formerly considered a race of *V. chalybeata*, and sometimes treated as conspecific with *V. funerea*; interbreeds with former in NE Tanzania and with latter in SE DRCongo. Monotypic.

Distribution. Kenya, N & E Tanzania, SE DRCongo, SW Angola, S & E Zambia, Malawi, W Mozambique, NE Botswana, Zimbabwe, and N South Africa (Limpopo and Mpumalanga lowveld).



Descriptive notes. 10–11 cm; 11·5–15·5 g. Male breeding is black with purplish or bluish-purple gloss (gloss dull, even when plumage fresh), concealed white flank spot; tail dark brown, wing with inner three secondaries and their coverts glossy black, other secondaries and primaries and their upperwing-coverts brown to dark brown, underwing-coverts light grey; iris dark brown; bill white; legs puce to pale pink. Differs from *V. funerea* and *V. chalybeata* in having pinkish-white (not reddish) legs; best identified by song imitations of Jameson's Firefinch (*Lagonosticta rhodopareia*), especially alarm "purr" call and whistled "feee". Non-breeding male is similar to female, but upperparts more distinctly streaked, legs light orange. Female has pale brown central crownstripe streaked black, bordered by dark brown stripe, whitish supercilium, dark stripe from eye back to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, wings brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast to undertail-coverts plain whitish-grey, side of breast and flanks buffy grey, underwing-coverts grey; bill grey-white, grey or grey-brown, upper mandible darker, legs light pinkish-grey. Female and non-breeding male are indistinguishable in field from *V. funerea*, and not always distinguishable from *V. chalybeata*; differ from race *amauropteryx* of latter in bill and leg colours. Juvenile is similar to female but with less distinct patterning, has crown nearly uniformly grey-brown, upperparts brown and only lightly streaked, indistinct buffy supercilium, whitish below, breast buffy grey, bill black (changes to whitish from 40 days after fledging); mouth-lining pink, broad pinkish-violet oral flange extending between two small white papillae at each side of gape, and narrow blue band separating pink and white areas (mouth pattern nearly identical to that of nestling and juvenile of host, Jameson's Firefinch); post-juvenile moult at 3–4 months, in captivity three males at 1 year had pale legs and dull purplish-blue plumage similar to those of adult males at site of capture. Voice. Chattering and churring songs like those of other indigobird species, mixed with imitations of songs and calls of Jameson's Firefinch: rapid "purr" alarm; high piping notes ending in double whistle, "hihihihihi-way-wee", fast and slow liquid trills; 2-note whistled series, "t'we t'we"; long sustained whistle "feeew" or downslurred "feeeeeew". Each male has 24 song themes, of which a third mimic host species, the others not so; slow and fast chatters (like those given in song) used in aggressive contexts, interspersed with complex songs. Males within a few kilometres of each other match their songs ("song neighbourhoods" may be more than 20 km² in area); males a few kilometres farther away have different songs. Female chatters like those of male.

Habitat. Grassy, brushy woodlands, thornbush and riverine habitats. Roosts in dense leafy trees in mixed-species flocks with congeners in breeding season and, especially, in dry season. In much of range occurs together with *V. chalybeata*, but both present species and its host are less tolerant of heavy grazing by cattle than are *V. chalybeata* and its host, Red-billed Firefinch (*Lagonosticta senegala*), and tend to be found in denser bushland and taller grass than habitat preferred by last two species.

Food and Feeding. Small grass seeds, taken from ground. In Zambia, takes seeds of annual grasses *Echinochloa colonum*, *Setaria*, *Urochloris* and *Dactycynodon*, and amaranth (*Amaranthus*), as also do sympatric race *amauropteryx* of *V. chalybeata* and their firefinch hosts. Moves on ground by hopping; feeding bout lasts for up to 20 minutes. Scratches with both legs nearly simultaneously to uncover seeds on bare earth, then hops backwards and pecks up exposed food. Hulls seeds in bill, rolling each one forwards and back with tongue against ridge of palate. Breeding male and his female visitors forage in male display area. Near end of breeding season, flocks with congeners.

Breeding. Season (based mainly on oviduct eggs) Jun in Kenya, Feb–May (some males in breeding plumage into Jul) in Zambia, Apr in Botswana, Jan–May (breeding plumage as late as Oct) in Zimbabwe, and Dec–Apr in South Africa. Territorial, male defends song perch and mating site from own species and congeners, sings on open tree or call-site, 10–50 songs in 10 minutes, may sing continuously for an hour, usually begins in early morning and can continue through day until 30 minutes before sunset; male attracts up to six females in a day and copulates with as many as three daily, courts visiting female with hover above and in front of her, mounts from above, utters mimetic songs while pair in cloacal contact; after courting, whether successful or not, male flies to grassy place nearby and gives mimicry songs, a female approaches and feeds with him on ground; female then flies to another male, and is courted by each of several males in turn. Brood-parasitic, lays in nests of Jameson's Firefinch, which rears parasite's young together with own brood; nestling skin colour and natal down undescribed, mouth colours and papillae like those of juvenile (and those of firefinch's own chicks); eggs develop in ovary in graded sets of 3–4, eggs laid one per day, a few days between sets, eggs white, unmarked, 15 × 12·5 mm (larger than those of host); no information on incubation and nestling periods. Fledged young occur in family groups of Jameson's Firefinch; independent juveniles appear at call-site of singing adult male from Mar, when other adult males flock to these sites and begin post-breeding moult; juveniles may learn songs and form social associations at these times. Maximum recorded survival involved a female ringed as adult in Malawi and recovered 4 years later; annual survival of marked individuals in Zambia c. 50%.

Movements. Resident. Perhaps locally nomadic in non-breeding season.

Status and Conservation. Not globally threatened. Locally fairly common. Often confused with *V. funerea* in earlier literature. Ringed female active within area of 10 km². In 1973–1976, population density at Lochinvar National Park, in Zambia, c. 0·5 males/km², and density of Jameson's Firefinch was about ten times that of its brood parasite. By 1997, numbers had decreased locally by 90% concurrent with increased grazing by domestic cattle. Although they prefer tall grass and lose habitat as a result of grazing cattle, both species occur in patchy grassy habitats with grazing wild ungulates, as at Kirawira (Serengeti National Park), in Tanzania.

Bibliography. Colebrook-Robjent (1977), Cooper (1972), Dowsett-Lemaire & Dowsett (2006), Hockey *et al.* (2005), Maclean (1993), McCarthy (2006), Parker (1999), Payne (1968a, 1973a, 1977a, 1982, 1985b, 1987b, 1996, 2004, 2005a), Payne & Payne (2002), Payne *et al.* (1993), Sorenson *et al.* (2004), Tarboton *et al.* (1987), Tree (1994).

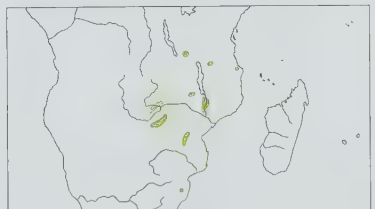
20. Green Indigobird

Vidua codringtoni

French: Combassou de Codrington **German**: Sambesiwitwe **Spanish**: Viuda Verdosa
Other common names: Green Widowfinch, Peters's Twinspot Indigobird, (Southern) Twinspot Indigobird, Luangwa/Zambezi/Codrington's Indigobird

Taxonomy. *Hypochera codringtoni* Neave, 1907, Molilo's, near Petauke, Zambia.
Formerly considered a race of *V. chalybeata*; has been treated as conspecific with *V. funerea*, but throughout its range breeds sympatrically with latter, and the two parasitize different host species. Described taxon *V. funerea lusituensis* (from R Lusitu, in E Zimbabwe) is a synonym of present species. Monotypic.

Distribution. S & SE Tanzania, S Zambia, W & S Malawi, W & E Zimbabwe, and NE South Africa (N KwaZulu-Natal).



Descriptive notes. 10–11 cm; 11·4–14·1 g. Male breeding is black with bright blue or green gloss, concealed white flank spot; tail black, wing with inner three secondaries and their coverts glossy black, other secondaries and primaries and upperwing-coverts black, underwing-coverts light grey; iris dark brown; bill white; legs bright orange or red. Differs from sympatric congeners, e.g. *V. chalybeata*, in combination of glossy green to blue plumage, black wings and tail, brighter orange legs, and larger size, also by voice. Non-breeding male is like female, but more strongly marked. Female has black-streaked pale brown central crownstripe bordered by dark brown lateral stripe, pale face with whitish supercilium, dark stripe from eye back to lighter brown unstreaked nape, indistinct blackish ear-spot; upperparts brown with blackish shaft streaks, rump unstreaked brown, tail dark brown, nearly black, wings dark brown, buffy wingbars formed by tips of upperwing-coverts; chin and throat whitish, breast grey, side of breast and flanks buffy grey, belly and undertail-coverts white, underwing-coverts grey; bill whitish to grey or grey-brown, upper mandible darker, legs orange, duller in non-breeding season. Female differs from congeners in more distinct separation of grey breast and white belly. Juvenile is less patterned than adult female, has crown nearly uniformly grey-brown, indistinct buffy supercilium, brown upperparts only lightly streaked, whitish below, breast buffy grey; mouth yellow with three black palatal spots, no other details. Voice. Song churring and scratchy, like

those of other indigobird species, mixed with imitations of songs and calls of host. Peters's Twinspot (*Hypargos niveoguttatus*). Each male has c. 20 song themes, a third of which mimic host species; non-mimetic songs include low and fast chatters similar to those in songs of other indigobirds, given in aggressive contexts, interspersed with complex song. Males within a few kilometres of each other match all their song themes; those farther away have different sets of song themes. Most distinctive and frequently heard mimicked twinspot vocalization is "trrrrrrreee" alarm trill, higher in pitch (7–8 kHz) than firefinch alarm trills (4 kHz). Also copies simple song, high "treeee" followed by lower whistles and rapid chatter; long, complex, soft sexual song with whistles, trills and chatters; short excitement calls, "sip" and "tsisi"; and begging calls, which resemble those of young firefinches.

Habitat. Riverine and flooded thickets and dense acacia (*Acacia*) woodland thickets, usually in lowlands; also around airfields, garden areas and camp-sites in Zambia (S of Lusaka), and at camp-sites in NE South Africa (KwaZulu-Natal). Roosts in dense foliage of trees, in small groups in breeding season.

Food and Feeding. Small grass seeds, taken from ground. Breeding male and his female visitors forage on his territory; in non-breeding season, forages in flocks with congeners and with estrildid finches.

Breeding. Males in breeding plumage, song, courtship and mating in Mar–May; breeding plumage Jan–May in Zambia and mid-Jan to mid-Jun in Malawi. Territorial, male sings from conspicuous perch in tree or bush, defends tree and area around singing site; courts visiting females as he hovers in flight display, copulation at his perch, male then giving mimetic begging calls, after which he flies to grassy place a few metres away and gives mimetic songs, female approaches and forages with him. Brood-parasitic on Peters's Twinspot and Pink-throated Twinspot (*Hypargos margaritatus*), evidence for which based on song mimicry; in Zambia, Zimbabwe and Malawi 38 of 40 males mimicked song of Peters's Twinspot, and at Phinda Game Reserve (KwaZulu-Natal), in South Africa, where that twinspot does not occur, males mimic songs of Pink-throated Twinspot; occasional males imitate songs of other estrildids, e.g. in Zimbabwe one at Premier Estate (Mutare) copied songs of African Firefinch (*Lagonosticta rubricata*) and one at Kwekwe mimicked songs of Jameson's Firefinch (*Lagonosticta rhodopareia*); in captivity parasitizes Peters's Twinspot, which rear and fledge young. Ovary develops sets of 3 eggs, laid one egg daily, a few days between sets, eggs white and unmarked; no information on incubation and nestling periods, nestling undescribed.

Movements. Resident.

Status and Conservation. Not globally threatened. Not well known. Probably fairly common locally.

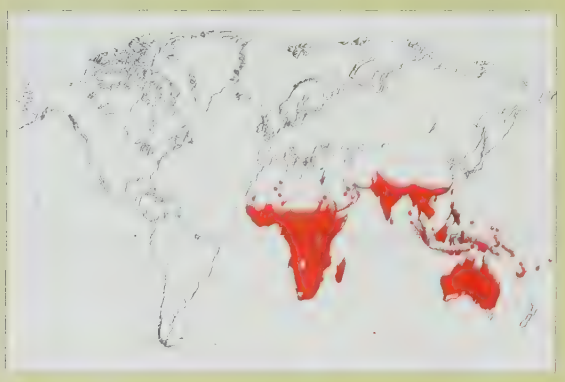
Bibliography. Colahan (1995), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett, Aspinwall & Leonard (1999), Dowsett-Lemaire (2006), Dowsett-Lemaire & Dowsett (2006), Hockey *et al.* (2005), Klein & Payne (1998), Payne (1973a, 1977a, 1996, 2004, 2005a), Payne & Payne (2002), Payne, Payne & Nhlane (1992), Payne, Payne, Nhlane & Hustler (1993), Sefe *et al.* (2005), Sorenson *et al.* (2004), Stjernstedt (1994).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family ESTRILDIDAE (WAXBILLS)



- Small passerines with short bill, short rounded wings, some species with plumage dull brown or grey, many brightly coloured and boldly patterned.
- 8–15·5 cm.



- Afrotropical, Oriental and Australasian Regions and tropical Pacific islands.
- Open grassland and marshy areas to open woodland and rainforest.
- 32 genera, 134 species, 314 taxa.
- Eight species and one subspecies threatened; none extinct since 1600.

Systematics

The estrildid finches are a group of songbirds living in the Old World, with centres of diversity in Africa and Australasia. They are small, often brightly coloured passerines with a short bill and short, rounded wings, and most are terrestrial foragers with a seed-eating lifestyle. Some species, such as the Australian Zebra Finch (*Taeniopygia castanotis*) and White-rumped Munia (*Lonchura striata*), are popular as cagebirds and have been bred in captivity for more than a century. Other species have been involved in the cagebird trade, have been observed and bred in captivity, and have been the subjects of behavioural studies. The estrildid finches maintain a strong pair-bond, the male and female partners spending most of their time together. They build an unwoven, covered nest with a side entrance, and both sexes incubate the eggs and care for the young. The nestlings and fledged young have a distinctive method of begging for food, with the neck held low and twisted to one side and the open mouth directed upwards. The parents feed their young mainly on regurgitated seeds. The song of most members of the family is sexual, and given by the male to a female at close range, rather than being a territorial signal delivered over a distance. Perhaps more so than with other groups of songbirds, the behaviour of the estrildids has been used as a means of estimating the systematic relationships among the species.

The closest relatives of the Estrildidae are the Viduidae, the African brood-parasitic whydahs and indigobirds in the genera *Vidua* and *Anomalospiza*. The genus name *Vidua* was described by G. Cuvier in 1817, earlier than the publication of the genus name *Estrilda*, which W. Swainson described in 1827. Were these two sets of finches to be combined, the family name would be Viduidae because of nomenclatural priority. In addition, the estrildid and viduid finches have sometimes been included in an expanded family Ploceidae, and morphological and molecular-genetic studies ranging from that of G. D. Bentz, in 1979, to the analyses of K. A. Jønsson and J. Fjeldså, in 2006, reveal that this set also is monophyletic.

Three main systematic groups of Estrildidae have often been recognized. The first, the waxbills, live mainly in Africa; the second group, the grassfinches, look similar in appearance to the waxbills and live in Australia; and the third group, the munias and mannikins, consists of thick-billed finches that occur throughout the Old World tropics, the parrotfinches being brightly coloured birds of southern Asia, Australia and the Pacific islands.

The present arrangement adopts a comprehensive phylogenetic estimate based on mitochondrial genetics of all species, and in which the groups are treated as three subfamilies: the waxbills,



Subdivision of the Estrildidae

[Figure: Hilary Burn]



The Estrildidae are thought to have originated in Africa, where the greatest number of species can be found, and where the two most closely related families, Viduidae (whydahs and indigobirds) and Ploceidae (weavers), also have their centres of diversity. The subfamily Estrildinae occurs mostly in Africa, with two species, the Green Avadavat (Amandava formosa) *and the* ***Red Avadavat****, inhabiting southern Asia. The Red actually shares a more recent ancestor with the third member of the genus, the Zebra Waxbill* (A. subflava) *of Africa, than with the Green. The Red Avadavat has been introduced in many parts of the world.*

[*Amandava amandava*, Tuscany, Italy. Photo: Daniele Occhiato]

in Estrildinae; the parrotfinches, in Erythrurinae; and the grassfinches, munias and mannikins, constituting the subfamily Lonchurinae. In this estimate, the parrotfinches share a recent common ancestor more with the grassfinches, munias and mannikins than with the waxbills.

Systematic interest in estrildid finches has focused on comparative morphology and behaviour, and, more recently, molecular genetics have been compared in order to estimate the phylogeny of species and the relationships of estrildids with other groups of songbird. Early systematic accounts were based on museum study skins, with particularly emphasis given to the shape of the wing. J. P. Chapin, in 1917, first drew attention to the importance of mouth markings of the nestlings, the young waxbills having palate spots and the munias palate bars. He described the nestling mouths, the relative length of the primary feathers and the form of the nest for several genera and species. In 1943, J. Delacour considered both morphology and behaviour. He regarded the waxbills, which he placed in the subfamily Estrildinae, as being characterized by the presence of marks and spots on the nestling gape and palate, by high-pitched whistling songs, by the male's use of a grass or straw or feather in courtship display, by the body proportions of a small head but long wing and tail, and by the general active and sprightly behaviour. In contrast, the mannikins, which Delacour grouped in a subfamily Amadinae, were characterized by the possession of a simpler nestling gape consisting of a swelling, rather than distinct balls or wattles, a nestling palate with curved bars, a less musical song and a more static display, a massive bill and head, but short wings and tail, and a generally clumsy appearance. He placed the third group, the grassfinches, in "Erythrurae", which he described as intermediate between the other two, the nestling mouth markings more like those of the waxbills, but the adult voice unmelodious, and the song and courtship more similar to those of the mannikins than to those of the waxbills; these birds varied in appearance, were less clumsy than the mannikins, and were slower and heavier than the waxbills.

In morphological studies, the feather tracts differentiate the families Ploceidae, Viduidae and Estrildidae. Bentz compared the limb muscles of estrildid finches. He found five species of grassfinch, then grouped in "Poephilinae", to have two uniquely derived muscles. One was a deep wing muscle, M. pronator profundus Type 2; the other was a leg muscle with a fleshy origin of the postacetabular portion of M. iliotibialis lateralis. A second set of finches, "Lonchurinae", had two uniquely derived muscle traits: in the wing an elongated belly of M. tensor propatagialis pars brevis, and in the leg a loss of M. plantaris. This set of birds included two *Erythrura* parrotfinches, three *Lonchura* species, and an African waxbill, the Cut-throat Finch (*Amadina fasciata*); M. plantaris was present in the waxbill. A third set of finches, "Estrildinae", represented by 18 species in Bentz's study, had M. pronator profundus Type 2, as in the grassfinches, but had lost M. latissimus dorsi pars caudalis. Other muscle types varied within these sets of finches. In addition to these species, the terrestrial Locust Finch (*Paludipasser locustella*) has unusually large leg muscles, unlike the terrestrial African Quailfinch (*Ortygospiza atricollis*).

The eleven recognized races of the ***African Quailfinch*** *are sometimes considered to comprise two or even three species, with the black chinned and, less often, white-spectacled forms being treated as distinct. But the facial patterns of the races integrade, and there are no significant differences in vocalizations, or in bill colour during breeding. The mouth colour and pattern of nestlings are also the same for all races. Nestling mouth markings have been used to establish taxonomic relationships among the Estrildidae.*

[*Ortygospiza atricollis ansorgei*, Pirang, Gambia. Photo: Steve Garvie]





The genus Amadina *has been treated by some as belonging to the munia / mannikin subfamily, Lonchurinae, because of the thick bill, scaly-patterned underparts, and singing posture. But the songs, nestling palate markings, and sexual dimorphism in adult plumage are closer to the waxbill subfamily, Estrildinae. The relatively large, mannikin-like conical bill of the* ***Cut-throat Finch*** *is probably the result of convergence, reflecting selection pressure associated with dietary specialization.*

[*Amadina fasciata contigua*, Modimolle, South Africa. Photo: Warwick Tarboton]

Other morphological studies that have been used in assessing the systematic relationships among the finches involved the plumage, the skeleton, the structure of the bill, and the natal down and palate markings of the nestlings. The palates of estrildid nestlings are remarkable, perhaps more so than in any other avian family. Most nestling waxbills and the parrotfinches have palate spots, and many grassfinches and the mannikins and munias have palate bars or lines.

In chromosome morphology, L. Christidis, in several papers published in the 1980s, reported three groups: the grassfinches formed one group, the munias, mannikins, parrotfinches and *Amadina* formed another, and the waxbills represented a third group. In these studies, the species membership within each group was assumed on the basis of earlier classifications of E. Mayr and colleagues, in 1968. The parrotfinches, the Pictorella Finch (*Heteromunia pectoralis*) and the *Amadina* species were compared with the munias and mannikins, but they were not compared also with other groups such as the Australian grassfinches and the waxbills. In chromosome morphology, *Heteromunia* was less similar to the *Lonchura* species than it was to the parrotfinches and the African *Spermestes*.

An early genetic assessment of estrildid relationships by Christidis, based on protein electrophoresis of 30 species, reported that the Australian grassfinches comprised one set of taxa, with the African waxbills as their closest relatives. The sister-group to that set included the *Lonchura* munias and mannikins, with *Amadina* most closely related to these birds, and the *Erythrura* parrotfinches were the sister-group to *Lonchura* and *Amadina*. In contrast to those estimates, a study of protein electrophoresis, morphology and behaviour of 22 species, undertaken by L. F. Baptista and colleagues in 1999, indicated that the two *Amadina* species were waxbills, that the munias and mannikins with the grassfinches were a sister-set to the waxbills, and that the African *Spermestes* mannikins were a sister-set to the Australasian munias and mannikins in the genus *Lonchura* and the African Silverbill (*Euodice cantans*); parrotfinches were not included in the comparison. A mitochondrial and nuclear estimation of the phylogeny of twelve species by M. A. A. Van der Meij and co-workers, in 2004, gave results much like those of Baptista and colleagues, the African waxbills including *Amadina* in one clade and the parrotfinches, grassfinches, munias and mannikins in another clade.

In a later molecular study, the estimate of estrildid phylogeny was based on a comparison of all estrildid species. The data were mitochondrial sequences of 1100 base pairs for each species and many subspecies. The estimate was preliminary, because only some results have been published in detail. The published generic phylogeny detailed by M. D. Sorenson and co-workers, in 2004, included all except two monotypic estrildid genera. Of those two, the Locust Finch, once thought to belong in the genus *Ortygospiza*, had been found by R. B. Payne and Sorenson to be only distantly related to that genus, and the Mountain Firetail (*Oreostruthus fuliginosus*) was placed within the grassfinches. In addition, Sorenson and colleagues listed three species of



The three antpeckers in the genus Parmoptila *are considered to form a superspecies. Jameson's* (P. jamesoni) *and the Red-fronted Antpecker* (P. rubrifrons) *are sometimes treated as conspecific, as, less often, is* ***Woodhouse's Antpecker****. These are forest species. They have small, narrow bills, decurved at the tip, and cleft tongues with brush-like bristles. They were once thought to belong to the nectarivorous flowerpeckers (Dicaeidae), and are still sometimes known as "flower-pecker finches".*

[*Parmoptila woodhousei woodhousei*, Mt Cameroon, Cameroon. Photo: Doug Wechsler/ VIREO]

Most estrildids have short, stubby bills like those of typical finches. More slender and elongated bills, like that of the ***Grey-headed Negrofinch****, indicate an insectivorous rather than seed-eating diet. Like the antpeckers* (Parmoptila)*, negrofinches are forest-dwelling waxbills, and they are highly arboreal, and rather like tits (Paridae) in behaviour. Four species of* Nigrita *are currently recognized, but of the six races of the Grey-headed Negrofinch two,* emiliae *and* candidus*, may be separate species.*

[*Nigrita canicapillus canicapillus*, Lekki Peninsula, Lagos State, Nigeria. Photo: A. P. Leventis]

Nesocharis, but one of these, the Grey-headed Oliveback (*Nesocharis capistrata*), was in fact associated with *Estrilda*. Moreover, the relationships among certain species were not included in the published results. The mitochondrial phylogeny provides a reference for evaluation of the relationships among the estrildid finches. This preliminary estimate of phylogeny is the basis of the present understanding of finch relationships.

The subfamily Estrildinae occurs mainly in Africa, with two species in southern Asia. The main clades are one consisting of the Cut-throat Finch and Red-headed Finch (*Amadina erythrocephala*), three avadavats (*Amandava*), the Locust Finch and the African Quailfinch; one containing the forest finches in the genera *Nigrita*, *Parmoptila*, *Nesocharis*, *Cryptospiza* and the Green Twinspot (*Mandingoa nitidula*), and the *Estrilda* waxbills; and a third clade, incorporating the firefinches (*Lagonosticta*), pytilias (*Pytilia*), blue waxbills (*Uraeginthus*) and purple waxbills (*Granatina*), the twinspots in *Clytospiza*, *Hypargos* and *Euschistospiza*, and the forest seedcrackers (*Pyrenestes*) and bluebills (*Spermophaga*). The three clades in the mitochondrial phylogeny of Sorenson and colleagues also were recovered in the molecular phylogeny of Van der Meij and co-workers.

Included in the first of these clades are the African waxbills and two Asian species, namely the Green Avadavat (*Amandava formosa*) and the Red Avadavat (*Amandava amandava*), both of which are closely related to the Zebra Waxbill (*Amandava subflava*). The Red Avadavat and the Zebra Waxbill share a more recent common ancestor than the two Asian finches do with each other. *Amadina* contains two stout, thick-billed species, the Cut-throat and Red-headed Finches. These were once thought to be related to *Lonchura* munias and mannikins, because the bill is thick, the feathers of the underparts have a scaly pattern, pale with dark edges, and the singing posture is fluffed and vertical, as is the case with *Lonchura*. On the other hand, the song, allozymes, the nestlings' palate markings and natal down and the sexual dimorphism in adult plumage of *Amadina* are like those of the waxbills, as pointed out by H. R. Güttinger in 1976, and, more recently, by L. F. Baptista and colleagues in 1999; and in the molecular estimates of phylogeny made by Sorenson and his team and by Van der Meij and colleagues, *Amadina* is related to the waxbills, rather than to the munias and mannikins. A preliminary phylogeny by Sorenson and Payne indicated that the Locust Finch, the sole member of *Paludipasser*, was basal to the other estrildids, but later estimates suggested that it is related to the waxbills in the genera *Amandava*, *Amadina* and *Ortygospiza*, and it is not clearly monophyletic with *Ortygospiza*. The relationship of *Paludipasser* to the other genera is uncertain. Chapin, in 1917,



The ***Angola Swee*** *and the Yellow-bellied Swee* (Coccopygia quartinia) *are often treated as races of the Swee Waxbill* (C. melanotis)*, all three often being placed in the genus* Estrilda*. But the three swees differ from one another in morphology and behaviour; and on the basis of plumage, body shape and distribution, they seem closer to the olivebacks* (Nesocharis) *than to* Estrilda*. Species limits can be difficult to establish in this family, and in captivity, estrildids from different genera will interbreed. However, the swee species are among those found to show a strong preference to mate with their own kind.*

[*Coccopygia bocagei*, Kajonde, Mt Moco, Angola. Photo: A. P. Leventis]



had noted the similarity of the Locust Finch to the Cut-throat Finch and the African Quailfinch, and H. Lynes and W. L. Sclater, in 1934, placed the species in *Ortygospiza* on the basis of its having barred flanks in the female and a red bill. The African Quailfinch includes three groups, western birds forming one group and central, and eastern and southern populations a further two. Central African quailfinches with a black chin are sometimes recognized as a distinct species, "*Ortygospiza gabonensis*", but their plumage traits overlap with those of the far western subspecies *ansorgei*, and intermediate individuals occur where the ranges of black-chinned and white-chinned birds approach each other around east-central and south-central Africa. In other morphological traits, including bill colour, feather colour above and below the eye, and dorsal plumage, the groups exhibit no constant differences from one another, and their songs are nearly identical. They are therefore regarded as conspecific.

In the second clade of the Estrildinae, the forest waxbills include the antpeckers in *Parmoptila* and the negrofinches in *Nigrita*. Antpeckers, sometimes known as "flower-pecker finches", are arboreal finches with a small bill, narrow and curved downwards at the tip. As their English name suggests, they feed on ants (Formicidae) and other small insects, and also take small fruits. Together with the Tit-hylia (*Pholidornis rushiae*), they were once regarded as African members of certain Australasian families, the thornbills (Acanthizidae) or the pardalotes (Pardalotidae), or the more widespread flowerpeckers (Dicaeidae). The genus name is derived from the Greek words *parme*, meaning a small, rounded shield, and *ptilon*, a feather, the name referring to the feather shape. Negrofinches live in the forest canopy and middle storey and feed on small insects and fruit, behaving like an Old World warbler (Sylviidae) or a tit (Paridae) and foraging in mixed flocks with other small insect-eating birds. Another small forest songbird, the Tit-hylia , has been considered an estrildid, but in a mitochondrial phylogeny it appears with the Green Hylia (*Hylia prasina*) in the African warblers, rather than with the estrildid finches, and more recently has been placed with the penduline-tits in the family Remizidae.

This second clade includes also the olivebacks (*Nesocharis*) and the swees (*Coccopygia*). *Nesocharis* are birds of forest and forest edge and have grey, black and olive-green plumage. The White-collared Oliveback (*Nesocharis ansorgei*) and Shelley's



*At 14 cm and 13 g, the **Grey-headed Oliveback** is much larger and heavier than its two congeners, Shelley's* (Nesocharis shelleyi) *and the White-collared Olivebacks* (N. ansorgei). *The two smaller species often use the nests of other birds, such as weavers* (Ploceus), *while the Grey-headed builds its own. The gape patterns of Grey-headed and White-collared Oliveback nestlings are also very different; those of Shelley's Oliveback have not been studied. Preliminary mitochondrial analysis found the Grey-headed Oliveback to be closer to* Estrilda *waxbills than to the smaller olivebacks; it may belong in a genus of its own.*

[*Nesocharis capistrata.*
Photo: Cyril Laubscher]

Oliveback (*Nesocharis shelleyi*) have songs with high-pitched squeaks and trills, while the Grey-headed Oliveback has songs of clear slurred whistles. For breeding, White-collared and Shelley's Olivebacks often use the nests of other bird species, whereas the Grey-headed Oliveback builds its own nests. In the preliminary mitochondrial phylogeny, the Grey-headed Oliveback was not so closely related to the two small olivebacks as it was to the *Estrilda* waxbills. The three swee waxbills in the genus *Coccopygia* are more closely related to the olivebacks than they are to the Common Waxbill (*Estrilda astrild*) and other *Estrilda* waxbills. On the basis of plumage, body shape and geographical distribution, K. Immelmann and colleagues, in 1977, also considered *Coccopygia* and *Nesocharis* to be each other's closest relatives.

Crimsonwings (*Cryptospiza*) live in montane forest. They have a stout bill and exhibit some red in the plumage, mostly on the upperparts. The forest-living Green Twinspot is smaller than



*The four "twinspot" genera derive their name from the two white spots on each breast feather. The **Green Twinspot** shares the pattern of conspicuous white spots on its flanks and belly with the other twinspots, but it is smaller, and has a short, pointed outer primary, unlike the long, broad outer primary of the other three genera. It shares this and other characteristics, such as its juvenile plumage, with the crimsonwings* (Cryptospiza). *Recent molecular-genetic analysis indicates that it is in fact related to the crimsonwings rather than to the other twinspots.*

[*Mandingoa nitidula nitidula,*
Eshowe, South Africa.
Photo: Geoff McIlleron]



As the generic name suggests, the crimsonwings (Cryptospiza) *are secretive birds. They are found in montane or submontane forests, where they occupy dense undergrowth. All four species have red on their upperparts, which is more pronounced and extensive in the males. The male* ***Ethiopian Crimsonwing*** *has a pink or orange-red orbital ring, whereas the female's is duller, typically greyish. In some estrildid species, iris colour also differs between the sexes, and some bare-part colours may change with the onset of breeding.*

[*Cryptospiza salvadorii kilimensis*, Mt Meru, N Tanzania. Photo: Martin Goodey]

other twinspots, and it has a very short, pointed outer primary, as in the crimsonwings and unlike the other twinspot genera. The Green Twinspot, currently in the monotypic genus *Mandingoa*, was once placed with the crimsonwings in the genus *Cryptospiza*, principally because the juvenile plumages of the two are similar. Recent molecular-genetic studies indicate that it is closely related to the crimsonwings, and not to the other twinspots in the genera *Clytospiza*, *Hypargos* and *Euschistospiza*.

Finally, this group includes the *Estrilda* waxbills. The main lineages of *Estrilda* identified in the mitochondrial phylogeny, as detailed by C. H. Fry and S. Keith in 2004, in Volume VII of *The Birds of Africa*, correspond fairly well to four genera recognized by H. E. Wolters in his world checklist, published during 1975–1982. Three allopatric species, the Lavender (*Estrilda caerulescens*), Black-tailed (*Estrilda perreini*) and Cinderella Waxbills (*Estrilda thomensis*), comprise one lineage. In plumage these three are mostly uniformly grey, with a black streak through the eye; they differ from each other in the distribution of red in the plumage. The clade corresponds to the genus recognized by Wolters as *Glaucestrilda*. The sister-lineage is the Black-faced Waxbill (*Estrilda erythronotos*) of semi-arid thornbush country, recognized by Wolters as a genus *Brunhilda*.

A second set of waxbills includes the Orange-cheeked (*Estrilda melpoda*), Fawn-breasted (*Estrilda paludicola*), Black-rumped (*Estrilda troglodytes*), Crimson-rumped (*Estrilda rhodopyga*) and Arabian Waxbills (*Estrilda rufibarba*). The mitochondrial phylogeny suggests that some forms previously recognized as subspecies of the Fawn-breasted Waxbill may be distinct species. Thus, the forms *benguellensis* and *ruthae* are basal to other waxbills in the Fawn-breasted Waxbill group of races and to the Black-rumped, Crimson-rumped and Arabian Waxbills, and might be separated as the "Benguella Waxbill"; and the ochre-plumaged *ochrogaster*, another subspecies of the Fawn-breasted Waxbill, has at times been recognized as a distinct species, the "Abyssinian Waxbill". Another set, not in the above-mentioned clade, consists of the Common Waxbill, including the subspecies *nigriloris*, sometimes recognized as a distinct species, the "Black-lored Waxbill", and the Anambra Waxbill (*Estrilda poliopareia*), which is most closely related to, and outside the clade of, several subspecies of the Common Waxbill. The Common Waxbill is widespread in Africa, and the Anambra Waxbill occurs in a small region in Nigeria. Immelmann and colleagues, in 1965, recognized a subgenus *Melpoda* for the Fawn-breasted and Orange-cheeked Waxbills, and Wolters placed all of these waxbills in the genus *Estrilda*.

A final set of waxbills includes the Black-crowned Waxbill (*Estrilda nonnula*) of open woodlands and the Black-headed Waxbill (*Estrilda atricapilla*) of forest clearings. Kandt's Waxbill (*Estrilda kandti*) was formerly considered a subspecies of

The genus Estrilda *is the largest in the subfamily Estrildinae. The Black-tailed* (Estrilda perreini), *Cinderella* (E. thomensis) *and* ***Lavender Waxbills*** *have contiguous, non-overlapping ranges, and form one lineage within this genus. Their plumage is mostly a uniform pearly grey, with a black streak through the eye, and differing amounts of red in the plumage. The females generally resemble the males, but have a dark grey lower belly and flanks. The distance contact calls of the three species are also very similar.*

[*Estrilda caerulescens*, Senegal. Photo: Roland Seitre]





The Arabian Waxbill (Estrilda rufibarba) *has been variously regarded as closest to the Black-rumped Waxbill* (E. troglodytes), *as the race* rufibarba *of the* ***Crimson-rumped Waxbill****, or as a hybrid. Mitochondrial analysis has shown that the Arabian and Crimson-rumped Waxbills are sister species, and belong to the same lineage as the Black-rumped, Orange-cheeked* (E. melpoda) *and Fawn-breasted Waxbills* (E. paludicola). *As well as some plumage similarities, the Arabian and Crimson-rumped have similar habitat preferences. In the Crimson-rumped, the black bill is sometimes red near the cutting edges, as in this male. In the breeding season, the male Arabian's bill is red at the base.*

[*Estrilda rhodopyga centralis*, Lake Baringo, Kenya. Photo: Richard Peek]

the Black-headed Waxbill, but in the mitochondrial phylogeny it appears to be more closely related to the Black-crowned Waxbill than to the nominate race and race *avakubi* of the Black-headed Waxbill. In addition, the results suggest an additional cryptic species, the "Kenya Mountain Waxbill *Estrilda atricapilla keniensis*", which forms a clade that is basal to the three aforementioned species, including nominate *kandti*. The Kenyan individuals are morphologically distinct from Kandt's Waxbills of the montane Albertine Rift region, the adult males of which are barred pale grey, the females being darker brown; in *keniensis*, the males and females are more nearly alike. For the time being, the two forms are tentatively treated as subspecies of a single species, Kandt's Waxbill. These three *Estrilda* species correspond to Wolters's genus *Krimhilda*.

The other major clade of waxbill genera consists of the bluebills (*Spermophaga*) and seedcrackers (*Pyrenestes*), the blue waxbills (*Uraeginthus*) and purple waxbills (*Granatina*), the pytilias (*Pytilia*), the twinspots of the genera *Euschistospiza*, *Hypargos* and *Clytospiza*, and the firefinches (*Lagonosticta*). The first two sets of waxbills are birds of forest, and most others are birds of open woodland. Bluebills have a thick bill with a slightly swollen, curved culmen and pink cutting edges, a red-and-black plumage, and, as with the twinspots, a long and broad outer primary. Seedcrackers differ from their closest relatives, the bluebills, in having a bill as broad as it is deep, broadest at the base of the lower mandible, and with the culmen and other outlines straight, not curved, and in having a short, pointed outer primary. In male plumage, the Black-bellied Seedcracker (*Pyrenestes ostrinus*), with its red head, breast, flanks and rump and black back, wings and belly, is nearly identical to Grant's Bluebill (*Spermophaga poliogenys*) and the Red-headed Bluebill (*Spermophaga ruficapilla*); the two genera have a swollen broken white eyering and their nests are similar to each other. The seedcrackers have been treated as one, two or three species. In addition to geographical differences in plumage, individuals of different size occur within a given region. In the case of the Crimson Seedcracker (*Pyrenestes sanguineus*) small-billed and large-billed individuals occur together in West Africa, and the same applies to the Lesser Seedcracker (*Pyrenestes minor*) in Malawi and Mozambique. In Central Africa, Black-bellied Seedcrackers having a small bill and small body size occur together with large-billed individuals in some regions, small-billed birds being more common in regions of heavier rainfall. In addition, individuals with a really huge bill are found in areas with large-billed birds, and all three types are reported in northwestern Zambia. These seedcrackers take different foods, the seeds of certain sedges (Cyperaceae), according to their bill size. The "mega-billed" ones occur in seasonally drier habitats and feed on the largest hard seeds.



The Black-headed Waxbill (Estrilda atricapilla) *differs from the otherwise very similar Black-crowned Waxbill* (E. nonnula) *only in the larger area of red on its flank, and the smaller spot of red on its bill. The two species are found together in DRCongo. A third species in this lineage,* ***Kandt's Waxbill****, is still sometimes treated as a race of the Black-headed, but a mitochondrial study indicates that it is actually closer to the Black-crowned Waxbill. In each of these species, nestlings have a ring of five black spots on the palate and two dark spots on the tongue, although gape-swelling and palate colours differ.*

[*Estrilda kandti kandti*, Mgahinga Gorilla National Park, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]



The seedcrackers (Pyrenestes) *have been treated as one, two or three species. Seedcrackers have bills that are as broad as they are deep, but within each species bill size can vary from relatively small to massive. In fact, the bill-size differences between morphs of the same species are as great as those between different species. Bill size can vary geographically, with smaller-billed forms found in areas of higher rainfall, but different bill-size morphs of the same species are found together in some areas, for example the* ***Lesser Seedcracker*** *in Malawi and Mozambique, and these morphs interbreed. This captive bird was trapped in east Zimbabwe.*

[*Pyrenestes minor.* Photo: Cyril Laubscher]

Pytilia waxbills are more insectivorous than most other estrildids, and they feed termites (Isoptera) to their brood. The Melba Finch (*Pytilia melba*) is widespread over semi-arid regions of Africa. Its plumage varies considerably from western to eastern and southern parts of its range, but the existence of populations with intermediate plumage indicates that all of the different types belong to a single species, with some gene exchange between regions. In the phylogeny of *Pytilia* drawn up by N. K. Klein and Payne in 1998, the Melba Finch is basal to a clade of the other species. The Orange-winged Pytilia (*Pytilia afra*) lives in south-central Africa, mainly in regions more mesic than those inhabited by Melba Finches. Its counterparts in West Africa are the Yellow-winged (*Pytilia hypogrammica*) and Red-winged Pytilias (*Pytilia phoenicoptera*), and in Ethiopia the Ethiopian Pytilia (*Pytilia lineata*). A few specimens, including a bird described in 1908 as "*Pytilia lopezi*", have a mixture of traits of Yellow-winged and Red-winged Pytilias and are plumage morphs of these species. Red-winged and Ethiopian Pytilias are similar to each other in plumage, but they differ in bill colour. In choice tests in aviaries, these birds mate with a partner having the same bill colour as their own, and they behave as distinct biological species. The two species can interbreed in captivity; hybrid offspring have the upper mandible black and the lower mandible red.

Purple waxbills and blue waxbills are best known for their behaviour and plumage. The two members of the first group, the Violet-eared Waxbill (*Granatina granatina*) and the Purple Grenadier (*Granatina ianthinogaster*), live in semi-arid habitats, the former in southern Africa and the latter in East Africa. Both have rich rufous-brown plumage with patches of violet and blue. In the first proper moult, both sexes grow the adult head plumage by the age of five weeks, when they may form mating pairs. Of the three blue waxbills, the Red-cheeked Cordon-bleu (*Uraeginthus bengalus*) is locally sympatric with the southern Blue Waxbill (*Uraeginthus angolensis*) in DRCongo and Tanzania, and there is evidence of their interbreeding. Males differ in that the Red-cheeked Cordon-bleu has a red cheek patch, which is not present on the Blue Waxbill.

Twinspots in the genera *Clytospiza*, *Hypargos* and *Euschistospiza* have broad rectrices, conspicuous white spots on the breast and flanks, and a long outer primary, more than twice the length of the wing-coverts and rounded at the tip. These species have two white spots on each breast feather, a pattern found also on the Green Twinspot, the sole member of *Mandingoa*. Dybowski's Twinspot (*Euschistospiza dybowskii*) of West Africa and the Dusky Twinspot (*Euschistospiza cinereovinacea*) of Angola and the Albertine Rift are sister-species. Another pair of sister-species is represented by Peters's Twinspot (*Hypargos niveoguttatus*) and the Pink-throated Twinspot (*Hypargos margaritatus*), which

The genus Granatina *comprises the Violet-eared Waxbill* (G. granatina) *and the* ***Purple Grenadier****. This genus is sometimes subsumed into* Uraeginthus, *which herein is considered to comprise three small blue waxbills. All these species are sexually dimorphic, this being more pronounced in* Granatina. *The bird on the left here is a female, with narrow silvery-blue patches above and below the eye, whereas the male has more extensive areas of purplish-blue. The blue or silver feathers around the eyes begin to grow 24–35 days after hatching.*

[*Granatina ianthinogaster*, Mt Meru, N Tanzania. Photo: Martin Goodey]



occur nearly together in southern Africa. The Brown Twinspot (*Clytospiza monteiri*) is most closely related to the firefinches of the genus *Lagonosticta*.

Firefinches are small estrildids with red plumage, notably on the rump, and small white spots on the breast. The Brown Firefinch (*Lagonosticta nitidula*) lacks red on the rump, which is instead greyish or grey-brown, and the Black-bellied Firefinch (*Lagonosticta rara*) lacks the white breast spots. Members of this genus live in shrub or open woodland and grassy habitats, and as many as five species can occur in a single locality. The phylogenetic relationships among the species estimated in mitochondrial-sequence analyses by Sorenson and co-workers in 2003 and 2004 are nearly the same as those determined in a phylogenetic analysis of mitochondrial restriction sites by Klein and Payne in 1998. The Red-billed (*Lagonosticta senegala*), Bar-breasted (*Lagonosticta rufopicta*) and Brown Firefinches comprise one clade. The last two of these have nearly identical songs and calls, but they are recognized as distinct species because they differ from each other in the pattern of the nestling mouth and in both the juvenile and the adult plumages. The other clade in this genus includes the Black-faced (*Lagonosticta larvata*) and Black-bellied Firefinches as basal species. Black-faced Firefinch populations in West, Central and north-east Africa differ from one another in plumage, but their songs and calls are nearly the same; in the mitochondrial phylogeny, the western birds, subspecies *vinacea*, are less closely related to the other two, *nigricollis* and the nominate race, than these two are to each other. Black-bellied Firefinches have plumage and songs that differ between West and Central Africa, and the mouth colours of the nestlings also differ regionally, being red, white and blue in West Africa, but light red and white in Central Africa. The widespread African Firefinch (*Lagonosticta rubricata*) is blue-billed in most of its populations; the partly reddish-billed *landanae* of Angola is sometimes considered a separate species, the "Pale-billed Firefinch", although the bill colour varies from reddish to grey in northern Angola, where *landanae* is the same in plumage as the subspecies *congica* to the north and east of it. The other *Lagonosticta* species comprise the sister-clade of the African Firefinch. In this set, the Mali (*Lagonosticta virata*), Rock (*Lagonosticta sanguinodorsalis*) and Chad Firefinches (*Lagonosticta umbrinodorsalis*) of West Africa comprise a clade that is distinct from Jameson's Firefinch (*Lagonosticta rhodopareia*) of eastern and southern Africa. Both species groups live in semi-arid grassy woodlands and on rocky hillsides.

The second subfamily, Erythrurinae, includes a single genus, *Erythrura*, containing the Gouldian Finch (*Erythrura gouldiae*) of Australia and the parrotfinches, which range from South-east Asia, the Philippines and the Sunda Islands eastwards to the islands of the south-central Pacific Ocean. The Gouldian Finch has plumage with green, blue and red, as do its congeners, but it also sports purple, yellow and black. Several parrotfinch species live on islands where they are the only member of the genus, while others are sympatric with one or more other parrotfinches. Remains of an extinct large, stout-billed parrotfinch have been found on Rota, in the Northern Mariana Islands.

The Tawny-breasted Parrotfinch (*Erythrura hyperythra*) is widespread from the Malay Peninsula and the Philippines south to Java, the Lesser Sundas and Sulawesi, while the Pin-tailed Parrotfinch (*Erythrura prasina*) occurs from South-east Asia south to Sumatra, Java and Borneo. The Green-faced Parrotfinch (*Erythrura viridifacies*) is found in the north and central Philippines on Luzon, Panay and Negros, and the Mount Kataglad Parrotfinch (*Erythrura coloria*) is restricted to mountains on Mindanao, the southernmost of the main islands of that archipelago. The Tricoloured Parrotfinch (*Erythrura tricolor*) occurs in the Lesser Sunda Islands, and the Blue-faced Parrotfinch (*Erythrura trichroa*) is widespread in Sulawesi, the Moluccas, New Guinea, the Bismarck Archipelago, north-eastern Australia and western Oceania, with many subspecies. The latter species has colonized at least ten different islands by long-distance dispersal over water. The Papuan Parrotfinch (*Erythrura papuana*) occurs together with the Blue-faced Parrotfinch in New Guinea, whereas the Red-throated Parrotfinch (*Erythrura psittacea*) is the only member of the genus on New Caledonia. On the islands of the south-west Pacific, the Red-headed Parrotfinch (*Erythrura cyaneovirens*) is widely distributed in a number of subspecies: the races *regia* and *serena*, both restricted to Vanuatu, are sometimes treated as a distinct species, the "Royal Parrotfinch"; and race *pealii*, found only in Fiji, is similarly sometimes split, as "Peale's Parrotfinch". The large Pink-billed Parrotfinch (*Erythrura kleinschmidti*) is found only in Fiji, where it is sympatric with *pealii*.



Eight subspecies of ***Melba Finch*** *have been recognized, varying considerably in plumage across the species' very large range. It has been suggested that the red-lored* citerior *and grey-lored* percivali *represent two different species, but red-lored and grey-lored males intergrade across East Africa, and many intermediates occur. Populations that are intermediate between the other plumage types are known, indicating that all belong to the same species. Females are similar to males but lack the red face.*

[*Pytilia melba citerior*, Alagarno, Bornu, Nigeria. Photo: A. P. Leventis]



The two Euschistospiza *twinspots form a superspecies. Dybowski's Twinspot* (E. dybowskii) *is sexually dimorphic, but in the* ***Dusky Twinspot*** *the sexes are similar. The difference is not related to different mating systems, since both species, like all Estrildidae, are monogamous and share parenting duties. The two* Hypargos *twinspots are sexually dimorphic, as is the Brown Twinspot* (Clytospiza monteiri).

[*Euschistospiza cinereovinacea cinereovinacea*, Kajonde, Mt Moco, Angola. Photo: A. P. Leventis]

In a review of the parrotfinches, published in 1972, V. Ziswiler and co-workers recognized five subgenera of *Erythrura*, apart from the Gouldian Finch. Two of these, *Reichenowia* and *Erythrura*, are found in the Asian region, and the other three, *Trichroa*, *Amblynura* (or *Alacanthe*) and *Rhamphostruthus*, in the Melanesian region. These five sets differ in plumage colour. In the first, the monotypic subgenus *Reichenowia*, the Tawny-breasted Parrotfinch lacks red in the plumage, even the rump, which is red on other species of parrotfinch. The second set contains the Pin-tailed, Green-faced and Tricoloured Parrotfinches, which are variable and sexually dimorphic in plumage; allopatric forms occur from the Philippines south to Borneo, the Lesser Sundas, Sumatra and South-east Asia. The third subgenus, *Trichroa*, contains the Blue-faced, Papuan and Mount Katanglad Parrotfinches, which have a blue face, also with red in the Mount Katanglad Parrotfinch, and are mostly allopatric, although both

Taxonomic relationships among the Lagonosticta *firefinches can be difficult to establish. In the past, the* ***Chad Firefinch*** *was often treated as a race of Jameson's Firefinch* (L. rhodopareia). *It is almost identical vocally to the Rock Firefinch* (L. sanguinodorsalis), *from which it differs in plumage; the Rock Firefinch was not described until 1998. All three may form a superspecies with the Mali Firefinch* (L. virata), *which is also sometimes considered conspecific with Jameson's Firefinch. The situation is even more complex with the Black-bellied Firefinch* (L. rara), *in which not only do the songs and plumages of adults vary regionally, but so do the mouth colours of the nestlings.*

[*Lagonosticta umbrinodorsalis*, Waza National Park, Cameroon. Photo: Ketil Knudsen]







Erythrurinae is the least speciose subfamily in Estrildidae, and comprises just a single genus, Erythrura. *Its members are found across Australasia, South-east Asia and the tropical Pacific islands. Some, like the* ***Red-throated Parrotfinch****, confined to New Caledonia, are restricted-range species. Others are more widespread, such as the* ***Blue-faced Parrotfinch****, with twelve subspecies extending from Sulawesi to the extreme eastern Caroline Islands, via north-east Australia. The Red-throated Parrotfinch is the only member of the genus in New Caledonia, but some* Erythrura *species have overlapping ranges. In New Guinea, for example, the Blue-faced Parrotfinch is found with the Papuan Parrotfinch* (E. papuana)*, which is very similar in appearance, though larger and with a more massive bill. The Red-throated Parrotfinch belongs to a group of species with a grooved horny palate and a sharp cutting surface on the lower jaw; these species cut open their seeds. The Blue-faced Parrotfinch belongs to a group of five species which have a knob on the horny palate that they use to crush seeds against the lower jaw before swallowing them.*

[Above: *Erythrura psittacea*, New Caledonia. Photo: Juniors Bildarchiv/ photolibrary.com.

Below: *Erythrura trichroa sigillifera*, Ubaigubi, EC New Guinea. Photo: William S. Peckover]

the Blue-faced and the Papuan Parrotfinches are found in New Guinea. These last two species are nearly identical to each other in plumage, but the Papuan Parrotfinch is larger and has a thicker bill. In the subgenus *Amblynura*, the Red-headed Parrotfinch has a red face and red crown and the Red-throated Parrotfinch has a red face and throat; the two have non-overlapping ranges on islands of the south-west Pacific. Finally, the fifth subgenus, *Rhamphostruthus*, holds just the Pink-billed Parrotfinch, a comparatively large species with a long pink bill and a short tail, which lives on Fiji. In 1968, Mayr and colleagues had listed three subgenera, and more than three decades later, in 2001, J. Nicolai and J. Steinbacher listed four genera, in both cases in addition to the Gouldian Finch.

The mitochondrial phylogeny suggests that the Gouldian Finch (Clade 1) is basal to the other *Erythrura* species. In addition, two further clades are mainly in the Asian region: one consists solely of the Pin-tailed Parrotfinch; and the other contains the Tawny-breasted, Green-faced and Pink-billed Parrotfinches. Another is mainly in the Melanesian region, and consists of the Red-throated Parrotfinch, the Red-headed Parrotfinch, including *pealii* and *regia*, and the Blue-faced and Papuan Parrotfinches; this clade includes also the Mount Katanglad Parrotfinch of the south Philippines and the Tricoloured Parrotfinch of Wallacea. The first three clades appear as an unresolved polytomy; monophyly of Clade 4 is well supported. One inference is that the two species in the Philippines are not each other's closest relatives: the Green-faced Parrotfinch of the northern and central Philippines is related to the Malaysian parrotfinches, and the Mount Katanglad Parrotfinch of the southern Philippines is related to the Blue-faced Parrotfinch and Papuan Parrotfinch of Wallacea and Melanesia. Another inference is that the Pink-billed Parrotfinch and the other parrotfinches of the Melanesian region are the products of two separate dispersals from South-east Asia into the South Pacific.

The third and final subfamily, Lonchurinae, includes the munias and mannikins, the grassfinches, and the Pictorella Finch. The last-mentioned, the sole member of the genus *Heteromunia*, shares some plumage characteristics, such as sexual dichromatism, with the grassfinches, and others, such as a black face and throat, as well as a nestling palate with a bar, with the munias and mannikins. In earlier studies, the Pictorella Finch was known as a mannikin and placed in the genus *Lonchura*, for example by Delacour in 1943 and R. Restall in 1997, or was associated with the munias and mannikins and the grassfinches, as by H. Steiner in 1960. In genetic studies, R. Kakizawa and M. Watada (1985) found it to be basal to both the grassfinches and the munias and mannikins, and Sorenson and colleagues found it to be part of an unresolved three-way tie with the grassfinches and the munias and mannikins.

Among the grassfinches, the mitochondrial phylogeny did not clearly support distinct clades that correspond with traditional generic classifications. Nevertheless, it did not present any statistical support for rejecting these inclusive genera. The genera in current Australian systematic works, such as R. Schodde and I. J. Mason's 1999 *Directory* and, in 2008, the work by W. E. Boles and L. Christidis entitled *Systematics and Taxonomy of Australian Birds*, are considered the most appropriate treatment thus far. In 1987, Christidis found that the Painted Finch (*Emblema pictum*) and Diamond Firetail (*Stagonopleura guttata*), both at the time placed in *Emblema*, and the Crimson Finch (*Neochmia phaeton*) and Star Finch (*Neochmia ruficauda*) did not form distinct sets, and he noted the large genetic distances between these species; the Australian Zebra Finch was most closely related to the Double-barred Finch (*Taeniopygia bichenovii*). The mitochondrial phylogeny and the 1999 study by Baptista and colleagues, on the other hand, found the Double-barred Finch not to be closest to the two zebra finches. In the mitochondrial phylogeny, the genetic distance between the Timor Zebra Finch (*Taeniopygia guttata*) and the Australian Zebra Finch was less than that between other species of Australian grassfinch, but greater than that between certain Australasian mannikins and munias. The genus *Neochmia* in the Australian classifications includes the Red-



Of the two firetail genera, the single representative of Oreostruthus, *the* ***Mountain Firetail****, is found on New Guinea. It shares the red rump and red bill of the* Stagonopleura *firetails, but lacks the fine barring, the flank spots, or the scalloping which variously characterize these species. There are three races of the Mountain Firetail, living on different mountain ranges within the Central Papuan Mountains Endemic Bird Area. They rarely descend below 2000 m.*

[*Oreostruthus fuliginosus*, New Guinea. Photo: Brian J. Coates]



The three Stagonopleura *firetails are all found in the south of Australia. The* ***Red-eared Firetail*** *is restricted to the South-west Australia Endemic Bird Area. The Diamond* (S. guttata) *and Beautiful Firetails* (S. bella) *have overlapping ranges in the south-east, although with different habitat preferences. While the Diamond Firetail is gregarious, and nests in small colonies, the Red-eared Firetail is generally found singly, in pairs or in family parties, and is territorial, not tolerating another breeding pair within 100 m of its nest.*

[*Stagonopleura oculata*, Australia.
Photo: Roland Seitre]

browed Finch (*Neochmia temporalis*), the Star Finch and the Plum-headed Finch (*Neochmia modesta*), as well as the Crimson Finch. The Australian firetails appear as a clade, and are treated as congeneric; the three species are the Diamond Firetail, the Red-eared Firetail (*Stagonopleura oculata*) and the Beautiful Firetail (*Stagonopleura bella*).

Munias and mannikins form the third group within Lonchurinae. Delacour, Restall and, most recently, E. Dickinson recognized as many as 38 species in one genus, *Lonchura*. The relationships among these species have been estimated in various molecular phylogenies, from that by Kakizawa and Watada, in 1985, to the analyses by Sorenson and co-workers, in 2004. The African mannikins appear to comprise one clade, and the Australasian munias and mannikins, along with the Madagascar Bibfinch (*Lepidopygia nana*) and the two *Euodice* silverbills, comprise the other. The African species are now placed in the genus *Spermestes*. The Grey-headed Silverbill (*Spermestes caniceps*) is basal to the other African mannikins, and it appears not to be closely related to the other silverbills, in *Euodice*. The Bronze Mannikin (*Spermestes cucullata*) is the most widespread Afrotropical mannikin and is basal to the other two, the Black-and-white (*Spermestes bicolor*) and Magpie Mannikins (*Spermestes fringilloides*). Although the Black-and-white Mannikin has sometimes been treated as representing two distinct species, this seems unwarranted; the black-backed nominate race and subspecies *poensis* of West and Central Africa and the rufous-backed subspecies *nigriceps* of eastern and southern Africa comprise a single species, as evidenced by the occurrence of morphologically intermediate populations.

The Australasian munias and mannikins in the genus *Lonchura*, the *Euodice* silverbills and the Madagascan *Lepidopygia* comprise the other clade. The African Silverbill, the Indian Silverbill (*Euodice malabarica*) and the Madagascar Bibfinch appear to be more closely related to the Australasian munias and mannikins in *Lonchura* than they are to the African mannikins in *Spermestes*. Güttinger, in 1976, determined the systematic position of *Lepidopygia* from its nestling morphology and display behaviour. Kakizawa and Watada, in 1985, and Baptista and colleagues, in 1999, found *Euodice* to be a sister-clade to the Australasian *Lonchura* species; they did not sample *Lepidopygia*. Both Güttinger and the Baptista team suggested that the Java Sparrow (*Lonchura oryzivora*) and the Timor Sparrow (*Lonchura fuscata*), both formerly separated in the genus *Padda*, should be included in *Lonchura*. In the mitochondrial phylogeny drawn up by Sorenson and colleagues, *Lepidopygia* is basal to the other two genera.

Certain *Lonchura* species are commonly known as "munias", while others are referred to as "mannikins" and "nuns". The English vernacular names reflect the geographical distribution of the species: "munias" are those in Asia, the Greater and Lesser Sundas and the Moluccas, and they generally have a smaller bill, whereas "mannikins" are the species in New Guinea, the Bismarck Archipelago and Australia, and these generally have a large bill. Towards the end of the nineteenth century, R. B. Sharpe listed the older name *Lonchura*, described by W. H. Sykes in 1832; the type species of this was "*Loxia punctulata*", the Scaly-breasted Munia (*Lonchura punctulata*), but he included this species in



Two members of the genus Neochmia, *in the subfamily Lonchurinae, were at one time proposed as Australian representatives of two Africa genera in the subfamily Estrildinae. The plumage of the* ***Crimson Finch*** *and the aggressive behaviour of the male were thought to closely resemble the firefinches in the genus* Lagonosticta. *Similarly the Red-browed Finch* (N. temporalis) *was thought to share most of the morphological and behavioural characters of a typical* Estrilda *waxbill*

[*Neochmia phaeton phaeton*, Northern Territory, Australia.
Photo: Marie Read]



On the basis of its courtship behaviour and the appearance of its nestlings, supported by mitochondrial analysis, the ***Madagascar Bibfinch*** *appears to be more closely related to the Australasian munias and mannikins* (Lonchura) *than to the African mannikins* (Spermestes). *It is thought that the ancestors of the Madagascar Bibfinch and the African mannikins dispersed back to Africa, the origin of the Estrildidae, following a species radiation in Australia.*

[*Lepidopygia nana*, NW Madagascar. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

another genus, *Munia*. Sharpe listed other forms now treated within *Lonchura* as representing a genus *Uroloncha*. In 1943, Delacour listed 14 species of *Lonchura* in a subgenus *Munia*, in which he treated the *malacca–atricapilla–ferruginosa* complex as a single species; the other species he placed in the subgenera *Heteromunia*, *Euodice* and *Lonchura*, the last containing 13 species. H. Mayer, in 1985, recognized 13 species of nun, whereas Wolters, a decade earlier, had listed 20 nuns in the genus *Munia*. In 2001, Nicolai and Steinbacher recognized 21 nuns, 18 in the genus *Munia*; their nuns, or *Nonnen*, included also the Java Sparrow, the Timor Sparrow and the Pictorella Finch.

The Java and Timor Sparrows and the New Guinean montane Streak-headed Mannikin (*Lonchura tristissima*) comprise two clades that are basal to the other *Lonchura*. The other munias and mannikins form two well-supported and distinct large clades, and the Scaly-breasted Munia is basal to those two. One large clade consists of two lineages: the first includes six Asian *Lonchura* species, namely the Black-throated (*Lonchura kelaarti*), Black-faced (*Lonchura molucca*), White-rumped, Dusky (*Lonchura fuscans*), White-bellied (*Lonchura leucogastra*) and Javan Munias (*Lonchura leucogastroides*); the second contains a further five Asian species, the Tricoloured (*Lonchura malacca*), White-capped (*Lonchura ferruginosa*), Chestnut (*Lonchura atricapilla*), White-headed (*Lonchura maja*) and Pale-headed Munias (*Lonchura pallida*), together with the Grey-banded Mannikin (*Lonchura vana*) of western New Guinea, which is closely related to the White-headed and Pale-headed Munias. The second large clade of this genus occurs in Melanesia and Australia and contains 13 species. These are the Snow Mountain (*Lonchura montana*), Alpine (*Lonchura monticola*), Black (*Lonchura stygia*), Grey-crowned (*Lonchura nevermanni*), Grey-headed (*Lonchura caniceps*), Hooded (*Lonchura spectabilis*), Black-breasted (*Lonchura teerinki*), Chestnut-breasted (*Lonchura castaneothorax*), Yellow-rumped (*Lonchura flaviprymna*), Thick-billed (*Lonchura melaena*), Grand (*Lonchura grandis*), Hunstein's (*Lonchura hunsteini*) and New Ireland Mannikins (*Lonchura forbesi*). As an exception, the Five-coloured Munia (*Lonchura quinticolor*) of the Lesser Sundas is more closely related to the mannikins in New Guinea, the Bismarck Archipelago and Australia than it is to the munias in the Sundas, the Moluccas and Asia. The mitochondrial phylogeny indicates that most of the 14 species in the Melanesian–Australian region are the products of a single radiation.

Estrildid species are recognized by their morphological distinctiveness, their behavioural distinctiveness in songs and calls, and their evolutionary status as indicated in a phylogeny. Ideally, all three criteria would be met in the delimitation of a species. In practice, the songs and calls of certain species are not known, and experimental tests of mate choice have involved only a few allopatric forms for which no morphological intermediates are known. Island forms are often morphologically distinctive, but in the absence of behavioural differences it is considered better to adopt the traditional taxonomy with regard to species limits, as with the island forms of the parrotfinches. In tests of mate choice among captives, certain finches, such as swee waxbills in the genus *Coccopygia* and zebra finches in *Taeniopygia*, revealed a strong preference to mate with their own kind, and in these cases the allopatric forms are recognized as distinct biological species, but no tests have been reported for most such groups of species. In a few cases, the songs and calls of allopatric forms are nearly identical, and the taxa involved are then treated as conspecific. Thus, the populations of north-eastern Africa sometimes recognized as "*Estrilda charmosyna*" are regarded as conspecific with the Black-faced Waxbill; the firefinch taxa *vinacea*, *togoensis* and *nigricollis* of western and central parts of Africa, sometimes considered to form two distinct species, are all treated as conspecific with the Black-faced Firefinch; and the taxon *landanae* of the lowermost River Congo and north-west Angola, sometimes treated as a distinct species under the name "Pale-billed Firefinch", is treated as a subspecies of the much more widespread African Firefinch. On the other hand, in cases in which the songs and calls of different populations appear to be identical, the birds are recognized as distinct species on the basis of other traits and earlier systematic treatments. This is so with the Black-bellied, Crimson and Lesser Seedcrackers, the Lavender, Black-tailed and Cinderella Waxbills, the Bar-breasted and Brown Firefinches, and the Black-faced, White-capped and Chestnut Munias. For many species groups, no recorded songs were available for comparison.

All species and many subspecies of the Estrildidae were included in the mitochondrial phylogeny of Sorensen and co-workers, but the phylogenetic estimate is preliminary in respect of the



Previously subsumed into the large Asian and Australasian genus Lonchura, *the African mannikins are now placed in their own genus,* Spermestes. *Four species are currently recognized. The black-backed races of the* ***Black-and-white Mannikin*** *have been treated as a separate species from the rufous-backed race,* nigriceps, *but back colour in this species seems to vary clinally. For example, the race* poensis *varies from black-backed in the west of its range, to brown-backed in the east.*

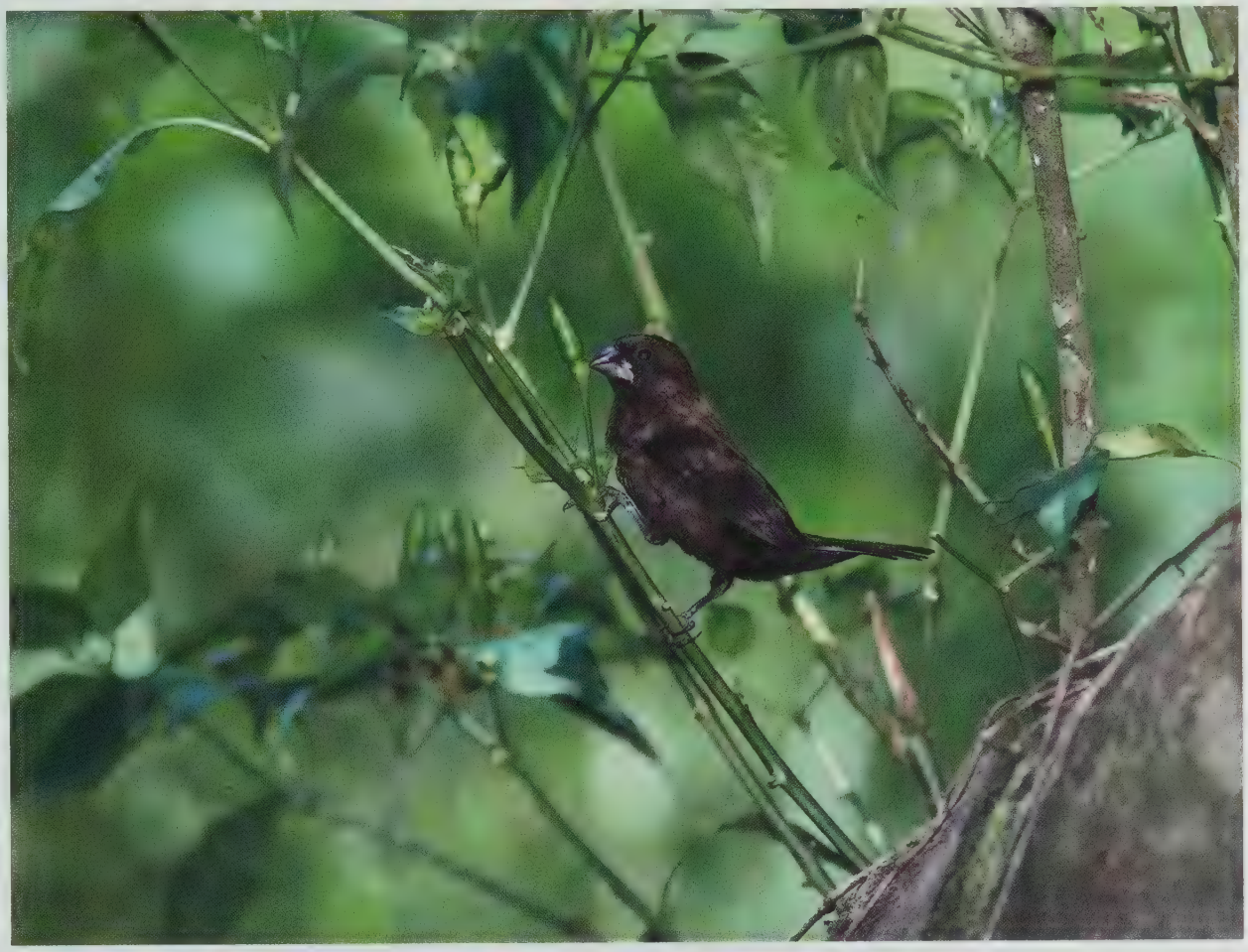
[*Spermestes bicolor nigriceps*, Port Shepstone, KwaZulu-Natal, South Africa. Photo: Hugh Chittenden]

relationships at the species level. In some cases, the problematic nominal species were deeply embedded within the more generally recognized species; for example, the African Quailfinch included the black-chinned forms sometimes treated as a separate species, "*Ortygospiza gabonensis*", and the Common Waxbill included the black-lored DRCongo form *nigriloris*, which has likewise been treated as a distinct species. In these situations, the problematic form is recognized as a subspecies of the species concerned. In a couple of cases, the mitochondrial phylogeny failed to recover species monophyly when the morphology suggests otherwise. Thus, the Fawn-breasted Waxbill as currently constituted did not appear monophyletic, the forms *benguellensis* and *ruthae* being basal to other forms of this species, as well as to the Orange-cheeked and Black-rumped Waxbills and other species; nor did Kandt's and Black-headed Waxbills, and the montane form *keniensis*, often not recognized even as a subspecies, appears as basal to a number of waxbill species, including the Black-headed, Kandt's and Black-crowned Waxbills. The species limits suggested in various studies are only tentative, and there is a need for further comparison of populations, molecular genetics and behaviour. The reasons for this are several. It is apparent from a number of studies of passerine relationships, including those of estrildids, that mitochondrial and nuclear genes sometimes give different estimates of phylogenies, and that nuclear genes themselves sometimes indicate different estimates of species phylogeny. In addition, optimization models used in the estimation of phylogenies sometimes give different results. Further, insertions and deletions sometimes pose alignment difficulties in comparison of nucleotide sequences, and these and other molecular irregularities may be independent of species status. Moreover, genetic distances between closely related species vary among different clades, and no behavioural evidence is available to enable the recognition of outlying forms as species.

Hybridization is a subject of special interest in the study of species limits, and it has been considered in reviews of the biological species concept in ornithology, as by T. D. Price in 2008. Further, the sterility of hybrids was once considered proof of the immutability of species. It is interesting, therefore, that captive estrildids often interbreed and rear their hybrid offspring. These include species that are not closely related and are in different genera and subfamilies. Among estrildids, interspecific hybridization is more common in captivity than in natural populations, and hybridization depends more on opportunity in the aviary than on the systematic relationship between the hybridizing species, as pointed out by H. Steiner in the mid-twentieth century and, later, by J. Fehrer in 1993. Five of the twelve sets of hybrid estrildids in which both male and female were fertile involved munias, and four of these involved the White-rumped Munia, the most common species in captivity. Intergeneric hybrids are sometimes fertile, either both sexes or only the males being so, whereas inter-subfamily hybrids are not fertile.

Reviews of hybridization among birds have noted cases of fertile hybrids, as well as lower viability and fertility in females than in males. The sexual difference in fitness appears to be a consequence of the female heterogametic sex chromosomes in birds, and the generalization that hybrid females are less likely to survive and to breed is known as Haldane's Rule. Reviews have used the records in A. P. Gray's 1958 book *Bird Hybrids*, in which males were considered fertile if they sang, and females were considered sterile if their eggs did not hatch. Sterile males may sing, however, and fertility may depend both on male sperm and female eggs and on compatible developmental genetic programmes that are associated with a common ancestry. Fehrer's recent review of hybridization by estrildid finches listed 29 pairwise species combinations that produced fertile hybrid offspring; of these, 17 involved fertile male hybrids only, and the remaining twelve involved both fertile male and fertile female hybrids.

Hybridization does not necessarily indicate that the birds are in fact conspecific, because within a mixed population most individuals mate with members of their own population, rather than with individuals of the other population. In the field, hybrid and introgressed birds occur in northern Australia, where Chestnut-breasted Mannikins interbreed with Yellow-rumped Mannikins, yet most individuals are not hybrids. Similarly, the





The Lonchura *species of Asia, Indonesia and the Philippines are commonly known as munias. They generally have rather small bills. The* ***Dusky Munia*** *is found in Borneo and on the surrounding islands, including the Philippine island of Mapun. It is relatively unusual for a* Lonchura *species in having uniformly coloured plumage; perhaps for this reason, it has been little troubled by the bird trade, unlike many of its congeners. The* Lonchura *species of Australia, New Guinea and the Bismarck Archipelago have larger bills, and are commonly known as mannikins. The* ***Yellow-rumped Mannikin*** *is a restricted-range species, found in the North-west Australia Endemic Bird Area. It hybridizes with the much more widespread Chestnut-breasted Mannikin* (L. castaneothorax), *and is being replaced by it. In some populations, half of the adult Yellow-rumped Mannikins have some Chestnut-breasted plumage features. The Chestnut-breasted Mannikin may also hybridize in the wild with the Grey-headed Mannikin* (L. caniceps)*; indeed, in captivity it has hybridized with 25 other estrildids, mostly other* Lonchura *species. Munias and mannikins have a distinct juvenile plumage, and may take several moults to reach adult plumage. These species are generally monomorphic, with little or no difference between male and female plumage, unlike the also lonchurine Australian grassfinches, which are dimorphic.*

[Above: *Lonchura fuscans*, Danum Valley, Sabah, Borneo. Photo: Ong Kiem Sian.

Below: *Lonchura flaviprymna*, Kununnurra, Western Australia, Australia. Photo: Don Hadden]



Although sometimes seen foraging in pairs while breeding, the ***African Silverbill*** *is highly social throughout the year, and outside the breeding season can form large flocks. One widely quoted account describes this species as "not particularly active... sitting huddled together for long periods", whereas the congeneric Indian Silverbill* (Euodice malabarica), *long thought to be a race of the same species, is said to be "very agile and active" among branches or twigs. Like many but not all of the subfamily Lonchurinae, African Silverbills are a "contact" species, and birds will huddle or "clump" together. But while captive pairs may sit pressed against one other for long periods, wild flocks are much more dynamic, constantly changing perches, displacing one another, and briefly preening themselves and other individuals. It has been suggested that in a natural state, adult estrildids clump only with their mates or dependent young. However, a study of captive Red Avadavats* (Amandava amandava) *found that while birds in breeding plumage clumped only with their mates, once the males had moulted back into female-like plumage, the selection of clumping partners became less rigid, although it was still mostly between paired birds. When the flock was introduced into unfamiliar surroundings, there was an increase in clumping, which then gradually decreased.*

[*Euodice cantans orientalis*, Tawi Atayr, Oman. Photo: Hanne & Jens Eriksen]



*Highly social throughout the year, the **Australian Zebra Finch** breeds colonially, and forms large foraging flocks, especially when not breeding. As with many other estrildids, these birds tolerate close contact with one another. As the rather random spacing between the birds in this flock shows, they do not maintain an individual distance in the strict sense of the term. However, the birds do show aggression to one another in certain contexts, for example in defence of food, favourite perches or sleeping nests, as well as brood nests, nest materials and mates. In captivity, unpaired males behave sociably towards one another, but can be provoked into fighting by the sight of a female nearby.*

[*Taeniopygia castanotis*, Coral Bay, Western Australia, Australia. Photo: Graeme Chapman]

Chestnut-breasted Mannikin has hybridized with the Grey-headed Mannikin in New Guinea, but nearly all individuals in the overlap zone are not hybrids. An apparent hybrid Chestnut × White-headed Munia observed in the Malay Peninsula is the only reported instance of a possible wild hybrid estrildid in Asia. Certain specimens of mannikins in New Guinea have been identified as hybrids, as melanistic individuals or as undescribed subspecies. In New Guinea, a population of mannikins was found to be intermediate in appearance between the Streak-headed Mannikin and the so-called "White-spotted Mannikin", *leucosticta*, now considered conspecific but at the time treated as a separate species; this intermediate population was described by Restall as a new race of the Streak-headed Mannikin. Similarly, a bird in Papua with an appearance intermediate between these taxa was considered by G. F. Mees in 1958 to be a hybrid and by Restall, some 40 years later, to be a Streak-headed Mannikin *sensu stricto*. In other cases, mannikins in south-eastern New Guinea were considered by some authors to be hybrids between the Hooded and Alpine Mannikins, and by others to be a subspecies of the Hooded Mannikin, and an individual from southern Papua identified by Mees as a hybrid Grey-crowned × Black Mannikin was thought by Restall to be a melanistic Grey-crowned Mannikin. In most cases, the details remain to be determined.

On the other hand, new species have been named on the basis of unusually plumaged birds in bird markets in regions where people have an interest in the breeding of estrildids. In the best-documented case, the "Cream-bellied Munia" was described as a new species, "*Lonchura pallidiventer*", from live specimens purchased at a bird market in Jakarta, in Java, and said by the trader to have been wild-caught in southern Kalimantan, in south Borneo. The plumage of the flanks is scaly in pattern, a characteristic regularly present on several *Lonchura* species and found occasionally on others. The "scaly gene" is found in many species without the feather pattern, and it is expressed in hybrids even of those species normally having a non-scaly pattern, such as the Indian and African Silverbills. In captivity, a pair of "*pallidiventer*" nested, but their eggs did not hatch, and a pair in another aviary produced no young. In laboratory analyses of two specimens of "*pallidiventer*", one was found to be identical in mitochondrial sequence to a specimen of the White-capped Munia, and the other was nearly identical to one of the White-headed Munia. Because mitochondrial genes are transmitted maternally, it is probable that the first individual's mother was a White-capped Munia and the second bird's mother a White-headed Munia, but the plumage of the two "*pallidiventer*" is not very similar to that of the adult of either of these two. S. van Balen had suggested that *pallidiventer* was a hybrid Scaly-breasted × White-bellied Munia, as it appeared intermediate in plumage between these two species, but the mitochondrial sequences were unlike that of either of them. In its pale belly and undertail-coverts "*pallidiventer*" differs from the adults of other munias. It is of interest to note that several species of munia have pale underparts in juvenile plumage, and "*pallidiventer*" may have retained this plumage into adult life. Because many munia species have nearly identical mitochondrial nucleotide sequences, the specific parentage of "*pallidiventer*" is problematic; nevertheless, the bird appears to be a hybrid form.

The Estrildidae are thought to have originated in Africa, where the number of species is greatest and where the two most closely related families, Viduidae and Ploceidae, have their centre of species diversity. After a species radiation within Africa, some estrildids dispersed to Australasia. A later dispersal out of Africa occurred when the avadavats extended their range eastwards to India. Some time after the estrildids had radiated in Australasia, there were dispersals back to Africa by the ancestors of the African *Spermestes* mannikins, the *Euodice* silverbills and the Madagascar Bibfinch. Finally, further, recent dispersals from Africa across the Red Sea are suggested by the occurrence: of *Euodice* species in the Arabian Peninsula and southern Asia, as well as Africa; of the Arabian Waxbill in the Arabian Peninsula; and of some other African waxbills in the Arabian Peninsula.

Morphological Aspects

Estrildid finches are generally small, ranging in weight from just 6–7 g in the case of the Zebra Waxbill, the swees and some *Estrilda* waxbills to as much as 24 g and 30 g in the Red-headed Finch, the Western Bluebill (*Spermophaga haematina*), the larg-



*The **Chestnut Munia** forages socially, even during the breeding season, when it often nests in loose colonies. Large flocks descend on rice crops, particularly when the rice is at the unripe, "milky" state, causing serious economic damage. They also attack pearl millet crops in India. The Chestnut Munia has been accidentally or deliberately introduced to Japan, Hawaii, some Caribbean islands, and Ecuador, among other places. Because of its success in establishing itself, it is often regarded as an invasive pest, and a potential competitor to native birds.*

[*Lonchura atricapilla jagori*, Dumaguete, Negros, Philippines. Photo: Edward Vercruysse]

est-billed form of the Black-bellied Seedcracker and the Java Sparrow.

Many estrildids have a short, stubby bill like that of a typical finch (Fringillidae), and the form of the bill is associated with the diet of grass seeds. A few members of the family have a slender bill that is not at first appearance very finch-like. The bill of the insectivorous antpeckers looks like that of a warbler, and these birds also have a cleft tongue with brush-like bristles. A slender elongated bill is possessed by some other estrildids that take insects, including the White-breasted (*Nigrita fusconotus*) and Grey-headed Negrofinches (*Nigrita canicapillus*) and the Melba Finch, whereas a short, narrow bill typifies the Pale-fronted Negrofinch (*Nigrita luteifrons*), and a rather long, pointed bill characterizes several waxbills, such as Dybowski's Twinspot, the Dusky Twinspot, certain *Lagonosticta* firefinches and the *Granatina* purple waxbills. A long pointed bill is a distinctive feature of the Pink-billed Parrotfinch. The grassfinch with the most slender pointed bill is the Painted Finch, which is known in the field as a seed-eating bird, but in captivity takes many insects. The Pictorella Finch is more slender-billed than are the *Lonchura* munias and mannikins, and it, too, takes insects. The Magpie Mannikin has a large bill, and it feeds on both insects and bamboo seeds. The large-billed Grand Mannikin consumes small grass seeds in the same manner as do other, smaller-billed mannikins, such as the Hooded Mannikin, and its bill differs between the sexes, males having a very large and deep bill and females a less large and less deep one. This difference is perhaps related to mate choice, rather than to feeding differences between the sexes.

The functional morphology of the bill of the Scaly-breasted Munia, as a representative of Estrildidae, has been described in detail by F. W. Nuijens and G. A. Zweers. Estrildids with a stout bill have particularly large jaw muscles and a strong bite, examples being the Red-headed Finch, the Crimson Seedcracker and the Java Sparrow. Certain estrildids with a stout bill differ in the palate skeleton and in their feeding behaviour. In the Western, Red-headed and Grant's Bluebills, the pterygoid is slender and rod-like, and the palatine is slender and its posterior lateral projection, the angulus caudolateralis, is rotated towards the ventral side by about 20°; the quadrate has a long, slender processus orbitalis. The Black-bellied Seedcracker, a huge-billed bird, has the pterygoid flattened, with the broad surface only about 30° from vertical, its ventral edge lateral to the dorsal edge; the palatine is expanded and broad, its angulus caudolateralis is rotated ventrad by about 45° from horizontal, and the quadrate has a short but broad processus orbitalis. The smaller-billed Lesser Seedcracker has the pterygoid less flat, rotated ventrad, and not so extreme in shape and position as those of the mega-billed seedcrackers. In both of these seedcrackers, the angulus caudolateralis of the palatine extends farther tailwards along the length of the bone than it does in the bluebills. In addition to the massive bill, the seedcrackers have massive jaw muscles. Bluebills have sharp cutting edges of the bill. The Red-headed Bluebill takes seeds, fruits, termites and small insects, and it breaks clumps of soil or termite nests by delivering hard, downward blows of the bill. Western Bluebills use the bill as a tool for de-husking seeds, and they take the husk of oil palm fruit (*Elaeis guineensis*), which they remove by biting with the sharp edge of the bill, twisting the head and tearing the fruit, whereas the seedcrackers crush seeds with the bill. For comparison, other waxbills with a thick bill and a strong bite, such as the Red-headed Finch and the Cut-throat Finch, have a slender rod-like pterygoid and a palatine process with the angulus caudolateralis displaced ventrally about 20° from the horizontal. In other estrildid groups, the Java Sparrow has a straight and non-expanded pterygoid and a palatine much like those of the bluebills, and its mandibulum, or lower jaw, has a stout processus medialis and lateralis mandibulae, while a parrotfinch, the Gouldian Finch, has all small elements of the palate skeleton. The variation in the bony structure of the palate in these thick-billed finches is consistent with the estrildid phylogeny in showing that bill size and shape have evolved independently and convergently in different lineages of finches, as illustrated by *Amadina*, *Pyrenestes* and *Spermophaga*, *Erythrura*, and *Lonchura*.

In other families of finches, the Cuckoo Finch (*Anomalospiza imberbis*), a stout-billed member of the Viduidae, has a broad and rotated pterygoid that is fused with a broad angulus caudolateralis, much as in the seedcrackers. The quadrate of *Anomalospiza* has a long processus orbitalis. The ploceid Thick-billed Weaver (*Amblyospiza albifrons*) has the pterygoid broad and rotated, and fused with a stout and rotated palatine. The Hawfinch (*Coccothraustes coccothraustes*) and the Northern Cardinal (*Cardinalis cardinalis*), belonging to the respective



*Like many other estrildids, the **Red-billed Firefinch** retires to the shade during the hottest part of the day to rest and preen. The maintenance and comfort behaviour of most if not all estrildids resembles that of most other passerine birds. They scratch their heads indirectly, by bringing the leg up over the wing. Several species have been observed sunbathing, the typical posture being sideways to the sun, with the sun-side wing spread and drooping, and the body and head feathers erect. Anting has been seen in a few species, but dust-bathing, so far, only in moulting Diamond Firetails* (Stagonopleura guttata).

[*Lagonosticta senegala brunneiceps*, Awasa, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

families Fringillidae and Cardinalidae, have the pterygoid long, only slightly expanded, and not fused with the palatine, and the palatine has a long angulus caudolateralis that is directed ventrad in *Coccothraustes* but not in *Cardinalis*; these two finches have a quadrate with a notably long processus orbitalis. The pterygoid and palatine of the *Pyrenestes* seedcrackers are similar in form to those of Fischer's Lovebird (*Agapornis fischeri*), a member of the parrot family (Psittacidae); the lovebird's quadrate, however, lacks the large processus orbitalis, and its pterygoid and palatine are much more expanded and rotated. The quadrate of the seedcrackers is notably large, with broad condylar surfaces, in comparison with those of the other finches and the lovebird.

Parrotfinches differ in morphology in relation to their foods, as detailed in the Ziswiler team's 1972 review of the genus *Erythrura*. One set of species feeds mainly on grass seeds and bamboo seeds. The second set has a bill suited to de-husking



*Mutual preening, or allopreening, often takes place between mated partners, but also between flock members of more highly social species like the **African Silverbill**. By concentrating on the head and upper neck, which a bird cannot reach by itself, allopreening serves a feather maintenance function, but also plays a part in strengthening bonds and reducing aggression. Subordinate birds tend to solicit preening from more dominant individuals. It has been observed that species in which both sexes have bright and similar plumage preen one another little or not at all, and in firefinches* (Lagonosticta), *the frequency of allopreening is inversely correlated with the amount of red in the female's plumage.*

[*Euodice cantans orientalis*, Tawi Atayr, Oman. Photo: Hanne & Jens Eriksen]



*The forest-edge habitats favoured by the **Western Bluebill** are often close to water, and like most estrildid species, the birds take full advantage of this by bathing frequently. Other estrildid species bathe among leaves wet with dew or rain. Many come regularly to birdbaths, where available, although some appear to prefer the simulated rainfall from fountains or lawn-sprayers to bathing in bowls or pools. After bathing, the birds dry themselves by shaking the feathers, then usually preen.*

[*Spermophaga haematina haematina*,
Abuko Nature Reserve, Gambia.
Photo: Steve Garvie]

dicotyledonous seeds with a cutting action; these are the Red-throated and Red-headed Parrotfinches, which take seeds of *Casuarina* species and figs (*Ficus*). The parrotfinches can be divided into six groups, based on bill morphology and corresponding diet. The first three are group "A", with the Pin-tailed and Green-faced Parrotfinches, group "B", with the Tawny-breasted Parrotfinch, and group "C", with the Blue-faced and Tricoloured Parrotfinches; all of these have a knob on the horny palate and a broad occlusive surface on the lower jaw, and they crush their seeds before swallowing them. Group "D" contains the Mount Katanglad and Red-throated Parrotfinches and the Fiji race of the Red-headed Parrotfinch, the last known as "Peale's Parrotfinch", and group "E" consists of the Papuan Parrotfinch and the Vanuatu subspecies of the Red-headed Parrotfinch, the latter commonly referred to as the "Royal Parrotfinch"; these have a grooved horny palate and a sharp cutting surface on the lower



*Even within the more social species of estrildid such as the **Red-browed Finch**, the basic unit seems to be the pair, and it has been suggested that in at least some species, pair-bonds are lifelong. Pairs may bathe together, preen one another, and sit in contact with one another when resting. They recognize one another's songs and calls, and some species have greeting displays that they use when meeting after separation. Often involving bowing or nodding, or angling of the tail towards the partner, these greetings resemble elements of courtship displays, and both partners may perform them side-by-side and in synchrony.*

[*Neochmia temporalis minor*,
Topaz, Atherton Tableland, NE Queensland, Australia.
Photo: Stanley Breeden/ Lochman Transparencies]



The songs of some closely-related estrildids can be difficult to distinguish. The Fawn-breasted Waxbill (Estrilda paludicola) *has a song very like that of the* ***Orange-cheeked Waxbill****, though harder and more ringing. Their calls are more different, and contact calls also vary among races of the Fawn-breasted Waxbill. Female song has been noted in several species in the waxbill subfamily Estrildinae. The song of captive female Orange-cheeked Waxbills has been described as weak and disjointed compared to the male. This species has been introduced to the Hawaiian Islands.*

[*Estrilda melpoda*, Kealia, Maui, Hawaiian Islands. Photo: Jim Denny]

jaw, and they cut open their seeds. Finally, group "F", with the Pink-billed Parrotfinch alone, has a palate with a strip of grooves, and a broad occlusive surface on the lower jaw; this species presses its food, fig fruit, and it also feeds on insects by probing with the bill. Other morphological differences among the parrotfinches include the details of the mouth structure, the number and size of the salivary glands and oesophageal glands, the form and size of the jaw muscle, and features of the gut. In as much as groups A–C and D–E do not correspond closely to the species groups derived in the other estimates of relatedness (see Systematics), the bill specializations of parrotfinches appear to be more closely associated with their food than with their phylogenetic relationships.

The bare parts vary in colour. This includes the colour of the unfeathered eyering, the size and colour of which appear to differ between the sexes in some estrildids, and in a few species its size

All estrildids have a sexual song, given in close proximity to the female, and often very quiet. The song of the ***White-capped Munia****, for example, mostly consists of a series of clicks and wheezing notes almost inaudible to the human observer. Most estrildids do not use song as a long-distance territorial signal. Exceptions include the territorial purple waxbills. Male Purple Grenadiers* (Granatina ianthinogaster) *give a loud song early and late in the day. The songs of individual male* Granatina *waxbills are distinct from those of their neighbours. Females also sing, and pairs countersing frequently.*

[*Lonchura ferruginosa*, Java. Photo: James Eaton]





*The large bill of the **Magpie Mannikin** equips it to deal with the large, hard seeds of bamboo. Bamboos flower and seed at long intervals, which accounts for the irregular presence of this species in some parts of its range. In Zimbabwe, its movements have been correlated with the seeding of Bindura bamboo* (Oxytenanthera abyssinica). *The Magpie Mannikin also eats grass seeds, and rice has become a major component of its diet in some areas. Similarly, the Java Sparrow* (Lonchura oryzivora), *now largely dependent on rice, is thought originally to have been a bamboo specialist.*

[*Spermestes fringilloides*,
Port Shepstone,
KwaZulu-Natal,
South Africa.
Photo: Hugh Chittenden]

and colour change also with the onset of breeding condition. Some members of the family exhibit sexual dimorphism in iris colour.

Sexual dimorphism in plumage colour and pattern varies among the Estrildidae. Some species are monomorphic in plumage; these are the *Estrilda* waxbills, the Yellow-bellied Swee (*Coccopygia quartinia*), most of the munias and mannikins in the genera *Lonchura* and *Spermestes*, the Beautiful Firetail, the Red-browed Finch and the Red-throated Parrotfinch. Others vary from being slightly to moderately dimorphic, to exhibiting strong sexual dimorphism. In several species pairs of waxbills, one species is monomorphic and the other is dimorphic, the plumage of males and females differing in colour and pattern; these include Woodhouse's (*Parmoptila woodhousei*) and Red-fronted Antpeckers (*Parmoptila rubrifrons*), the Grey-headed and Pale-fronted Negrofinches, the Yellow-bellied Swee and the Swee Waxbill (*Coccopygia melanotis*), the Dusky and



*Parrotfinches are opportunistic and adaptable in their diet. The **Red-headed Parrotfinch** feeds in trees on the fruits of figs and casuarinas, and on the ground on the seeds of herbs and grasses, including rice. It has been suggested that this species originally fed mainly on seeds of herbs, but took advantage of introduced grasses. It also eats insects and spiders, and nectar and pollen in season. The Fijian race* pealii *is often considered a separate species, Peale's Parrotfinch.*

[*Erythrura cyaneovirens pealii*,
Fiji.
Photo: Ian Morley]

Dybowski's Twinspots, the Mali and Chad Firefinches, and the Bar-breasted and Red-billed Firefinches. Among the parrotfinches most species are not dimorphic or are only slightly so; the Gouldian Finch and the Pin-tailed Parrotfinch are the exceptions, displaying strong plumage dimorphism between the sexes. In the subfamily Lonchurinae, all degrees of sexual dimorphism occur among the grassfinches, whereas the mannikins and munias are mainly monomorphic. Because all estrildids are monogamous, the nesting partners remain together in pairs, and both sexes take an active part in parental care, the differences among species in plumage dimorphism are not related to different mating systems.

Distinct plumage morphs are a feature of the Gouldian Finch, the face of which can be red or black or yellow. These colour morphs are ecologically significant as indicators of associated genetic traits. The birds mate preferentially with a partner of the same colour morph. The hatching rate of eggs of mixed pairs is lower than that of pairs in which the partners are of the same morph, and the offspring of mixed pairs have a lower survival, both as juveniles and as adults, most notably in females, as a result of some underlying genetic incompatibility.

Estrildid finches vary also in the extent to which the adult and juvenile plumages differ. Juveniles of the *Euschistospiza* and *Hypargos* twinspots and the *Granatina* purple waxbills are distinct in plumage from their respective adults. Some estrildids are similar in adult female and juvenile plumages, examples being the *Uraeginthus* blue waxbills, the East African Yellow-bellied Swee and the Crimson-rumped Waxbill. Munias and mannikins have distinct adult and juvenile plumages, and in several species groups the juvenile plumages of the different species are nearly identical, such that the young may not be identifiable until they have developed part of the adult plumage.

Moult in the estrildid finches is seasonal in occurrence, and is generally completed shortly before the breeding season. The sequence of feather loss and replacement is similar to that in many other songbirds. For most species, post-juvenile moult has been observed mainly in captivity, and the timing of moult may differ from that in natural conditions. Nevertheless, the onset and the duration of post-juvenile moult are nearly the same in wild and captive Australian Zebra Finches. In this species the body moult often begins at 35–40 days of age; the sex-specific plumage of some young becomes evident at this time, and the moult to adult plumage is nearly complete in 55–60 days; an exception is provided by wild birds hatched late in the season in south-western Australia, where the development of adult plumage is often delayed for several months. The primaries are replaced after the post-juvenile body moult is completed, beginning at a mean age of 80 days or later for birds hatched late in the breeding season, and taking 200–230 days to be replaced.

The annual adult moult replaces the first adult plumage with a similar older adult plumage, and the aspect of plumage remains the same. Moult is generally completed outside the breeding season, although Australian finches of dry country sometimes moult during the breeding period, and birds may interrupt wing moult while they are breeding. The time of the onset and the duration of moult in the field have been determined from the proportion of birds in moult at any time of year and from recaptures of individual birds. In the Australian Zebra Finch the pace of moult is generally slow. The flight-feathers are replaced only gradually with usually only one primary (of each wing) in growth at any one time. Progress is from the innermost primary to the outermost. The secondaries are replaced from distal towards proximal, much as in most other songbirds. The inner primaries take about 21 days from loss until they are fully grown. Duration of the complete primary moult averages 230–240 days in the Australian Zebra Finch; other Australian finches also show slow moult. In southern Zambia, in a population of Red-billed Firefinches, the primaries of some adults are in moult from March through to December. Moult of recaptured adults has been found to be slower in birds that begin to moult early in the season, in March, but more rapid in birds beginning their moult later, in October, when some birds will grow two primaries at a time; in this asynchronous population some adults have completed their moult by September. In Zambia, Senegal and Nigeria, about 50% of the birds in the population complete their moult in 90–120 days. In contrast, in captivity the firefinches complete their moult in 40 days or less. In exception to the estrildid pattern of one annual moult, the Asian Red Avadavat usually completes two body moults, and one wing moult, in a year. The adult male undergoes a change from a pale tan plumage in the non-breeding season to bright red in the breeding season; a few males, however, moult from one breeding plumage to another. The female may



Feeding on the ground in grassy woodland and on cultivated land, the ***Red-cheeked Cordon-bleu*** *takes the seeds of grasses, such as the* Brachiaria stigmatissata *seen here, and also ants and termites. Foraging is confined to shaded areas in the middle parts of the day, but birds exploit places exposed to the full sun in the early mornings and late afternoons. They feed mostly in pairs, but sometimes gather to form temporary foraging flocks. Birds in pairs peck more rapidly than those in other situations, and it has been suggested that one advantage of permanent pair-bonds is that such partners may forage more efficiently than unpaired birds, in preparation for the breeding season.*

[*Uraeginthus bengalus bengalus*, Amurum, Jos Plateau, Nigeria. Photo: A. P. Leventis]

undergo two body moults but does not change in appearance with the seasons.

Change in plumage can occur with age in the case of adults. For example, several munias and mannikins in the genus *Lonchura* apparently develop their definitive adult plumage only after several moults, and the Tricoloured Parrotfinch is said to acquire its bright adult plumage only after a third moult. In captivity, *Amandava* and *Amadina* species may develop melanistic plumage, unlike any seen in the field, after several moults, and hybrids between captive Chestnut-breasted and Yellow-rumped Mannikins often change their appearance through the first years of their lives. Finally, wild-living populations of the Melba Finch in Djibouti and South Africa sometimes exhibit a lack of melanin or an excess of yellow pigment.

Nestlings have elaborate mouth markings and colours. The corner of the mouth is swollen at the gape with flanges or papillae. These swellings vary in size, shape and colour. The palate of most waxbills and all parrotfinches has black spots, and the palate of munias and mannikins has black bars. In grassfinch nestlings the palate varies among species, some having spots and some having bars. In addition to the black mouth markings, nestling estrildids have conspicuous colours on the gape and palate, visible on live birds but disappearing in pickled specimens. Other structures and colours that vary among species include raised structures of colours that contrast with the palate, and spots and bars on the tongue. The nestling mouth colours and melanin patterns are known for more than one hundred estrildid species. The parents see these visual patterns when the young display them while begging for parental attention. The markings and colours of the begging young are thought to have signal value to the parents.

The corner of the mouth, the gape, is frequently swollen with pads, papillae, balls, globes or reflection pearls. These structures are often strikingly coloured, pearly or opalescent with an underlying layer of melanin, and they contrast with the nestling skin. Pads at the corner of the gape of those nestlings having gape-balls are often yellowish-grey. The base and the oral surfaces of the gape swellings are typically black. Those of closely related species are similar in appearance, as demonstrated by nestlings of the parrotfinches, on which the swellings are large globes of pearly blue and are conspicuous reflectors of light in the dark nest. Nestlings of most species of waxbill have small balls on the gape, or they have enlarged gape-flanges. In some species the pattern is elaborate, as in the African Quailfinch nestling, which has a gape with three light blue balls separated by black margins, giving the closed mouth a checkerboard appearance and the open mouth a circle of bright spots. The nestling munias and mannikins have swollen gape-flanges.

Inside the mouth, the palate is marked with black spots or bars. Most waxbills and parrotfinches and many grassfinches have five black spots arranged like the spots on a domino, in a pattern like a cut diamond on the palate. The Red Avadavat has six spots, the central spot being divided into two. Some waxbills, including the bluebills, the *Uraeginthus* blue waxbills and *Hypargos* twinspots, have only three spots. The Melba Finch has a single central spot, while the four other pytilias have none at all, and nestlings of the swee waxbills in the genus *Coccopygia* similarly lack black spots. Species with similar nestling gape and palate markings and colours are generally closely related. The markings and colours are most variable in the waxbills, and they are species-specific in the firefinches, the *Uraeginthus* blue waxbills and most pytilias. In the genus *Estrilda*, however, the nestlings of many species are nearly identical in their gape and mouth markings. In cases in which sibling species are most similar in the markings and colours, the common factor appears to be a recent divergence of species. In Australia, the four *Neochmia* grassfinches have a palate pattern of five black spots, and two of the species, the Star Finch and the Plum-headed Finch, have the anterior spots joined to form a black bar. The three *Stagonopleura* firetails have five spots connected by a line to form a diamond shape open posteriorly, a pattern emphasized by white palate swellings. In the *Poephila* grassfinches, the three species differ in the degree to which the spots combine into bars. Hybrids between the Masked Finch (*Poephila personata*) and the Long-tailed



Foraging almost exclusively on the ground or in low cover, the ***Red-headed Bluebill*** *lifts and moves dead leaves in search of seeds and insects, and breaks up clods of earth and termite nests with blows from its bill. Although it can perch on near-vertical stems and branches, it is reportedly unable to "cling, hang and stretch about like a typical waxbill". It takes the seeds of legumes* (Indigofera), *morning glories* (Ipomoea) *and speargrass* (Imperata cylindrica). *The race* cana *from the Usambara Mountains of north-east Tanzania is reported to specialize in grass seeds.*

[*Spermophaga ruficapilla ruficapilla*, Kakamega Nature Reserve, Kenya. Photo: Theodoulos Poullis]





When grass seeds, especially cereals, are abundant, estrildids of several species may gather to feed on them. The ***Red-billed Firefinch*** *forages for seeds only on the ground, occasionally grasping ripe stems to shake down seeds, but the* ***Blue Waxbill*** *is far more adaptable, using its weight to bend seedheads to the ground, or perching among the stems to take ripe and unripe seeds. As well as whole grains of small cereals such as tef* (Eragrostis tef)*, Red-billed Firefinches will take spilled meal. These birds sometimes become very tame, entering dwellings and approaching people grinding grain to scavenge fallen fragments of larger cereals. Estrildids will de-husk a grass seed by using the tongue to position it against the cutting edges of the bill. The action is very rapid, but, when nervous or under pressure, wild estrildids that normally de-husk seeds have been observed to swallow them whole. In captivity, birds have also been seen swallowing seeds without de-husking them. These birds were in no way particularly hungry or hurried, and may have been seeking some nutrient present in the husk and not otherwise provided in their artificial diet.*

[Above: *Lagonosticta senegala rendalli.*

Below: *Uraeginthus angolensis.*

Kafue National Park, Zambia.
Photos: Jesús Rodríguez-Osorio]



Examination of the stomach contents of the ***Indian Silverbill*** *suggests that its main food is small seeds, with insects and their eggs taken opportunistically. During the growing season, Indian Silverbills perch on stalks to feed from the seedheads of grasses, sedges and cereals like millet* (Panicum). *For most of the year, however, they forage for fallen seeds on the ground. Following the monsoon or other rains, when the grass seeds germinate, they make short-distance movements in search of alternative food, sometimes gathering in large flocks.*

[*Euodice malabarica*, Oman.
Photo: Mathias Schäf]

Finch (*Poephila acuticauda*) have five spots, like the Masked Finch; in the second generation of hybrids, 25% had *personata*-like mouth markings, 25% had markings like those of *acuticauda*, and 50% were intermediate between the two species. The only species known to exhibit intraspecific geographical variation in nestling mouth markings is the Black-bellied Firefinch: nestlings in Nigeria have a red, white and blue pattern on the palate and gape, whereas nestlings in Cameroon have light red and white colours and no trace of blue. The palate bars are single in Australasian *Lonchura* munias and mannikins, and double in African *Spermestes* mannikins.

In many estrildids, the prominence of the nestlings' black palate spots is somewhat overshadowed by the striking colours of the gape and palate. In one of the most conspicuous colour schemes, in *Pytilia*, each nestling has pale sky-blue, red and purple in a contrasting pattern on the roof of the mouth. The blue gape colours are more prominent in the *Granatina* purple waxbills than in the *Uraeginthus* blue waxbills. The gape and palate of the Locust Finch are unlike the mouths of other estrildids, the nestling having a gape of blue swellings and a palate of red with black lines, rather than the spots of other waxbills. These markings and colours of the Locust Finch nestling are unlike those of the species' apparent closest relatives, the African Quailfinch, the three *Amandava* species and the two large-billed *Amadina* finches; indeed, such markings are unique among estrildids.



Many of the Estrilda *waxbills feed preferentially from the seedheads of growing plants. They perch on the stem, or jump from the ground to pull the seedhead down, holding it beneath one foot while they take the seeds. Where their ranges overlap, the typical waxbills are separated by habitat choice, the* ***Common Waxbill****, for example, often being found in damper sites than its closest congeners.*

[*Estrilda astrild astrild*, Addo Elephant National Park, South Africa.
Photo: Rafael Armada]



Aviculturists have noted that the ***Fawn-breasted Waxbill*** *is "fond of perching on upright reed stems, and this should be borne in mind when furnishing its bird room or aviary". This species is often found near water, or in damp grassy clearings in woodland. It forages in pairs or in small groups, and in flocks in grassland. Here seen feeding while perched on stems; the birds will also take seeds from the ground. The closely related Anambra Waxbill* (Estrilda poliopareia)*, once considered a race of the Fawn-breasted, is also often found beside rivers, in swamps and at other wetland sites. It takes the seeds of sedges and grasses, moving to the seeds and flowers of elephant grass* (Pennisetum) *when other grasses are flooded. The Black-bellied Seedcracker* (Pyrenestes ostrinus) *is a sedge specialist. In Cameroon, both small-billed and large-billed individuals of this species take the seeds of the small-seeded sedge* Scleria verrucosa*, when these are abundant. Only huge-billed individuals, however, are able to take the very hard seeds of* Scleria racemosa*, using the bill to crack them.*

[*Estrilda paludicola ochrogaster*, Awasa, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



A study of ecological segregation among birds in south-east Australia found a substantial overlap in range between the ***Double-barred Finch*** *and its only sympatric congener, the Australian Zebra Finch* (Taeniopygia castanotis). *However, there was no overlap in the habitats used by these species. Both feed on the seeds of grasses, taking them from the stems or from the ground. Unlike the Australian Zebra Finch, which is highly social all the year round, the Double-barred Finch forages singly and in pairs, as well as in flocks. It can sometimes be found in mixed-species flocks with other estrildids, mainly Diamond Firetails* (Stagonopleura guttata), *but also, on occasion, Zebra Finches.*

[*Taeniopygia bichenovii annulosa*, Galvan's Gorge, Western Australia, Australia. Photo: Don Hadden]

The palate bar of nestling munias and grassfinches develops from spots in the older embryos and hatchlings, as described for young in the genera *Lonchura*, *Poephila*, *Neochmia* and *Stagonopleura*. In the nestling Black Mannikin, the bar is incomplete at hatching and complete by day 10. The skin colour of some estrildids changes from being pale at the time of hatching to becoming dark or nearly black after the first week of nestling life, and the shape and colour of the gape change with age. On hatching, Peters's Twinspot has white gape swellings, these becoming yellow around the fifth day, and the lower swelling is partly orange by the time the young bird leaves the nest. Zebra Waxbills have whitish gape-flanges that become small and grey by the time of fledging. The palate pattern of the Locust Finch nestling changes, as it develops a second set of bars by its sixth day of life. In the genus *Lonchura*, the gape swellings of nestlings of several species, including the Black and Black-breasted Mannikins and the Five-coloured and Pale-headed Munias, change from blue to white with age.

The five-spot palate pattern appears to be the primitive trait in the Estrildidae, as it occurs in most African species and half of the Australian ones. The bar (or arc) pattern is the derived form, as shown also in its embryonic and nestling development from spots. In his 1965 book *Australian Finches in Bush and Aviary*, Immelmann remarked that this evolutionary change from spots to a derived condition of bars has occurred independently in the African estrildids and the Australian ones.

In addition to their mouth patterns, the nestlings of estrildid species differ from one another in the presence or otherwise of natal down and, when present, its distribution. *Estrilda* waxbills, the Australasian munias and mannikins, and the parrotfinches have naked skin at hatching. Young blue waxbills, purple waxbills, firefinches and African *Spermestes* mannikins, on the other hand, do have natal down when they hatch.



With rather tit-like agility, the ***Swee Waxbill*** *feeds largely from seeds still attached to grasses and other vegetation, and it sometimes takes buds and small insects. It will also seek seeds on the ground, with the same restless activity. Among the less social estrildids, the Swee Waxbill is usually encountered in pairs and small groups, and is only rarely found in mixed-species foraging flocks.*

[*Coccopygia melanotis*, Kurisa Moya Nature Lodge, Limpopo, South Africa. Photo: Derek Engelbrecht]

Habitat

Estrildid finches are for the most part birds of grassy areas, often the grassland matrix dotted with wooded or shrubby patches, and they are nearly always found close to water. They feed in grassy areas and nest in grassy glades and in trees and bushes. Most members of the family are terrestrial, taking their food from the ground and from vegetation within a metre of the ground. Some finches are nearly independent of trees and shrubs, and occur in open grassland that sometimes floods in the rainy season. In the Afrotropics, the African Quailfinch, the Locust Finch, the Zebra Waxbill and several *Estrilda* waxbills, including the Orange-cheeked and Fawn-breasted Waxbills, live in grasslands and make little or no use of bushes and trees. Other members of the family

feed on the ground and in the grass, but also spend time in bushes and trees, examples being the Blue Waxbill and Blue-headed Cordon-bleu, the Violet-cheeked Waxbill, the Purple Grenadier and the *Pytilia* species, and some widespread species, such as the Common Waxbill, occur also in tall grass and marshland vegetation. Many estrildids are frequent or common in grassland around cultivation, and a few species are regarded as pests in cereal crops and rice (*Oryza*). Most waxbills in the areas of overgrown cultivation, however, take mainly the seeds of weedy annual grasses, rather than those of the cereal crops.

Semi-arid grasslands in Africa are home for many estrildids, and the dry grassy savanna country and grassy bushland provide grass for food and thorny acacias (*Acacia*) for nesting sites. Some members of this family are associated with grass that is supported by moist areas around rocky hillsides; these include the Mali, Rock and Chad Firefinches and Dybowski's Twinspot. Other dry-country finches are the African and Indian Silverbills. These habitats harbour abundant termites, and some species, including the Melba Finch, Red-winged Pytilia, Brown Twinspot and Black-faced Firefinch, are associated with termitaria and the crusty soil that conceals the termites. In southern Asia, estrildid finches occur over a wide range of habitats, including forest, this last being occupied by parrotfinches and by Scaly-breasted, Dusky and White-bellied Munias.

In Australia, most finches are found in sparsely wooded grasslands and grassy savanna. The Diamond Firetail occurs in a wide variety of wooded habitats, including open eucalypt (*Eucalyptus*) stands, mallee bush and scrubby grassland. Very open sclerophyll woodland with a grassy understorey is the habitat of the Gouldian Finch, the Long-tailed Finch and the Masked Finch. Painted Finches occur in rocky scrub acacia and spinifex grassland in Australia. Other inhabitants of grassy savanna are the Star Finch, the Plum-headed Finch, the Australian Zebra Finch and the Double-barred Finch.

Marshlands are the most common habitat of several estrildids. These birds live in reedbeds, floating mats of vegetation, tall marsh grass, and wet grasslands along the edge of rivers. In Africa, certain populations of the Crimson Seedcracker and the Black-bellied Seedcracker inhabit swampy sedgelands. Red-fronted Antpeckers live along the borders of forest swamps and flooded forest, White-collared Olivebacks extend into papyrus (*Cyperus papyrus*) swamps and thickets, and Brown Firefinches live in marsh vegetation alongside the Okavango and Zambezi Rivers. In Australia, the Pictorella Finch is found in marshes, rice fields and grassy dry woodlands, the Crimson Finch often nests in swampy grasslands, and the Chestnut-breasted and Yellow-rumped Mannikins live in marshes, as well as in arid grassland. Immediately to the north, in New Guinea and the nearby Bismarck Archipelago, Black Mannikins live



An examination of the bill measurements and crop contents of the two subspecies of the ***Crimson Finch*** *found that the commoner race,* phaeton *had a deeper and wider bill than the "white-bellied" race* evangelinae*, and consumed seeds of a larger mean diameter. A similar difference was found in the bill sizes of the two races of the congeneric Star Finch* (Neochmia ruficauda)*. During the wet season there is a considerable overlap in the diets of Crimson and Star Finches, but Crimson Finches are able to take larger seeds.*

[*Neochmia phaeton phaeton*, near Cairns, NE Queensland, Australia. Photo: Stanley Breeden/ Lochman Transparencies]

In adapting from grassland to forest life, the Erythrura *parrotfinches have broadened their diets to include the seeds of many kinds of plant, as well as fruit, flowers and insects. The mostly insectivorous Pink-billed Parrotfinch* (E. kleinschmidti) *has even developed foraging behaviour like that of a nuthatch (Sittidae) or treecreeper (Certhiidae), moving up and down trees and clinging to the vertical trunks while it probes with its bill, or levers off pieces of bark to expose grubs. More typically, the* ***Tricoloured Parrotfinch*** *still includes grass seeds along with the figs and other fruits in its diet, and it feeds on the ground and in low scrub as well as in trees.*

[*Erythrura tricolor*, Babar, S Moluccas. Photo: Filip Verbelen]





Flocks of ***White-headed Munias*** *have been observed "roller-feeding", with the birds at the rear continually overflying those at the front, as they forage. They are often found in large flocks, mixed with congeners such as Scaly-breasted Munias* (Lonchura punctulata) *in Java and Malaysia, and Chestnut Munias* (L. atricapilla) *in Vietnam. During breeding, however, they are more often encountered in pairs or small groups. They feed on rice, though usually at the under-ripe "milky" stage, and when seen on rice stubble are probably taking the fallen seeds of weeds. However, captive birds are reportedly perfectly capable of eating hard, dry rice.*

[*Lonchura maja*, Singapore. Photo: Ong Kiem Sian]

on floating mats of grass, and the large-billed Grand and Thick-billed Mannikins live in flooded marshes and swamps with emergent grasses.

While grasslands are the main habitat for most members of this family, several of the species occupy woodland and even evergreen forests. In Africa, the forest-dwelling finches include the antpeckers, the negrofinches, known also as nigritas, the bluebills and the seedcrackers. These live mainly in the forest understorey, thickets and bamboo, some feeding mainly on insects, fruits and flowers. The Green Twinspot frequents the understorey where certain grasses occur, and it takes the seeds of these, as well as insects. Typically found in rainforest, Grant's Bluebill, the Western Bluebill and the Red-headed Bluebill are also birds of the understorey; Crimson and Black-bellied Seedcrackers occur in forests, extending into swamp-forests and tidal creeks. In Australia, where this habitat is limited in extent, three species occur in forests: the Red-eared Firetail, which inhabits cool, wet evergreen forest of jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) and coastal heath and woodland in the south-west of the country; the Diamond Firetail, found in the south-east in river red gums (*Eucalyptus camaldulensis*), *Casuarina* and coastal heath; and the Red-faced Parrotfinch, in Australia confined to the humid north-east where it lives in hill and montane forest and dense secondary growth and coastal mangroves. In New Guinea, several estrildids occur in forests, notable among them being the Mountain Firetail, which is found in montane forest with southern beech (*Nothofagus*) and *Pandanus* palms and in forest openings. Logged forest often holds finches in areas where grasslands have become established following the creation of roads and clearings.

Most estrildid species are lowland in distribution. They occur at sea-level and upwards into continental and island plateaux and hills. Many, however, extend into highland areas, and a few make it into montane areas above 3000 m. In East Africa, the crimsonwings are typically found in montane regions, and Kandt's Waxbill is an inhabitant of montane glades and clearings as high as 3300 m in the Albertine Rift area and Kenya. In New Guinea, a few thick-billed species appear in montane and alpine grasslands, including the Alpine, Snow Mountain and Streak-headed Mannikins.

General Habits

Estrildids can be rather solitary birds in grassland and open woodland, most species being dependent on grass seeds in the diet. They are diverse in their social behaviour. Some estrildids are quiet, their songs and calls audible only at close range. A few species, however, are loudly vocal and territorial, and the pairs nest well apart from other pairs, this being typical for the Melba Finch, the Violet-eared Waxbill and the Purple Grenadier. Other species are gregarious throughout the year, living in feeding flocks and nesting in loose colonies, typical examples being the Australian Zebra Finch and the Scaly-breasted and White-headed Munias. The estrildid finches are among the most social of birds, the male and female mates spending nearly all of their time with each other. They are perhaps best known as cagebirds, and many have been bred in captivity. Indeed, aviary studies have provided a great deal of information on their biology.

Most members of the family are contact species. Pair-members, and sometimes other individuals, huddle together in social groups during the daytime, and at night they also roost with the bodies touching one another, irrespective of the temperature. Variation among the species in this behaviour is not entirely associated with their systematic status. For example, some munias are contact birds, whereas others remain out of bodily contact when they are perched and even when roosting.

Mated partners often preen each other. It appears that most estrildid species indulge in this behaviour, known as "allopreening", although some, including the African Quailfinch, the Melba Finch, and the Gouldian Finch and other parrotfinches, are not known to preen their social partners. The more gregarious estrildids, such as the Bronze Mannikin, spend a good deal of time in preening themselves and preening one another. Allopreening also is a family affair: the parents preen their fledged young and the young preen the parents in return, as well as preening one another. Generally, the socially subordinate individual solicits allopreening from its partner, often by bowing the head towards the partner; the dominant individual then preens the soliciting bird. Allopreening appears to reinforce a social bond, either to reduce aggression between the birds or to assert social dominance.

Nearly all estrildid finches build nests for breeding. In addition, some species regularly construct nests for the pur-



With so much overlap in their preferred foods, mixed flocks of estrildids are often found feeding together. Here ***Scaly-breasted Munias*** *are intermingled with* ***White-rumped Munias*** *(distinguished by the blackish face and tail, and rufous uppertail- and undertail-coverts). In Bangalore, maturing rice crops are reported to suffer serious damage from mixed flocks of Scaly-breasted, White-rumped, and Tricoloured Munias* (Lonchura malacca)*, Indian Silverbills* (Euodice malabarica) *and Baya Weavers* (Ploceus philippinus)*, which roost together in nearby reedbeds.*

[*Lonchura punctulata topela* and *Lonchura striata swinhoei*, Hong Kong. Photo: John & Jemi Holmes]

poses of roosting. These roost nests often are smaller and have thinner walls than the breeding nests, and, unlike the latter, they are not lined with fine materials and they lack an entrance tunnel. Roosting nests are known to be built by at least some of the Australian grassfinches, including the Australian Zebra Finch, the Timor Zebra Finch, the Double-barred Finch, the three firetails, the three *Poephila* grassfinches and the Red-browed Finch. In the same way, the flock-living African *Spermestes* mannikins and the Asian *Lonchura* munias commonly roost in a nest.

The comfort and maintenance behaviour of these finches seems unremarkable. From the available information, it is evident that most or all members of the family bathe in water, often communally, and many indulge in sun-bathing. Diamond Firetails were found to dust-bathe often when moulting, but, although it is likely that some other species dust-bathe, there appears to be little information on this aspect of their behaviour.

Bathing is a frequent activity, especially among those species living in more arid regions. It usually takes place in shallow water, such as small pools and the edges of water-holes, and many



Although they take some seeds, the bulk of the diet of the ***White-breasted Negrofinch*** *consists of insects and their larvae, and fruits including figs, the husks and pulp of oil palm, and small berries. Negrofinches have slender bills, and their movements are warbler-like, as they move among twigs and leaves, gleaning insects. They forage at various heights, though usually in the canopy in primary forest, and they rarely descend to the ground.*

[*Nigrita fusconotus fusconotus*, Bwindi-Impenetrable Forest National Park, Uganda. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]



During bamboo seeding time, flocks of hundreds of ***Pin-tailed Parrotfinches*** *can gather, remaining until the harvest of unripe bamboo seeds is over. The different species of bamboo will flower and produce seed at intervals of many years, and Pin-tailed Parrotfinches appear to wander over a large range to take advantage of these events. Like some other bamboo specialists among the estrildids, they also take rice, moving seasonally to follow the rice harvest. At other times this species forages alone or in pairs, sometimes searching for seeds among fallen leaves on the ground.*

[*Erythrura prasina prasina*, Kaeng Krachan National Park, Thailand. Photo: Tom Stephenson]

species make use of birdbaths in town and suburban gardens. Some estrildids will exploit other opportunities. For example, Crimson Finches have been observed to bathe on large dew-covered leaves, and in periods following rainfall. Beautiful Firetails bathe in the still wet foliage of shrubs and trees. Captive Star Finches frequently bathed in the spray of artificial water fountains, which would simulate rain, but they appeared to avoid other, more "traditional" sites, such as open bowls. Bathing is normally followed by preening. When head-scratching, all members of the family appear to use the indirect method, with the leg brought up over the rear edge of the drooped wing.

Sun-bathing is a less well-known activity, but it has been recorded for several estrildids. In northern Australia, for example, Double-barred Finches and Long-tailed Finches, after having bathed in a water-hole, were observed to sun-bathe in flocks on a small sandy beach; they then preened themselves. Also in



At least ten estrildid species—including the Crimson Finch (Neochmia phaeton) *in Australia, the Scaly-breasted Munia* (Lonchura punctulata) *in Asia, and the* ***Bronze Mannikin*** *in Africa—eat filamentous algae such as* Spirogyra, *which they take from shallow water such as rice paddies and ponds. A study of the White-rumped Munia* (L. striata) *in Peninsular Malaysia found that the primary periods for eating algae were January, and June to August, coinciding with the munia's two peak periods of reproductive activity. It was suggested that the munias ate* Spirogyra *as a source of protein to enable them to become physiologically ready for breeding, much as other bird species eat insects.*

[*Spermestes cucullata*, Pretoria Botanical Gardens, South Africa. Photo: Nevil Lazarus]

Australia, young fledgling Red-browed Finches were seen to sun with the adults.

Voice

Vocalizations of estrildids are often harsh and discordant, and consist of short notes and little apparent temporal pattern. On the other hand, some of the species have songs sounding like musical whistles. The vocal repertoires of this family include several calls, as well as songs, and the songs themselves are not always distinguishable from calls in their structure. Not all of these calls and songs have been linked with a behavioural context. Estrildid songs are sometimes of two forms, a loud song given as a distance advertisement and a soft song given in a close-range sexual context. In addition, some species have several distinct versions of song, known as song themes, given either by the same bird or as individualistic song themes by different birds of the same species. Similarly, some finches have loud long-range contact calls and soft close-range contact calls that are emitted in different contexts. Other vocalizations in the repertoire include flight calls, alarm calls and nest calls, the last given by a male at a nest or nesting site, and the young finches have their own distinctive begging calls. The repertoire of the best-studied estrildids is large: the Australian Zebra Finch has 14 distinct calls and songs; the Masked Finch has eleven distinct adult calls; the Black-throated Finch (*Poephila cincta*) has 13 calls; the Long-tailed Finch has 14 or 15, in addition to song; and the African Firefinch has as many as twelve distinct calls and songs given by a single individual.

Song is an important element of courtship. The courting male often sings directly to a female at close range, within a metre of her; this song is known as "directed song". The males, however, sing even when they are alone, when they give a "solitary song", which is the same in form but differs in social context and is not visually directed towards another bird. They also have a "social song", directed at another individual in non-sexual contexts. "Undirected song" is broadcast to a wider range of potential listeners, but the undirected song of Australian Zebra Finches also may be a signal to a mate and encourage her to remain in the nest. Most estrildids do not use song as a long-distance territorial signal. Indeed, the sexual song of many species, such as the munias, is audible only within a metre or two of the singer. The males of some species, such as the Red-billed Firefinch, have only one song theme, whereas those of others, such as the Melba Finch and Australian Zebra Finch, may have several song themes in a repertoire, or one complex song theme with many variations in the sequence and repetition of included phrases. In some species, each male within a local population has its own distinct songs, and sometimes, as with the Masked Finch, each bird has its own distinctive contact calls.

Closely related species are often similar in voice. The African waxbills in the subfamily Estrildinae have some of the best-known songs. Detailed comparisons of congeneric species and closely related subspecies are available for the African Quailfinch, the two purple waxbills in *Granatina*, the three blue waxbills in *Uraeginthus*, the pytilias and the firefinches. The species in these five genera have distinctive songs, but those of the Bar-breasted and Brown Firefinches are the same, as are the songs of the Rock and Chad Firefinches. The songs of the Blue Waxbill and Red-cheeked Cordon-bleu are nearly identical, with short harsh notes and clear whistles, but the alarm calls differ, fast chatters in the case of the Blue Waxbill and slower chatters in the Red-cheeked Cordon-bleu. Songs of the Blue-capped Cordon-bleu (*Uraeginthus cyanocephalus*) have longer whistles, but the alarm calls of this species are a slow chatter much like that of the Red-cheeked Cordon-bleu. The songs of the Melba Finch are complex, less so in West Africa, and most so in southern Africa, where they differ considerably between one local geographical area and another. The songs of the other *Pytilia* species are simpler in structure, but those of the Ethiopian Pytilia are not known in sufficient detail to allow a comparison with those of the Red-winged Pytilia. The four crimsonwings in the genus *Cryptospiza* are similar to one another in their songs, typified by long, clear, slurred whistles. The *Pyrenestes* seedcrackers and the *Spermophaga* bluebills have warbled songs with downslurs and upslurs, and a trill that rises in pitch towards the end, the bluebills delivering longer trills and arpeggios. Song differences between the small-billed form *rothschildi* and the larger-billed nominate race of the Black-bellied Seedcracker have been reported, but recordings indicate no vocal differences between the two. Two species groups of *Estrilda* waxbills are similar in their distance contact calls. Each member



More slender-billed than the munias and mannikins of the genus Lonchura, *in which it was once placed, the* ***Pictorella Finch*** *eats insects and other small arthropods as well as the seeds of grasses and weeds. It has stronger legs than* Lonchura *species, and feeds mostly on the ground. But it also reaches up or perches on the stems to get at the seeds of growing plants, including unripe rice. Pictorella Finches are often found along watercourses, or in marshes, swamps and flooded rice fields, and they take filamentous algae from shallow water.*

[*Heteromunia pectoralis*, Canteen Creek, Northern Territory, Australia. Photo: Don Hadden]

of the first group, consisting of the Black-tailed, Cinderella and Lavender Waxbills, utters a high-pitched whistled "seeee", and a similar whistle is given by the second group, the Black-faced Waxbill, with which the taxa *delamerei* and *charmosyna* are considered conspecific; the four species are each other's closest relatives (see Systematics).

Among the Melanesian and Asian parrotfinches in the genus *Erythrura*, the Green-faced, Mount Katanglad, Blue-faced, Red-throated, Red-headed and Papuan Parrotfinches have high-pitched penetrating rapid trills. These vocalizations differ from those of other parrotfinches.

In the subfamily Lonchurinae, the songs of Australian grassfinches are best known for the members of the genera *Poephila* and *Taeniopygia*. In the case of *Lonchura*, comprising the munias and mannikins, the songs are not very loud and are given by a male, directing his song to a female at close range. Most songs that have been recorded are of males in isolation, undirected songs; these are mainly the same in form as songs given in a sexual context. A basic pattern of *Lonchura* song consists of a series of soft short calls, such as bill-clicks and rattles, vocal wheezes and "tweek" sounds, followed by a louder and longer whistled "weeee". Species with this song pattern include the Scaly-breasted, Tricoloured, Chestnut, White-capped, Five-coloured, White-headed, Pale-headed, Black-faced and White-bellied Munias, and the Hooded, Grand, Grey-crowned, Yellow-rumped and Chestnut-breasted Mannikins; Scaly-breasted Munias have short calls and a slurred whistle with many overtones, and Chestnut-breasted Mannikins have "weeee" calls. Immelmann noted no differences between the songs of Chestnut-breasted and Yellow-rumped Mannikins in Western Australia, whereas Restall reported that the songs of the two species differ; at any rate, their songs are not well known. There is a general similarity in song among many *Lonchura* species, and it is likely that not all details given in the literature are species-specific. In other species in this genus, the song lacks a "weeee", as illustrated by the White-rumped and Javan Munias and the Black Mannikin, or the song is unknown, as is the case with the Grey-banded, Hunstein's, New Ireland, Grey-headed, Black-breasted, Snow Mountain, Alpine and Thick-billed Mannikins and the Dusky and Black-throated Munias. The songs of the Java and Timor Sparrow are a complex jingle and rattle, and both species have a whistled "weeee", although this call is not reported as being incorporated into the song of the Timor Sparrow. Both the nominate race and the "white-spotted" subspecies *leucosticta* of the Streak-headed Mannikin have a high-pitched buzzy jingle lacking a whistled "weeee".

Although there is a similarity in song among the various munias and mannikins, the songs may differ in detail. As described in words and in the absence of recordings, the songs of munias could apply also to Australian grassfinches in the genus *Poephila*; yet the songs even of the three grassfinch species differ from one another, and there are constant differences between subspecies and among individuals in the same population. The published verbal descriptions of song do not always capture the detail that is evident in audiospectrograms. Thus, the songs of individuals of the same species can differ, as is the case with the "Bengalese Finch", which is a domesticated strain of the White-rumped Munia, and several other estrildids.

The development of song in several members of this family has been studied. These birds learn their songs, and the details of song-learning are well known for some species. In experimental studies, finches can be reared by other species. The foster-reared



Estrildid finches drink water when it is available, and even those capable of surviving long periods of drought will make long daily trips to water-holes. The members of Estrilda, *such as the* ***Black-faced Waxbill****, drink in the usual passerine way, by tipping the head up to swallow. "Tip-down" drinking, where the bird uses a combination of movements of the tongue, pharynx and larynx to ingest water without raising its head, has been studied in some Australian finches. However captive birds of other species, including some* Estrilda, *have been reported using the tip-down method to drink water droplets, the contents of broken eggs, and aphid "honeydew".*

[*Estrilda erythronotos erythronotos*, Modimolle, South Africa. Photo: Warwick Tarboton]



*Although found in semi-arid habitats, the **Gouldian Finch**, seen here with three Long-tailed Finches* (Poephila acuticauda)*, a Masked Finch* (P. personata) *and a Peaceful Dove* (Geopelia placida)*, needs to drink every day. Its known breeding habitats in northern Australia are all within 2–4 km of water sources, such as small permanent water-holes or springs. The Gouldian Finch appears to favour shallow water-holes or soaks that are not densely vegetated, nor too exposed to aerial predators, but in some cases it will also drink from the edges of billabongs or dams. Counts at drinking places are used for monitoring populations of this Endangered species.*

[*Erythrura gouldiae*, Mt Barnett, Western Australia, Australia. Photo: Don Hadden]

individuals develop either the songs of their foster-parents or a song normal for their own species, or something in between. Behavioural interactions between young and adult appear to shape the process of learning a song. The young of some finches learn part of the songs of their foster-species and develop a mixed song with some features like those of their genetic parents and others like those of their fosterer, and variations in their individual experience may overcome any tendency to learn species-specific songs. Foster-reared young Bengalese Finches tend to sing with longer intervals between the song elements than found in the song of the Australian Zebra Finch, and they learn the songs of their foster-species less exactly. Young Scaly-breasted Munias reared with their father copy the details of the father's song, and young Yellow-rumped Mannikins from different parents copy each other after they become independent. In the most intensively studied species, the details of song-learning depend on the interactive behaviour of the young bird and its parent or foster-parent. Song-learning during foster care has been described for all the major clades of estrildid finches, namely the true waxbills, the parrotfinches, the grassfinches, and the munias and mannikins.

*In a survey between 1982 and 1985, almost three-quarters of observations of the **Arabian Waxbill** were in areas with flowing water. This species has become closely associated with irrigated agricultural areas, especially cereal cultivation, which provide accessible drinking water. These highly social finches seem to have developed a co-operative feeding technique which overcomes the disadvantage of their slight weight of only about 8·5 g: two or more individuals land on a grass or cereal stem, bending it towards the ground, and the one closest to the seeds feeds on them.*

[*Estrilda rufibarba*, Tihama, Yemen. Photo: Hanne & Jens Eriksen]





Both species of Euodice *silverbill are preferentially birds of dry country. They make seasonal movements away from the rain, and in countries where they have been introduced they tend to colonize the most arid parts. However, they need access to water, and often take advantage of irrigation systems, water supply tanks, and even leaking pipes. This* ***African Silverbill*** *is ready to catch the next drip from the pipe. But will it scoop the water in its bill, sip it or even suck it? Estrildid finches may lack the sucking ability of pigeons (Columbidae), but the techniques and mechanisms by which they obtain water from less accessible sources needs further study.*

[*Euodice cantans orientalis*,
Tawi Atayr, Oman.
Photo: Hanne & Jens Eriksen]

Song-learning among the estrildids is of special interest, because the brood parasites of these finches include several *Vidua* species that copy the songs of their foster-parents, and the viduid and estrildid finches share a common ancestor.

In a few Red-billed Firefinch broods that were foster-reared by Bengalese Finches, the male firefinches incorporated into their vocal repertoire the distance call of the Bengalese Finch. Firefinches passed on the learned Bengalese call through two, three and four generations of firefinch young. The long-term effect of learning also extended its effects to a female firefinch, likewise reared by Bengalese foster-parents, when she mated in a free-choice aviary with a Bengalese Finch, rather than with a firefinch; this union produced a hybrid firefinch × Bengalese Finch nestling.



The male ***Shelley's Oliveback*** *performs his courtship display with a wisp of grass dangling from his bill. He turns his body from side to side while hopping along the branch, sometimes changing branches, and giving squeaky trills at intervals of a few seconds. Many estrildids have a form of this display, although the details vary: most African waxbills hold a grass stem or feather upright in the bill. Some bob up and down on the perch while holding the grass stalk and singing; others drop the stalk before they begin to sing.*

[*Nesocharis shelleyi shelleyi*,
Mt Cameroon, Cameroon.
Photo: Ian Merrill]

Female song is known for the Zebra Waxbill, the Cut-throat Finch, the blue waxbills, the purple waxbills, the bluebills, the African and Jameson's Firefinches, and the Brown, Dybowski's and Peters's Twinspots. Male Melba Finches have an elaborate song, whereas the females have a short song; males of the other *Pytilia* species have simple songs, and the females are not known to sing. In the case of the Cut-throat Finch, both males and females sing when juveniles, but females rarely sing after they are mated. So far as is known, the females of other estrildid finches do not sing. The estrildid phylogeny shows a clade of female singers in the waxbills, *Lagonosticta*, *Uraeginthus*, *Granatina*, the twinspots and *Pytilia*. Female song has not been noted for the parrotfinches, the grassfinches, or the munias and mannikins, except in experimental studies of the Bengalese Finch, which is a domesticated form of munia.

Sexual differences in calls have been documented for a number of *Lonchura* species. These are the White-rumped, White-bellied, Javan and Chestnut Munias and the Streak-headed, Grand, Grey-headed, Grey-crowned, Hooded, Black and Chestnut-breasted Mannikins. Restall suggested that perhaps all *Lonchura* species have sex-specific call notes. Among the grassfinches, sex-specific calls have been described for the Australian Zebra Finch, and these calls may differ when the young are still in the nest. With most waxbills and parrotfinches, however, the calls of males and females appear to be the same.

Food and Feeding

Grass seeds are the staple food of the majority of estrildid finches. Most grass seeds measure 1–2 mm × 0·4–1·4 mm, a size that makes them suitable for de-husking; they do not have a hard protective coat or a sticky coat, and they lack toxic chemicals. Moreover, grass seeds are often produced in great abundance, and they can persist on the ground in edible form for many months in dry habitats. They are high in carbohydrate content, which is often around 80%, and they are convenience foods for birds in a dry environment, as they provide not only energy, but also metabolic water. These features make grass seeds a dependable and



*The sexes of the **Masked Finch** are alike, and in the first phase of courtship, the roles appear to be interchangeable. One bird lands within 10 cm of its mate, and adopts a bill-up posture, turning its tail and head towards the other bird before giving a deep bow. The two birds hop to-and-fro, or around each other, with head-bobs and bill-wipes, turning the head and angling the tail towards the partner. The second phase of courtship is performed by the male alone. Although the stem display is rare in the three* Poephila *grassfinches, the male Masked Finch will sometimes hold a grass stem as he performs his courtship dance, stretching and retracting his neck, fluffing his black bib, and pivoting his body while his feet stay on the perch. The male Long-tailed Finch* (P. acuticauda) *and Black-throated Finch* (P. cincta) *perform similar dances, fluffing or erecting the feathers of their black bibs. Female estrildids signal their readiness to mate by crouching, and with a vertical quiver of the tail. Copulation in the* Poephila *finches takes place inside the nest.*

[*Poephila personata personata*, Kununnurra, Western Australia, Australia. Photo: Graeme Chapman]



The nests of the Stagonopleura *firetails are bulky, oval structures made from green stems and blades of grass, with an entrance tunnel 30–40 cm long. They are lined with finer grass, plant down and other soft materials, such as the wool this* ***Beautiful Firetail*** *is carrying. In the most-studied species, the Diamond Firetail* (S. guttata), *adults continue to add lining material after incubation begins, and open a second entrance through the nest wall when the eggs hatch. The members of this genus build their nests in trees, several metres above the ground. Diamond Firetails, and possibly the other species, often choose clumps of mistletoe (Loranthaceae).*

[*Stagonopleura bella*, Melaleuca, Tasmania. Photo: Graeme Chapman]

nutritious major food for the finches. Grass seeds are taken by finches in natural areas, and they attract these birds also to farmed areas, where grasses grow in response to cultivation. A few finches take rice and have been considered to be agricultural pests. These include the Java Sparrow, whose scientific name, *oryzivora*, tells of its rice-eating behaviour, and also the Red Avadavat, the Pin-tailed Parrotfinch, the Black-and-white Mannikin, and the Scaly-breasted, White-rumped, White-headed, Javan, Chestnut, Black-throated and Pale-headed Munias. These estrildids have undergone significant decreases in numbers in several regions in the past few decades. Humans also make food available in the form of spilled or stored meal of maize (*Zea mays*) and manioc (*Manihot esculenta*) around villages, where such species as the Red-billed Firefinch take advantage of this free food.

Seeds of sedges are taken by seedcrackers, which are specialists on these items. They are taken also by Green Twinspots and by Black-and-white and Grand Mannikins and some other *Lonchura* species. In addition, seeds of other plants provide food for estrildids; they include herbs such as *Amaranthus*, thistles (Asteraceae), sunflowers (*Helianthus*), knotweed (*Fallopia*), euphorbs (*Euphorbia*) and *Laportea* stinging nettles, which are eaten by the Green Twinspot, the crimsonwings, the *Estrilda* waxbills and the Black-and-white Mannikin, and even the hard seeds of pine (*Pinus*) and bamboo, which are consumed by parrotfinches, African mannikins, and Asian munias and mannikins. The large-billed Java Sparrow may originally have been a bamboo specialist, which later adapted and became dependent on cultivated rice.

Fruits and husks of oil palm are taken by negrofinches, their feathers often greasy with palm oil, and by bluebills and African Black-and-white Mannikins. Black-bellied Seedcrackers, Western Bluebills, Red-browed Finches and Scaly-breasted Munias will feed on berries, but not as a main component of the diet. Other fruits consumed by estrildids include mangosteen (*Garcinia*), taken by Pink-billed Parrotfinches, and the fruits of large dicotyledons, including *Casuarina* and *Erythrina*, eaten by Green-faced, Red-headed and Blue-faced Parrotfinches. Fig fruits are taken by parrotfinches, including the Pink-billed, Mount Katanglad, Tricoloured and Red-headed Parrotfinches.

Seasonally, when flowers are available, nectar and some pollen are important in the diet of the Chestnut-breasted Negrofinch, the Black-tailed, Cinderella and Black-faced Waxbills, the Melba Finch, the Violet-eared Waxbill and the Red-headed Parrotfinch. These finches may take nectar at flowering trees, although it is quite possible that such observations refer to their feeding on insects at the blossoms.

Several members of this family consume filamentous algae, which they gather from shallow water such as fish-farm ponds and rice paddies. Zebra Waxbills, African Quailfinches, Pictorella Finches, Crimson Finches, Black-and-white Mannikins, Bronze Mannikins, Scaly-breasted and White-rumped Munias, and Hooded and Chestnut-breasted Mannikins have been seen to feed in this manner. Further, Bronze Mannikins take bites of growing green leaves, such as lettuce in gardens.

Termites are important in the diet of many African finches, having been recorded for 27 species, notably the purple and blue waxbills, the pytilias and a mannikin. Elsewhere, a parrotfinch and four Australian grassfinches are known to feed on termites. Estrildids capture the termites on the wing when these insects emerge in a mating swarm. They also peck with the closed bill through the surface crust over termite runways on the ground or at the base of a tree, breaking the hard soil and debris and exposing the termites to view. Finches seen to feed in this way are the Red-headed Bluebill, the blue waxbills, the purple waxbills, the pytilias, the Brown Twinspot and the African and Jameson's Firefinches.

Ants and their larvae and pupae are a regular food of antpeckers. These forest-dwelling birds take ants from the tree canopy and near the ground. They feed at papier-mâché ant nests, they open green leaves held together with insect silk, and they sometimes associate with mixed-species foraging flocks. Ants are taken less often by negrofinches, olivebacks, *Mandingoa* and *Hypargos* twinspots, *Estrilda* waxbills, Violet-eared Waxbills and Black-bellied Firefinches, by some parrotfinches, and by the Pictorella Finch. Other insects on which estrildids feed include scale insects (Coccoidea), eaten by negrofinches and olivebacks in forests and by the Cinderella Waxbill in mopane (*Colophospermum mopane*) woodland, and, in Australia, lerp, the protective



*Both **Masked Finch** partners gather the material for the nest. Nest-sites are very varied, sometimes on the branch of a tree or shrub, sometimes on the ground under a clump of grass, or beside a tree or log. Occasionally they nest in termite mounds, using the former nesting holes of parrots (Psittacidae) or kingfishers (Alcedinidae). Masked Finches are gregarious birds, and form loose breeding colonies with nests 20–50 m apart. Nest construction has been described as "dilatory", and can take several weeks. The nest is a bulky, globular structure made of grass, with a large side entrance, and often a large platform in front of the entrance hole. The nest is lined with feathers, vegetable down and hair. The birds also include lumps of charcoal, which stain their bills and the eggs black. Whatever the function of the charcoal, it seems to be important to the birds: according to one experienced aviculturist, captive Masked Finches will not breed without it.*

[*Poephila personata leucotis*, Cape York Peninsula, Queensland, Australia. Photo: Clifford & Dawn Frith]

cover produced by the larvae of psyllid insects (Psyllidae), which is taken by Crimson Finches. The egg masses of tree-frogs are consumed by an African forest-dwelling estrildid, the Chestnut-breasted Negrofinch.

The Pink-billed Parrotfinch perhaps has the most varied diet and feeding behaviour in the family. This species takes figs and other fruits, plucked or skinned, and selects and eats seeds and pulp. It also probes into rotting tree trunks in the manner of a woodpecker (Picidae) and takes large grubs; it pulls apart dead leaves in its search for insects; and it levers off pieces of bark in order to gain access to burrowing insects. Grey-headed Olivebacks take snails (Gastropoda). They also capture insects as they feed actively between the canopy and the ground, gleaning leaves and twigs, flying from leaf to leaf, and at times descending to the ground to take seeds. Snails are part of the diet also of the Dusky Crimsonwing (*Cryptospiza jacksoni*), and small snails may sometimes be taken accidentally with filamentous algae from surface water. Several members of the family consume spiders (Araneae).

Breeding estrildids rear their young on the same foods as those which they take for themselves. For their young they select especially grass seeds, particularly the soft, growing seeds. In captivity, many finches feed their young with insects when these are available, and a few members of the family are known to do the same in the wild, feeding their offspring with insects, mainly termites. Parrotfinches rear their young on fig seeds, as well as other fruits and insects.

When foraging, the estrildid finches take seeds that have fallen to the ground, and they also pluck ripe and half-ripe developing seeds from the heads of standing grass. The species vary in their apparent preferences; for example, the African waxbills often take seeds that are still on the grass stem, whereas the firefinches pick fallen seeds from the ground. In areas where grass seeds are abundant through the seasons, as in northern South Africa, and southern Zambia, several species feed on the same kinds of seeds. Estrildids employ several feeding techniques. The finch perches on the stem until the seedhead is forced to the ground, when it holds the seedhead under a foot while it takes the seeds; it picks seeds from the standing head while perched on the stem; it strips seeds by running the seedhead through the bill; and it jumps up from the ground to take seeds from the standing head. The finch dehusks the seed before swallowing it. It grasps the seed in the bill, and uses the tongue to move the seed into position on the edges of the bill until the seed's outer coverings are in contact with the cutting edges of the bill; the tongue then holds the seed in place, the mandibles close on it, and rapid vertical and lateral movements crack the seal between the seed husks and the kernel, while nibbling movements force the upper mandible down between the husks and shear these from the kernel. The finch drops the husk and swallows the kernel.

Most estrildids drink water when this is available. A few species can survive for months without water, but these and other finches of dry country nevertheless visit water-holes. Several dry-country finches in Australia drink while holding the bill tip downwards in the water, instead of using the method of most other birds, which tip the bill up in order to swallow. The Gouldian Finch, Pictorella Finch, Diamond Firetail, Star Finch, Australian Zebra Finch, Double-barred Finch, Long-tailed Finch, Black-throated Finch and Masked Finch are "tip-down" drinkers. The fleshy tongue laps a drop of water into the mouth, the tongue pulses the water into the pharynx, and the larynx forces water into the oesophagus, from where it passes to the crop. These drinking movements are rapid, and high-speed film and radiogram records show that, during one bill immersion, a finch takes 20 double scoops with the tongue in only one second. Some species, including the Pictorella Finch and Star Finch, sometimes drink also by tipping back the head, and other desert-dwellers, such as the Painted Finch, generally tilt back the head in order to swallow. The differences noted among these species may be a matter of degree and context. The main advantage of drinking in quick sips with the bill held in the water seems to be that the bird is better able to avoid being taken by a predator at the water-hole. The tip-down drinking behaviour of estrildid finches differs from the "sucking" of pigeons (Columbidae), which take water into the mouth by means of peristaltic action of the oesophagus.



*The male **African Quailfinch** has a nest display which is similar to part of his courtship display. He holds the nesting material crossways in his bill, with his body erect. Giving a soft song, he shows the material to female, then turns and runs to the nest-site, and begins to build. The male continues to fetch the material, often carrying several grass stems at once. The female may do most of the actual building.*

[*Ortygospiza atricollis digressa*,
Nylsvley, South Africa.
Photo: Warwick Tarboton]





Before beginning to build its nest, the ***Painted Finch*** *prepares a foundation platform of materials such as small stones, bits of earth, charcoal, bark and twigs. The nests are usually well concealed in clumps of spinifex* (Triodia) *grass, and the platform may serve to protect the nestlings from the plant's sharp spines. Within the clump, the nest itself is rather small and compact, with a side entrance, but lacking an entrance tube. The male fetches most of the materials, and does most of the work, but both partners bring the softer lining material. Most estrildid finch pairs spend nearly all of their time together, even when they do not have an active nest, but field ornithologists and aviculturists alike have commented that the pair-bond in Painted Finches seems weaker than in other members of the family. However, the birds share the task of incubation, in sessions of half an hour to an hour. The female incubates alone at night, which seems common among estrildids, although in the Masked Finch* (Poephila personata) *both partners spend the night in the nest.*

[*Emblema pictum*, Yanko Creek, New South Wales, Australia. Photos: Dean Ingwersen]



*The nest of the **Chestnut Munia** is usually built from fresh green grass and leaves, although these quickly become dry and brown. Chosen sites are usually less than 2 m above ground or over water, in reeds, grass or shrubs, although in the Himalayas the race* rubronigra *is said to favour higher sites in trees. The breeding season varies in different parts of the range. In the Malay Peninsula, males maintain large testes for up to 53 successive weeks, enabling them to begin breeding in response to a surge in the food supply. Chestnut Munias usually nest singly, but are sometimes loosely colonial, and occasionally more than one female will lay in a nest. Clutches are of four to seven eggs.*

[*Lonchura atricapilla*, N Sulawesi. Photo: Tim Laman]

Estrildids obtain water also from dew and from the leaves of succulent plants, and some foods contain sufficient free water for the bird's requirements. In addition, the finches gain water as a by-product when metabolizing their carbohydrate-rich food. By obtaining most of their water from their food, and by staying in the shade during the hottest times of the day, these birds are able to thrive in hot, dry desert regions.

Breeding

The breeding behaviour of many members of this family is well known from studies of birds in captivity. Certain courtship displays are similar in form to the begging displays of the young, and these patterns of behaviour may have become incorporated into courtship display through an evolutionary process of ritualization. Nestlings and fledglings have bright flashes of colours and patterns in the mouth (see Morphological Aspects) and, when begging, they display these to the adults provisioning them. In the case of several African estrildids, the parental care given by these finches has been taken advantage of by another group of finches, the brood-parasitic indigobirds and whydahs of the family Viduidae. Intriguingly, the young of the parasites often match the species-specific mouth patterns and colours of their estrildid host species.

Estrildid finches live in pairs in the breeding season. The male and female of a pair spend nearly all of their time together, even when they do not have an active nest, and all members of the family are socially monogamous.

Mate choice is a complex affair, each sex taking an active part in selecting a mate. The details are best known for the Australian Zebra Finch. In the experimental conditions of a multiple-choice arena, sometimes termed a "finkodrome", both males and females quickly discriminated among potential mates. The females were more successful in pairing with their initial preference than were the males, which suggests that females have more of the final influence in pair formation. Because males tend to display to any female, it is likely that the female is the more discriminating sex, and females use male song as one cue in mate choice. In both free-living populations and domesticated groups, males that are dominant over other males are more likely to form a pair-bond when they contest for a female. Once a pair is formed in the wild, the partners are nearly inseparable, the male usually leading around the female except at breeding times, when the roles are reversed. The partners in a pair keep in contact and synchronize their movements by means of calls. Time at rest is spent in allopreening (see General Habits), and potential sexual rivals are chased away.

Some species are strongly territorial, sing loud songs and do not tolerate conspecifics. These aggressive types of behaviour have been noted not only in the field, but also in captivity, in situations in which the birds are physically separated; captive Melba Finches, Blue-capped Cordon-bleus, Purple Grenadiers, Violet-cheeked Waxbills and Dybowski's and Peters's Twinspots can become hyperactive and stressed, and may even die, if they are not moved to separate living quarters. In the field, the breeding pairs are territorial and nest well apart. Among other estrildids, pairs occasionally nest close to each other and appear not to defend a territory, except for the immediate area of the nest-site. Several pairs of Bronze Mannikins sometimes nest in neighbouring trees and defend only the area within a metre of the nest. In the case of the Red-billed Firefinch, several pairs will nest a few metres apart in the thatch of a building, and in aviaries several pairs will breed together and do not interfere with each other's nesting activities. Similarly, Zebra Waxbills tolerate other pairs of the same species in captivity, although, in the field, their nests are usually out of sight of others. In several species of estrildid, the proximate neural mechanisms associated with the degree of sociality involve brain sites with species-specific binding affinity for oxytocin.

In Africa, breeding pairs take over old, deserted nests in abandoned colonies of *Ploceus* weavers, and in consequence the estrildids are loosely colonial themselves. The species that reuse old weaver nests occur mainly in dry habitats, and include espe-





The male and female ***Long-tailed Finch*** *are virtually indistinguishable not only to human observers, but also, apparently, without behavioural cues, to one another. Males court unfamiliar individuals of either sex with a shortened version of the courtship display, and attempt to copulate without waiting for the usual solicitation behaviour (crouching and tail-quivering). They do not, however, court or attempt to copulate with familiar males or females. Like the congeneric Masked Finch* (Poephila personata), *Long-tailed Finches will use a wide variety of sites for their nests, from the branches of trees and shrubs to creepers and clumps of grass; they will also use tree hollows, and nestboxes. They appear to show some preference for nesting in prickly plants, which may afford some protection against predators, a tendency also seen in* ***Bronze Mannikins****. Like some weavers* (Ploceus), *Bronze Mannikins sometimes pick sites that offer a measure of protection from predators, for instance near a wasps' nest; they will also occupy holes in large raptor's nests. They habitually choose sites above the ground, such as trees and shrubs. The male brings the grass for the nest, and the female does the building. The result is a loose, covered structure with a side entrance. Bronze Mannikins will also use old nests of other birds, including weavers* (Ploceus) *and bishops* (Euplectes).

[Above: *Poephila acuticauda acuticauda*, Broome, Western Australia, Australia. Photo: Graeme Chapman.

Below: *Spermestes cucullata cucullata*, Ngaoundéré, Cameroon. Photo: Kevin Ravno]

cially the Cut-throat Finch, Red-headed Finch, Red-cheeked Cordon-bleu, Bronze Mannikin and African Silverbill. Brown Firefinches appropriate old weaver nests in reedbed colonies. Australian finches inhabiting dry country sometimes breed in loose colonies, where they nest near conspecifics or other species. Gouldian Finches often nest in groups of several pairs in neighbouring trees, or in the same tree or termite mound, the nests in separate holes, and both Red-browed Finches and Star Finches sometimes breed in loose colonies. The Australian Zebra Finch usually nests solitarily, but a bush or tree may have several active nests nearby, and more than one female may lay in a nest; indeed, one nest of this species held as many as 23 eggs, a consequence of the opportunity for nest parasitism when local nesting density is high. The density of breeding birds may contribute to the high proportion of nests in which the brood is fathered by more than one male. Black-throated, Masked and Long-tailed Finches sometimes nest in loose colonies. Chestnut-breasted and Yellow-rumped Mannikins often nest in dense colonies, sometimes close to each other; both opportunity and the similarity of the courtship displays of these two species can lead to interbreeding and hybridization between them. In Asia, Scaly-breasted Munias nest in colonies of ten or more pairs, and Java Sparrows and Tricoloured, Chestnut and White-headed Munias sometimes breed in small colonies. In New Guinea, Streak-headed, Grand and Grey-headed Mannikins occasionally nest in loose colonies, and Thick-billed and Hooded Mannikins have done so in New Britain.

The courtship behaviour of many estrildid finches is well known. The birds are difficult to observe in the field, because most species are not loud and conspicuous in their behaviour. Observations in captivity are generally consistent with field observations, although some types of behaviour may, owing to the aviary size, occur only in the field, one example being the flight display of seedcrackers. Because birds are more successful in rearing their young when they are not disturbed, few aviculturists have closely observed and described the behaviour of their captives during breeding. Nevertheless, avicultural observations on estrildid finches have been the source of much information on the breeding behaviour of this family. The data for many species, however, are incomplete, because, as the well-respected aviculturist Baptista put it, "you have to decide whether to watch birds or raise birds".

Courtship displays have for long been of interest. As long ago as 1805, L. P. J. Vieillot wrote of the displays of estrildids (translated into English in 1979). Of the Red-cheeked Cordon-bleu, he wrote "One often sees him singing to his love, and, while holding a blade of grass in his beak, expressing the strength of his desires by tapping on the branch that serves as his perch." For the Red-billed Firefinch, he noted that "The male pays a great deal of attention to his mate. Before uniting with her, he perches next to her, and like the mariposa [cordon-bleu], engages in a dance of courtship. While holding a blade of grass in his beak, he sidles up to her by a series of small hops; then, while stamping both feet... on the perch, he sings his lively song in a strong voice."

Sexual displays of estrildids have been described and compared, with an aim of estimating the systematic relationships among the species. The display elements are performed in a somewhat regular sequence within a species and among closely related species, yet they are not always given in a sequence, and a male may only rarely perform some elements in his display repertoire. In addition, some aspects of behaviour used in courtship displays are given at other times, too, and some types of behaviour may have more than one meaning, being dependent on social context.

Males sometimes turn the body from side to side, changing perch, presenting one side and then the other to the mate, and pointing the tail towards her. This switching behaviour, or *Körperwenden*, is termed the "zigzag", "switch on perch", "twist and turn", "to and fro" or "crouch and pivot". Some pairs perform this before they proceed to other displays that lead to copulation. The behaviour occurs also in other contexts as a greeting display, for example when birds first meet in an aviary.

In courtship display, described by Güttinger as the *Gesang und Balz*, or "song and dance", the male often holds a grass blade, stem or fruiting head or a feather in the bill. He prominently shows this object to the female, this sexual behaviour with the nest-display object being termed the *Halmbalz*, or "stem display" or "straw display", or the "feather display" or "parade de la plume". The form of the display varies among the systematic groups of finches. The African waxbills hold the grass or feather upright in the tip of the bill, whereas the grassfinches and munias hold the grass dangling below the bill. Most of the waxbill species display with a feather, although the feather display is often lacking in the Red Avadavat, Zebra Waxbill and Cut-throat Finch, and it has not been described for the Red-headed Finch. The display is performed by most of the Australian grassfinch species, but not by those in the genera *Poephila* and *Taeniopygia*. There are dif-



*The **Swee Waxbill** lines its nest with copious quantities of soft materials like grassheads and feathers, which sometimes protrude from the entrance. The Yellow-bellied Swee* (Coccopygia quartinia) *builds a similar nest, though usually higher from the ground, often in a mistletoe clump. The mouth markings of the nestlings of these two species seem to be identical. There is no information about the nest or nestlings of the third member of the genus, the Angola Swee* (C. bocagei). *The three* Coccopygia *swees were previously thought to be races of a single species, but when the three forms were kept together in an aviary, they showed no sexual interest in one another.*

[*Coccopygia melanotis.* Photo: W. T. Miller/FLPA]

ferences also in the time for which the object is held: the Red Avadavat and Star Finch bow with a stem in the bill and release it for the final stage of display, and the Red-browed Finch holds a stem during the dance. The grassfinches differ in head posture while they sing, some species pointing the head upwards, others pointing it downwards, and still others holding the head horizontal. Among the *Lonchura* munias, some species hold the head down, some hold it horizontal, and some species lack a stem display; the Scaly-breasted Munia carries a stem and then drops it when it begins to sing and posture. The grass or feather held in the bill is the kind of material used in the building or lining of the nest, and the display object held in the bill is often called the "nest symbol".

In another courtship display, termed the "bob", a male moves the body up and down in rhythm as he bends and stretches the legs. The display is a vertical jerk and bow. Bobbing is sometimes called the "inverted curtsey": "inverted" because the bird first stretches the legs, and then bends them and raises the body, whereas the human curtsey involves bending of the knees and lowering of the body. The bob is a characteristic display of many members of this family, but the display appears to have been modified or gained and lost many times during the course of the evolution of the Estrildidae. In captivity and in the field, the male of some estrildids, including the Red-billed Firefinch and the Melba Finch, gives song, feather display and bob display not only to a mate, but also at times when he is alone.

In some displays, a male remains stretched upwards, with the head and bill held high. He often erects and fluffs the plumage, notably the belly feathers, in a "tent posture", producing a "pot-belly" effect. In this posture he sings in what is termed "fluffed singing". In other displays, the male claps the bill, swings the head from side to side, bows the head to the breast, or wipes the bill back and forth on the perch, this last action being common in other contexts, and not only in courtship. Males of the African mannikins open the bill and waggle the tongue in a courtship display known as "tongue-quivering". In another display on the ground, the male hops around the female in a "circle dance". Finches that court on the ground often spread the tail and drag it on the surface. Most species display frontally to the female, but others, such as the Crimson Finch and Red-browed Finch, use a "parallel display". In a few species, the female sometimes joins the male and mirrors his posture and movements. In addition, some species, primarily the seedcrackers and some parrotfinches, perform flight displays during courtship, the male flying with a grass stem to the female, or flying in sexual pursuit. Only a few estrildid species use the wings in courtship. This can involve a unilateral display similar in form to the wing-up of begging fledglings, as performed by the African mannikins, or a bilateral wing-flutter, made by the African Quailfinch, or a two-wings-up display, as performed out by a bluebill. Some other displays and activities, not directly associated with courtship, but which often take place between mates, are "nest invitation", mutual preening, and roosting together with bodies in contact (see General Habits).

Another type of behaviour performed during courtship and in other contexts is that of "peering", an action apparently unique



*Although capable of building its own nest, the **Red-headed Finch** more often uses the unoccupied nests of weavers, and it sometimes even commandeers active nests of species such as the Chestnut Weaver* (Ploceus rubiginosus). *The bird seen here was one of several that were breeding in abandoned Cape Weaver* (Ploceus capensis) *nests. The Red-headed Finch is one of at least 30 estrildid species that use the nests of other birds at least occasionally. Other species for which this is a regular nesting strategy include the congeneric Cut-throat Finch* (Amadina fasciata).

[*Amadina erythrocephala*, Polokwane, Limpopo, South Africa. Photo: Derek Engelbrecht]



*In the **Gouldian Finch**, the three morphs with different-coloured heads can occur within the same populations. These birds mate preferentially with partners of the same colour morph, and the offspring of mixed-morph pairs have lower survival rates. But perhaps because of low numbers of some colour morphs, up to 30% of wild pairs are mixed. Gouldian Finches build an open-cup nest in a hole in a tree or a termite mound, several pairs often nesting close together. The clutch is of four to eight eggs, and several clutches may be produced in a year, but overall nesting success is very low.*

[*Erythrura gouldiae*, Katherine Gorge, Northern Territory, Australia. Photo: Jean-Paul Ferrero/ardea.com]

to the estrildid finches. One individual, holding its plumage sleeked and the body rigid, acts in an attentive manner towards another; with its head turned in the direction of the latter, it leans sideways, sometimes so close that the other bird leans away. Males do this to other males, and male Bengalese Finches do it when they are young and listening to their fathers' singing. Gouldian Finches peer during courtship. Peering is sometimes directed towards a female during courtship, as demonstrated by the male Star Finch when he sings to his female, other individuals sitting closely while they watch and listen. Peering is performed by most of the Australasian munias and mannikins and by a few grassfinches; it has not been recorded for waxbills and the African mannikins.

Females signal their readiness to mate by crouching and with a vertical quiver of the tail. Those of a few species sometimes dance along with the male, but usually they show no sexual arousal, engagement or commitment until they crouch and quiver the tail. Many estrildids, including the firefinches, the Melba Finch, the swee waxbills and most munias, copulate in the open on a perch or on the ground. Others, including those in the genera *Mandingoa*, *Erythrura*, *Stagonopleura*, *Poephila*, *Taeniopygia* and *Euodice*, along with the Timor Sparrow, copulate inside the nest, and the Cut-throat Finch, Red-cheeked and Blue-capped Cordon-bleus, Grey-headed Silverbill and Bronze Mannikin copulate in both places. The site of copulation can vary with circumstance, coition taking place on a perch when the pair is alone, or in the nest in a crowded aviary, where interference by other birds can be a problem for a courting individual. Copulation itself is in most estrildids a quick "touch-and-go" affair; extended cloacal contact, in which the partners remain in touch for as long as 30 seconds, has been observed for some species, namely the *Uraeginthus* blue waxbills, the Zebra Waxbill and the Western Bluebill.

The distribution of courtship displays among the Estrildidae can be summarized as follows. (i) The stem display, known also as the straw display or feather display, is performed by most waxbills, but is uncommon in the genera *Ortygospiza*, *Amandava*, *Amadina* and *Coccopygia*; by most parrotfinches, but not the Gouldian Finch; occurs to a variable extent among the grassfinches, but is lacking or rare in the three *Poephila* and the three *Taeniopygia* finches; is performed by most Australasian munias and mannikins and by the *Euodice* silverbills; and is absent among African *Spermestes* mannikins. (ii) The display-flight, although uncommon, occurs in all major clades, the male usually pursuing the female in a slow, showy flight before courtship in the case of the seedcrackers, Melanesian parrotfinches, the Pictorella Finch, and the Grey-crowned and Grand Mannikins; in some other species, including some pytilias and firefinches, the male flies conspicuously to the nest with grass or a feather held in the bill; also, the male Crimson Finch has a display-flight associated with nest-building, and both male and female Star Finches separately make flight displays while holding grass in the bill. (iii) The zigzag is performed by most grassfinches and by African mannikins, but is absent as a courtship display in the repertoire of the parrotbills and waxbills, for which it functions as a greeting display only. (iv) The erect posture, in song and display, is common to all estrildid groups. (v) The low crouching or horizontal posture is part of the courtship ritual of some grassfinches, namely the Red-browed Finch and Australian Zebra Finch, the Gouldian Finch, some munias and all mannikins; the posture is used by many estrildids during a zigzag or greeting display. (vi) The "head upright" is performed by the Java Sparrow, *Euodice* silverbills, *Poephila* grassfinches, and some waxbills, namely the African Quailfinch, bluebills, blue waxbills, crimsonwings and firefinches; it does not figure in the courtship of parrotfinches, munias and mannikins. (vii) The "head over back" is utilized by pytilias and Malaysian parrotfinches, but not by Melanesian parrotfinches. (viii) Bobs are part of the courtship of most waxbills, but are absent or uncommon for the African Quailfinch, *Amandava* and the bluebills; they are used also by most parrotfinches, by most grassfinches, though rarely seen in certain species, and by munias and mannikins, but not by *Heteromunia*. (ix) The "belly fluff" is used by most waxbills, but not by blue waxbills and firefinches; it is not used by the parrotfinches; it occurs in the courtship of



*Although both the male and female **Locust Finch** incubate the eggs, the female sits for longer. It is reported that both birds roost in the nest at night, which is rare among estrildids. The typical incubation period for the family is 12–14 days, although this can be shorter or longer depending on the outside temperature. Some species, the Locust Finch reportedly among them, begin staying in the nest before the clutch is complete. The typical Locust Finch clutch is three to five eggs, although sometimes as many as eight.*

[*Paludipasser locustella uelensis*,
near Jos, Plateau State,
NC Nigeria.
Photo: A. P. Leventis]





*Estrildid nestlings hatch either naked, as in the **Blue-faced Parrotfinch**, or with natal down, as in the **Long-tailed Finch**. Nestlings have elaborate mouth markings and colours. The corners of the mouth can be swollen at the gape with flanges or papillae, which vary in size, shape and colour. The Blue-faced Parrotfinch has two large, shiny blue balls on each side of its gape. In the Long-tailed Finch, the gape flanges are unswollen and white or bluish-white. The inside of the Long-tailed Finch nestling's mouth is outlined with black marks and spots. The tongue is marked either with two spots or, as here, a band, perhaps changing from one to the other with age. The palate markings differ between estrildid species, though the patterns of spots are broadly similar within genera. Nestlings are silent for the first few days, using the colours and patterns of the mouth-lining and palate as signals when they beg, but within a few days they also begin to beg vocally when the parents are at the nest. Nestlings, and later fledglings, hold their necks low and twisted to one side when begging, with the open mouth directed upwards so that the markings are visible.*

[Above: *Erythrura trichroa sigillifera.*

Below: *Poephila acuticauda.*

Australia.
Photos: Roland Seitre]





Most estrildid species have a relatively long nestling period for small passerine birds. The young birds leave the nest 18–21 days after they hatch, or after 24 days in the forest seedcrackers (Pyrenestes). *In* ***Peters's Twinspot****, the young are ready to leave after 21 days, although the parents continue to feed the fledglings (below) for a further ten to twelve days. It is assumed that most adult estrildids feed their young on the same foods that they eat themselves. Seeds are carried in the crop and regurgitated into the mouths of the young. Similarly, those species that bring insects carry them in the crop and regurgitate them. Termites are an important part of the diet of young pytilias* (Pytilia) *and purple waxbills* (Granatina). *Some forest-living estrildids feed their young with small fruits and insects, or ant pupae in the case of the Grey-headed Negrofinch* (Nigrita canicapillus). *Parrotfinches* (Erythrura) *bring fig seeds to their young. The nests of many African estrildids are parasitized by host-specific whydahs and indigobirds* (Vidua). *On the evidence of song mimicry, Peters's Twinspot nests are probably parasitized by the Green Indigobird* (V. codringtoni) *in Zambia, Malawi and Zimbabwe.*

[*Hypargos niveoguttatus*. Photos: Cyril Laubscher]



Young estrildids may develop slowly in the nest, but mature quickly after leaving it. Some Estrilda *species begin to perform their songs and courtship displays after as little as six months. The* ***Common Waxbill*** *leaves the nest after 17–19 days, and is fully independent four to five weeks after hatching. For the first few days after the young have left the nest, a parent, usually the father, leads them back into it at night. Fledged Black-rumped* (E. troglodytes) *and Crimson-rumped Waxbills* (E. rhodopyga) *also roost in the nest for up to a week. Common Waxbills often incorporate fur picked from pungent carnivore dung into the fabric of their nests, and such nests are less likely to be preyed upon. The species is, however brood-parasitized by the Pin-tailed Whydah* (Vidua macroura). *The Common Waxbill has been introduced to many areas, most notably to a number of tropical islands.*

[*Estrilda astrild*, Oahu, Hawaiian Islands. Photo: Eric VanderWerf]

most grassfinches, some species fluffing other body or head feathers, depending on the brightness and boldness of the feathers, and in that of the munias and mannikins. (x) The "head bow", or "body lean", "body swing" or "body rock" is performed by some waxbills, including *Amandava*, all twinspots, a negrofinch, an oliveback, pytilias and (body leans) a bluebill; it is used also by *Heteromunia* and most grassfinches (but has not been recorded for the Painted Finch), and by some munias and mannikins; it is not a feature of the parrotfinches; the "head up, neck down" display of *Stagonopleura* firetails and perhaps some other groups may be a modified bow display. (xi) The "head swing" is recorded for a few waxbills, including two firefinches, two purple waxbills and a bluebill, and for most grassfinches, African mannikins, and some munias; it is absent in the courtship repertoire of parrotfinches. (xii) The "tail point" features in the displays of the Asian parrotfinches, most grassfinches, some munias and all mannikins; it is used also by a few waxbills, but in these cases perhaps not as part of courtship. (xiii) The "circle dance" (on the ground) and "tail spread" display is given by species in the genera *Ortygospiza*, *Amandava*, *Pytilia* and *Pyrenestes*, the Brown, Peters's and Dybowski's Twinspots, the Black-bellied Firefinch and the Pictorella Finch; it is not given by most other waxbills, nor by grassfinches, munias and mannikins. (xiv) The "wing display" with one wing held up on the side away from the mate is given by *Spermestes* species, and with both wings up by the Western Bluebill and, occasionally, the African Quailfinch; it is absent from the repertoires of other estrildids, except perhaps in sexual display-flights as mentioned above under (ii). (xv) The "tongue quiver" is unique to the African *Spermestes* mannikins.

The observations lead to the following generalizations. First, the bob display is the most widespread courtship element in the family, and is the one complex display not shared in detail with related families of birds. Second, the zigzag dance is widespread among munias, mannikins and grassfinches, but not among parrotfinches or waxbills, at least not as part of courtship behaviour. Third, head bows and body bows are widespread in all groups except the parrotfinches. Fourth, a terrestrial circle display and "tail spread and drag" originated repeatedly: in the twinspots; in *Pytilia* and in certain other waxbills; and in the Pictorella Finch. Finally, the parrotfinches lack several displays that occur in other estrildids, namely the zigzag, head upright, head over back, head bow, body bow and belly fluff, and they do not have any unique elements of courtship behaviour except that of "bundling" many bits of nest or display material in the bill.

Among the estrildine waxbills, certain courtship displays are shared by closely related species. This is illustrated by the Black-rumped and Crimson-rumped Waxbills, the adults of both of which "quiver" the body at the nest. For several species, including the Locust Finch, no courtship displays are known. Within several species groups, including *Estrilda* waxbills, *Uraeginthus* blue waxbills, *Lagonosticta* firefinches, *Erythrura* parrotfinches, *Poephila* grassfinches, African *Spermestes* mannikins, and Australasian *Lonchura* munias and mannikins, many related species are nearly identical in their courtship display. This uniformity of behaviour within a clade supports an evolutionary conserving of behaviour and highlights the importance of courtship displays in estimates of estrildid phylogeny. Without a doubt, plumage and song also are involved in species recognition.

Parrotfinches exhibit regional differences in courtship behaviour between the Asian/Malaysian species and the Melanesian ones. In courtship, the Malaysian Tawny-breasted and Pin-tailed Parrotfinches hold a stem or a bundle of nesting material in the bill while they raise and swing the head and bow, much as the estrildine waxbills do. The Melanesian parrotfinches hold a bundle of nesting material in the bill, but they do not bow in display; instead, the female initiates a flight display as she gives a trill, the male trills and follows in a prolonged undulating chase, she then perches, he approaches, and the two repeat the flight several times. This behaviour has been described best for the Blue-faced Parrotfinch. The two geographical groups differ also in their vocal behaviour. The Malaysian parrotfinches lack a location call and their songs and calls have a large frequency envelope, with

elements ranging from 1 kHz to 8 kHz, whereas Melanesian parrotfinches have a narrow frequency range and a lack of harmonic structure, and have a very high pitch, at 6–10 kHz. These two biogeographical groups correspond reasonably well to the clades identified in the mitochondrial phylogeny (see Systematics).

The courtship behaviour of the Australian grassfinches varies considerably. A stem display is exaggerated in the courtship of the Diamond Firetail, and it is rare or absent in that of others, including the *Poephila* grassfinches, the Timor and Australian Zebra Finches and the Double-barred Finch. Courtship of the munias and mannikins includes a few cases in which closely related species show a unique derived display. Java and Timor Sparrows display in an upright posture with the head and tail pointing down, this behaviour being unlike that of other *Lonchura* species. Many Asian species display with a stem, whereas most New Guinea and other Melanesian species do not, or, at least, a stem display has not been described for them.

In the best-known behavioural details that are restricted to a few sets of closely related species, the evolutionary divergence of behaviour accords clearly with the phylogenies (see Systematics). The studies made by Güttinger and by Baptista and colleagues indicate that several behavioural differences exist between the African *Spermestes* mannikins on the one hand and, on the other, the Australasian *Lonchura* munias and mannikins and *Euodice* silverbills: a wing-up display in courtship is present in *Spermestes*, but absent in *Lonchura* and *Euodice*; peering behaviour is not a feature of *Spermestes*, but is recorded for *Lonchura* and *Euodice*; courtship with tongue-wagging, a lateral movement resembling the food-begging of the young, is present in *Spermestes*, but absent in adult *Lonchura* and *Euodice*; copulation takes place inside the nest in the case of *Spermestes*, but most *Lonchura* and *Euodice* copulate outside the nest; and the begging call of *Spermestes* nestlings is a single note, whereas that of *Lonchura* and *Euodice* nestlings is a double note. If the most common condition in the grassfinches is primitive, one may conclude that the *Spermestes* clade, including *Odontospiza*, has the derived condition in copulation in the nest, courtship with wagging tongue, wing-up display, and the absence of downy head plumes, and that the *Lonchura* clade has the derived condition of peering behaviour.

In a more broad-ranging comparison of courtship behaviour, the bob display of estrildid finches is similar in posture and activity to the aerial courtship display of the Viduidae brood parasites, the birds most closely related to the Estrildidae. The aerial bob of the male Village Indigobird (*Vidua chalybeata*) and other indigobird species, the Steel-blue Whydah's (*Vidua hypocherina*) up-and-down aerial display that bobs up and down from the ground, and the perch-hover of the Shaft-tailed (*Vidua regia*) and Straw-tailed Whydahs (*Vidua fischeri*) are all similar in form to the estrildid bob display, as is the display of the Pin-tailed Whydah (*Vidua macroura*).

The evolution of courtship displays among the estrildids may have been influenced by these species' habit of nesting in spherical, covered nests with a low entrance at the side and a compact space inside, and by the incorporation of nestling begging behaviour into adult display behaviour. The restricted space in the nest-chamber perhaps shaped begging behaviour, as the nestlings cannot stretch upwards; instead, they turn the head upside-down and display the markings and colours of the palate. For the same reason, adults have little in the way of wing display; the females use the tail, but not the wings, in soliciting courtship. Males often incorporate elements of nesting behaviour, including the movements of nest-building, into their courtship through a process of "ritualization" into the stem display, and courtship displays may even incorporate movements of the begging young. In the case of the Diamond Firetail, for example, the courting male's posture and movement, with the head low, the neck turned around and the bill open, are all suggestive of the behaviour of a begging fledgling.

Nesting behaviour and parental care vary relatively little within the family. The male brings building material, mostly grasses, to the female, and she, sometimes assisted by the male, arranges the material into the nest structure. The nest is usually placed in a bush or tree, or built into the surrounding grass, or it is constructed on the ground at the base of a clump of grass. The material is not woven into the nest but, rather, the strands of grass and stems are thatched into the structure. The nest is a hollow ball or covered structure with a side entrance, and sometimes with an entrance tunnel or spout, or with a roof over the entrance hole. A few species of *Estrilda*, *Amandava* and other waxbills build an open cup of the same material on to the top surface of



The bird trade has been implicated in the decline of the globally threatened Green-faced (Erythrura viridifacies) *and Red-headed Parrotfinches* (E. cyaneovirens). *The* ***Pin-tailed Parrotfinch*** *is not currently listed as threatened, but the volume of trade is huge, unregulated, and unmonitored. Researchers report large numbers of this species in bird markets from Malaysia to Medan, in north Sumatra. The same is true in markets in Bali, where the species does not occur; it is apparently imported from Sumatra and Java.*

[*Erythrura prasina prasina*, Malaysia.
Photo: Roland Seitre]



*The **Pink-throated Twinspot** is confined to the South-east African Coast Endemic Bird Area, where it is found in dry woodland, sand forest and scrub. Although not considered globally threatened, it is listed as near-threatened on the South African Red Data List because of its small range. There has been a recent increase in the amount of land managed for conservation in its South African range, and the Pink-throated Twinspot occurs in a number of protected areas. In Mozambique, on the other hand, its range and population are larger, but are affected by only one protected area, and habitat is threatened by logging concessions and a giant eucalyptus plantation.*

[*Hypargos margaritatus*, Mkuze, South Africa. Photo: Pete Morris]

the covered nest structure; this is called a "cock's nest" or "bower", and is of uncertain function. The male spends time in this nest, carries old droppings to it and rubs them into the cock's nest, perhaps as a device against potential predators, the old droppings signalling to a predator that the nest is abandoned. The female lays her eggs in the covered nest-chamber, the nest having been lined with soft materials such as feathers; the Australian *Poephila* grassfinches sometimes line the nest-chamber with soft materials and pieces of charcoal. Some species have special nest structures. The Australian Painted Finch, for example, builds on the ground, first preparing a platform of stones, twigs or charcoal, and then building the compact ball of grass that forms the nest-chamber. Some pairs leave a few feathers or grass across the nest entrance as a "door" when they leave the nest. A few estrildids, such as the Blue Waxbill and Red-cheeked Cordon-bleu, often build their nests near an active nest of wasps (Hymenoptera), apparently for the protection against predators afforded by these aggressive insects.

The Gouldian Finch uses a hole in a hollow tree or termite mound, in which it builds what is often an open cup; when in aviaries without a nesting hole or nestbox, it constructs a covered nest. Long-tailed Finches usually build their own nest, but pairs in wild populations will make use of nestboxes. In captivity, most species readily build a nest in a wicker nestbox, and in this situation the size of the chamber in the nestbox determines whether or not the covered roof is built. Other species sometimes nest in holes in houses or caves.

Several members of the family take over old or active nests of other birds, especially the old covered nests of *Ploceus* weavers or *Nectarinia* sunbirds. At least 30 species of estrildid utilize the old nests of other birds occasionally or regularly, and the Cut-throat Finch, Red-headed Finch and African and Indian Silverbills do so as a usual nesting strategy. These species generally repair and line the old nest, and they sometimes build their own covered nest inside the existing nest-chamber. Nest takeover and intraspecific nest parasitism have been reported for several clades of estrildids. Assuming that the ancestral estrildids built their own nests, it is possible to estimate the minimum number of times this behaviour has evolved: thus, first for the Zebra Waxbill, secondly for *Amadina*, thirdly for *Nesocharis*, fourthly for the Black-tailed Waxbill, a fifth time for *Clytospiza*, a sixth for the Brown and Bar-breasted Firefinches, a seventh time for the Double-barred Finch and, finally, an eighth time for African *Spermestes* mannikins, the *Lonchura* munias, the *Euodice* silverbills and the Madagascar Bibfinch.

Co-operative breeding by estrildids is rare in natural conditions, although the young of a previous brood may assist in caring for a later brood of their parents in captivity. In one aviary, a male Red-winged Pytilia mated with two females, both of which laid in the nest, and the three adults together reared the broods; this was repeated for several broods. In the same aviary, a young Cut-throat Finch remained with its parents and helped to rear a later brood, and young Blue-capped Cordon-bleu did the same. In the field, in Australia, a male Long-tailed Finch that had fledged four months earlier and was in adult plumage joined its parents at a nest, and all three individuals fed the parents' later brood. In natural conditions, brood-members may occasionally remain for an extended period with the parents, but more often they leave before their parents begin the next breeding attempt.

There are recorded instances when more than one female has laid in a nest, but this is not common for any species. In the field, multiple laying of this kind has been noted for some estrildine waxbills, mainly in the genera *Amandava* and *Amadina*, for munias and mannikins in the genera *Euodice* and *Lonchura*, and for the Australian Zebra Finch. In the Malay Peninsula, nests of the Scaly-breasted Munia sometimes contain fresh eggs laid alongside a brood of advanced nestlings, or hold an oversized brood of nestlings of different ages. These combined broods are thought to be the result of opportunistic intraspecific brood parasitism, rather than co-operative breeding.

Estrildid eggs are white, and are incubated by both parents, both also brooding the small nestlings. The male and female take turns in sitting during the daytime, but the female alone remains on the nest through the night. The adults of some species begin



*The **Tricoloured Parrotfinch** is restricted to the Timor and Wetar and Banda Sea Islands Endemic Bird Areas. It is locally common on Timor, and a 2008 survey of the island of Wetar found that it occurred widely there, but at low densities. Logging is seen as the prime threat to habitats on these islands. In 2001, an expedition to Damar Island in the Banda Sea found that the Tricoloured Parrotfinch was one of six forest-dependent species to have been extirpated as a result of the modification of primary forest by small-scale "garden" agriculture.*

[*Erythrura tricolor*, Babar Island, S Moluccas. Photo: Filip Verbelen]

to stay in the nest before the clutch is completed. The incubation period is typically 12–14 days for most members of the Estrildidae. Shorter periods are well documented, as in hot weather when development of the embryo gets a head start, as also are longer incubation periods.

The nestlings hatch either naked or with natal down. Both parents deliver food to them in the nest. The nestling period generally is long, because, much as with other birds that breed in a covered nest, the chick development is slow. The young of most estrildids leave the nest between 18 and 21 days after they hatch, and the parents provide care for their young for a further week or two after they fledge. The period of dependence on the parents is unusually long in the case of the large-billed forest African bluebills and seedcrackers, the parents of these species continuing to feed their brood for as long as one month after the young leave the nest. The development of young estrildids after they have become independent of their parents varies considerably. Males of some species begin to sing and perform courtship displays within a few weeks after fledging, and the Australian Zebra Finch is able to breed at only 90 days of age.

Parent estrildids generally rear their young entirely on grass seeds, which are taken from the ground or, more often, while they are soft and growing on the grass stems. The adults carry the seeds in the crop and regurgitate the food into the mouths of the begging young. The parents of a few species bring insect food to the young, carrying this concealed inside the crop, rather than flying with insects visible in the bill. For several finches, such as the purple waxbills and the pytilias, termites are important in the rearing of the young, but for most species the foods delivered to the chicks are not known. In aviaries, when live insects are available, many seed-eating species bring insect food to their brood. The young of certain forest-living estrildids are fed with fruits and insects. The adults of most members of this family do not remove the nestlings' droppings from the nest, which becomes lined with dry faeces by the time of fledging.

Of particular interest is the begging behaviour of young estrildids, which differs from that of other songbirds. Rather than stretching the neck upwards, they crouch with the neck held low and twisted to one side, the roof of the mouth directed towards the parent, and in this position they move the head from side to side. Nestlings are usually silent for the first few days and beg with the visual display of the open mouth, but within a few days they also beg vocally when their parents are at the nest. The most conspicuous signals of the begging young are the patterned gape and palate and the colours of the gape and mouth-lining (see Morphological Aspects). Both nestlings and fledglings beg in this twisted-neck posture, with gape and palate displayed to the parents. After they fledge, the young of most estrildids beg without quivering the wings, although those of the Blue-faced Parrotfinch, Pictorella Finch, Red-browed Finch, Double-barred Finch and African and Indian Silverbills do so, and some fledglings spread and raise one wing, most often on the side away from the parent, where the wing acts as a shield to prevent the competing brood from receiving food from the parent. This latter behaviour has been documented for young Green and Red Avadavats, Zebra Waxbills, African Quailfinches and Pictorella Finches. Young of a few species, such as the Cut-throat Finch and the Red-faced Crimsonwing (*Cryptospiza reichenovii*), beg with the head upright and forward, not twisted around; these birds nevertheless have a patterned gape and palate with bright colours, much as in the other estrildid finches.

One theory that may explain the complex mouth patterns and colours of nestling estrildid finches is that they aid parents in recognizing their own young and providing them with parental care. Several estrildid finches in Africa are brood-parasitized by the *Vidua* indigobirds and whydahs, and the estrildid young compete for parental care with the parasite's young, as the estrildid parents rear the young *Vidua* in a mixed brood with their own young. Most *Vidua* species are host-specific in their brood parasitism, and their nestlings have a mouth pattern and colours and also begging behaviour like those of the estrildid host's nestling. This nestling mimicry by *Vidua* has evolved in competition for parental care with the host's young. There is some evidence that nestlings with mouth markings unlike the normal pattern of their species are disadvantaged. In experiments, young domesticated Australian Zebra Finches that lack the palate spots were found to be at a

disadvantage in terms of being fed when compared with young that do have the spots, and Common Waxbill nestlings with artificially altered spots were found to be fed less and to grow more slowly than "normal" nestlings. Nevertheless, many estrildids will rear young having a mouth pattern unlike that of the normal nestlings of their own species, at least if the young hatch from eggs in their nest, rather than being placed as chicks into the nest. Parental care may be tolerant when food is abundant, but the parents may be more discriminating when food is scarce, as found in tests of the parental care of zebra finches.

If a two-way co-evolutionary response of the estrildid hosts to brood parasitism accounts for the visual diversity of estrildid nestlings, one would expect to see several features. First, closely related estrildid species with a brood parasite should have nestlings that are more distinct from each other than is the case for species without a brood parasite. Second, the host species' nestlings should have a more brightly coloured mouth and more complex palate markings. In a comparison of the mouths of nestlings, Payne found that some parasitized estrildids differed more from their most closely related species than did the unparasitized estrildids. The difference between species, however, appears to be explained by the longer time since speciation of these parasitized species, as indicated by the genetic distances in the species phylogeny, compared with the non-parasitized species. Further, the nestlings of some estrildids, such as the purple waxbills, firefinches and pytilias, are brightly coloured, and these finches are hosts of the *Vidua* brood parasites. On the other hand, nestlings with bright mouth markings and colours are found also in some non-parasitized estrildids, such as the parrotfinches.

Another explanation for the bright mouth colours and patterns of nestlings is the occasional laying in one species' nest by other estrildid species, with a consequent competition between young for parental care. If so, one would expect sympatric species of estrildid to differ more from each other, and to have nestling mouths more elaborate and colourful and more divergent from each other, than is found among estrildids in areas with no closely related species. In a comparison of species, these patterns did not appear.

Third, the elaborate mouths of nestlings may have evolved as a consequence of the demands of parental care, as more bright colours and structures may enable the parents to see their nestlings better. Contrary to this idea, the nestling mouths of species that breed in dense habitat are no brighter or more complex than those species of more open habitats.

Finally, the diversity in nestling mouths may simply follow the evolutionary divergence of estrildid species. In fact, the visual structures of the nestling gape and palate have long been used as a means of estimating relationships among estrildid species. The mitochondrial phylogeny of the Estrildidae allows a test of this idea, and the results are consistent with this hypothesis of divergence, when the relative ages of the species are taken into account. The third and fourth hypotheses appear to account for the elaborate nestling patterns and colours of estrildid finches.

Population data for members of the Estrildidae are few. Average estimates of the annual adult survival in Africa of the Red-billed, Bar-breasted and Rock Firefinches and the Bronze Mannikin are in the range 0·65–0·70. Survival estimates for Australian finches are much lower, probably owing to the fact that the birds' dispersal takes them beyond the area where they were initially marked. Most or all estrildid species breed in their first year, sometimes at an age of less than six months, and they often nest repeatedly in a season.

Movements

Most estrildid finches are sedentary, and occur in the same areas throughout all seasons of the year. A few species make local movements, as demonstrated by seasonal occurrences and by recoveries of ringed individuals. Those that do move are primarily inhabitants of semi-arid seasonal habitats. The forest-dwelling species are mainly resident, and they include the African ant-peckers, negrofinches, olivebacks, seedcrackers and bluebills, the island-inhabiting parrotfinches, and some Australasian island and montane mannikins. Seasonal movements occur in relation to rainfall and the abundance of seeding grasses. In some regions



The mountains within the Central Papuan Mountains Endemic Bird Area present formidable barriers to distribution, and many of the endemic species have a very limited range. The high alpine grasslands and edges of alpine scrub in the Snow Mountains, in West Central New Guinea, are home to the Restricted-range ***Snow Mountain Mannikin****. A second endemic mannikin, the Black-breasted Mannikin* (Lonchura teerinki)*, is found in the middle slopes of the same mountains, in grasslands, old gardens and fields. To the south-east, in the Wharton and Owen Stanley Ranges, the Alpine Mannikin* (L. monticola) *occurs from villages and fields on the lower slopes, up to the high alpine grasslands and rocky screes.*

[*Lonchura montana*, Lake Habbema, W New Guinea. Photo: Ashley Banwell]

estrildids are regular migrants, and in others the large-scale population movements occur only in the driest years.

In Africa, Cut-throat Finches are seasonal migrants in some areas. They are dry-season visitors in the drier areas, including Gambia and northern Nigeria, and are observed on passage in spring and autumn in Chad and north-eastern Nigeria. In other parts of their range, such as Zimbabwe, they occur in an unpredictable manner and may be locally nomadic; individuals have been recovered far from the site where they were ringed. Similarly, the Red-headed Finch is a seasonal visitor in parts of southern Africa, and undertakes irregular movements. Other Afrotropical estrildids that appear or disappear with the rains include several species of semi-arid habitats. For example, the African Quailfinch and the Locust Finch are seasonal in parts of their range, and more than one subspecies of the African Quailfinch occurs in some areas in the dry non-breeding season. Some subspecies of the Common and Black-faced Waxbills are likewise seasonal in occurrence. Crimson-rumped Waxbills appear after periods of high rainfall in arid northern Kenya, and Black-rumped Waxbills are seasonal in occurrence in dry parts of Ghana and the Sahel, as also are Cinderella Waxbills in Namibia. Seasonal changes in local numbers of Melba Finches in north-east Nigeria and Botswana indicate migration, and ringed individuals have been recaptured up to 20 km from the ringing site. Similar changes in numbers of Orange-winged and Red-winged Pytilias suggest that these species, too, undertake some movements. In addition, Zebra Waxbills move into drier grasslands in the rains, African Silverbills migrate in accordance with the rainy and dry seasons in Mali, Ghana and Sudan, and Bronze Mannikins shift locally in response to rains and the seeding of grasses. Magpie Mannikins are irregular and infrequent in their occurrence, perhaps moving in response to the breeding cycles of the bamboos on the seeds of which they feed. Short-distance movements are suggested for the Blue Waxbill, Purple Grenadier and Jameson's Firefinch in places where their numbers change with the seasons, and in Cameroon the Chad Firefinch ascends in the early dry season from the hot plains into higher and wetter hills. Red-billed Firefinches, too, may undertake local movements; where marked individuals have been observed throughout the year in Senegal and Zambia, many remain within 10–20 km of the ringing site. In more forested woodlands, Lesser Seedcrackers appear in Zimbabwe mainly in the summer period. In addition to the Chad Firefinch, several other species in Africa are altitudinal migrants, among them the Yellow-bellied Swee, the Green Twinspot and the Red-faced Crimsonwing.

A few of the Asian species are seasonal migrants. The Indian Silverbill, for instance, moves seasonally and altitudinally in relation to rainfall. Red Avadavats are resident in most of their range, but the northern populations make a post-breeding shift to the south, where the nominate race occurs as a non-breeding winter visitor; movements occur also in relation to the availability of grass seed. Pin-tailed Parrotfinch flocks appear at the time of the rice harvest and the seeding of bamboo. Other Asian species known to move in response to the availability of food and water include the Java Sparrow and the Scaly-breasted, White-rumped, Javan, Tricoloured and Chestnut Munias. Seasonal altitudinal movements are made by the Black-throated Munia in India and Sri Lanka, and by Chestnut, White-rumped and Dusky Munias in Borneo.

Several parrotfinches, such as the Tawny-breasted, Pin-tailed and Green-faced Parrotfinches, seek out and feed on flowering and fruiting bamboo, and could be said to be nomadic to some extent. Certainly, the Grey-headed Mannikin in New Guinea appears to be nomadic outside the breeding season. Blue-faced Parrotfinches, resident in most of the Pacific, are nomadic in New Guinea and are seasonal migrants in Australia, where the adults move to coastal lowlands in the non-breeding season and occur in the interior uplands in the breeding season.

Most estrildid finches in Australia are resident, but some local movements are also apparent. Few long-term observations have been made in the dry outback. For these Australian birds, it has been difficult to determine whether the populations are seasonally migratory or nomadic or irruptive. Australian Zebra Finches remain all year in some localities in central Australia and Victoria, while in other areas they are irruptive, suddenly appearing in large numbers in places where they had not been seen for several years, and they may be opportunistic and nomadic, moving in response to irregular, non-seasonal conditions



*The **Cinderella Waxbill** is still relatively common in south-western Angola, but in Namibia its population probably numbers less than 2000 individuals, mostly confined to the mopane and riverine woodlands associated with the Cunene River. The proposed development of a hydroelectric plant on the Cunene could threaten its survival in Namibia, destroying around half its habitat, and affecting the insect biodiversity it relies upon when feeding young. The hydroelectric project would also remove habitat on the Angolan side.*

[*Estrilda thomensis*, Cunene River, Namibia. Photo: Johann Grobbelaar]

of rainfall and grass seeding. Black-throated, Masked and Long-tailed Finches occur in all seasons in some areas, but they are erratic in occurrence in the south of their range and in the dry season, and a few long-distance ringing recoveries have been made. Among other species of dry country, the Painted Finch remains near its water sources except in unusually dry years when the water disappears; it then moves into moister regions. The Pictorella Finch and the Chestnut-breasted and Yellow-rumped Mannikins occur locally in all seasons in some years, whereas in other years large numbers of these species may shift towards the coastal areas in the dry season and inland in the rains. Crimson Finches and Star Finches move locally in flocks after the breeding season, and Plum-headed Finches are seasonal migrants in southern parts of their range. In the case of the Gouldian Finch, the low proportion of recaptures of local individuals suggests that some movement takes place. Diamond Firetails are seen throughout the year in some sites, although large-scale movement has been observed directly in Victoria, the birds streaming in flight above the treetops, following watercourses and riparian woodland. Red-browed Finches are regionally resident, but in some areas the numbers present have been found to change with the seasons. Estrildid finches living in forested regions, the Red-eared Firetail in south-west Australia and the Beautiful Firetail in the south-east, are resident.

Relationship with Man

Aviculture has been an important source of information on the breeding behaviour of the estrildid finches, and the breeding of finches in cages has a long cultural history. Aviculture may also have a future as a means of breeding globally threatened species for reintroduction in the wild, as seems to have been done for the Java Sparrow.

Java Sparrows were known in China by the time of the Sung Dynasty, as recorded in recognizable ink paintings on a scroll of small birds on the branches of blossoming trees, attributed to the artist Emperor Hui-tsung, who ruled during the years 1100–1125. Java Sparrows were known also in the Ming Dynasty, during the Yongle Period of 1403–1424, in paintings on glazed porcelain. Near the end of the nineteenth century, A. G. Butler, in a translation of the words of K. Russ on the Java Sparrow, wrote: "Has been kept in a cage in Japan for hundreds of years, and selected as a fancy species by patient breeding..."; the white-plumaged domestic variety has, indeed, been bred in Japan for hundreds of years, and, as pointed out by K. Islam in 1997, Java Sparrows were mentioned in a handbook of Japanese foods and in a dictionary of the Japanese language published in the seventeenth and eighteenth centuries, respectively.

The Bengalese Finch is a domesticated strain of the White-rumped Munia, and in aviculture it is used as a foster-parent for other estrildid species. It is known in North America as the "Society Finch", in Germany as "*Japanisches Mövchen*" and in Japan and elsewhere as "Bengalee". The last name, "Bengalee", reflects the exotic origin of these finches when the birds were introduced into the Netherlands and adopted into Britain. At the time, several kinds of finch were known as "Bengalee". C. S. Flower, in the first decade of the twentieth century, noted that "the word Bengalee, variously spelt, has been used in various European languages to indicate almost any of the smaller weaver-birds, and is still commonly so used in the trade, but... is now generally restricted by English aviculturists to the [Java Sparrow]". An old Japanese book on cagebirds reported that the domesticated finches were traded from China to Japan about two hundred years earlier, and Russ also thought that the Bengalese Finch was a domesticated variety of the White-rumped Munia that had been bred by Japanese aviculturists for hundreds of years.

This may have been the earliest "parlour bird" to be selected and domesticated for companionship with people. Further, Bengalese Finches have been selected for distinct plumage, including "fawn" and "chocolate" morphs, and pied plumage and white plumage. They have been selected primarily, however, for their ability to breed in cages. They are hardy and tame, they breed readily, and they have a very strong parental instinct. Their courtship behaviour is similar to that of wild White-rumped Munias. The domesticated birds, however, are larger, more social, less shy, less aggressive and more vocal than their wild-



Previously placed in the genus Padda *with the Java Sparrow* (Lonchura oryzivora), *the* ***Timor Sparrow*** *similarly suffers persecution as a supposed pest of rice crops, and from trapping for the bird trade. It is listed as Near-threatened, because recent assessments suggest the population is declining as a result of habitat loss. However, surveys have found substantial populations in dry, degraded savanna-woodland landscapes along the north coast of Timor-Leste, where flocks of 30–50 birds can be seen. Seasonally, local people report that flocks around the rice fields can comprise thousands of birds. In contrast to neighbouring West Timor, where trapping seems to be increasing, there is no significant trade in Timor-Leste.*

[*Lonchura fuscata*, Timor, Lesser Sundas. Photo: Roland Seitre]

living counterparts, and in courtship they are less likely than wild individuals to carry material in a straw display (see Breeding). Because Bengalese Finches were selected centuries ago to breed in captivity, this selection for domestication may have lowered the threshold needed to stimulate females to mate, and so militated against the high-intensity stem display and the bob display. Nevertheless, the success of these finches in rearing young both of their own and of other species has engaged Bengalese Finches to serve in aviculture as foster-parents for other estrildids that have difficulty in successfully rearing their own young, and also for young brood-parasitic *Vidua* species.

Butler suggested that domesticated Bengalese Finches have a hybrid origin, being the result of crosses between the White-rumped Munia and the Indian Silverbill. In a test of this theory by E. Eisner, in 1958, male Bengalese Finch × African Silverbill hybrids were bred in captivity, and female Bengalese Finches were then introduced into the breeding aviaries; of the 63 eggs laid, none hatched. The findings are consistent with other reports that hybrids between the munia and the silverbill are sterile. In another test of the idea of a hybrid origin, two subspecies of the White-rumped Munia, *acuticauda* from India and *swinhoei* from China, taken from wild populations or bred by Baptista from wild-caught birds, were compared with Bengalese Finches in a mitochondrial-genetics survey; all of these birds were found to have identical genetic markers. This genetic identity supports the idea that Bengalese Finches were selected and domesticated from wild White-rumped Munias.

Domesticated strains of the Australian Zebra Finch have been bred for about 100 bird-generations in Europe and North America, where selective breeding has produced as many as 30 colour morphs, or "mutations". These include fawn, white and pied plumages, and a brown iris, in contrast to the red iris of wild adults; fawn plumage occurs in wild populations, as well. Domesticated strains of this species in Europe and North America, at 20–22 g, are larger than wild-living individuals, which weigh about 12 g; domesticated strains in Australia are of the same size as the wild birds.

Gouldian Finches have been studied in the field and in the laboratory, and domesticated strains breed readily in captivity. Since the late 1880s, the birds with variant plumage colours, like those that occur naturally in the wild, have been bred in captivity, with melanins or carotenoids present or absent in different parts of the body plumage. Four segregating genetic traits affect plumage colour and pattern, and the expressions of these vary between the sexes. These genetic results have been of interest in interpreting the ecological significance of plumage polymorphism in the field, where wild individuals preferentially choose a mate with plumage colours like their own.

Many other members of this family have been bred in captivity. Aviculturists have produced strains with unusual plumage pigmentation, for example in the Diamond Sparrow and several parrotfinches. None of these species, however, appears to have undergone the changes in behaviour that are known to have occurred with the four domesticated estrildids.

Aviculturists, from the late nineteenth century up to the early years of the twenty-first century, have developed guidelines for success in the keeping and breeding of estrildid finches in captivity. The birds do best in large aviaries where they have exposure to sunlight, as well as retreats where they can be warm and dry. Adequate lighting may also involve the provision of artificial electric sources. Aviaries are designed in such a way that they do not allow access by mice and rats (Muridae), and do not offer any opportunities for wild birds to introduce ectoparasites and gut parasites in droppings through the screen. They are often planted with trees, shrubs, herbs and grass, with care taken to avoid the introduction of toxic plants. Fresh clean water is provided for drinking and bathing, and the provision of shallow water, with perches to allow access for the birds and protection against falling into the water, is also recommended. For most species, suitable food includes a variety of small seeds, especially red



*A secretive and unobtrusive bird, the **Mount Katanglad Parrotfinch** was not discovered until the 1960s. At first it was known only from two or three localities, but it is now known to be much more widespread, and probably present on all of the mountains of central Mindanao. Although very little is yet known about this species, its population seems stable, and there are no known threats to its montane-forest habitats. But its small range on a single island makes it susceptible to emerging threats, and it is listed as Near-threatened.*

[*Erythrura coloria*, Mt Kitanglad National Park, Mindanao, Philippines. Photo: Ketil Knudsen]



*There have been no reliable sightings of the nominate race of the **Star Finch** since 1994, and it may already be extinct, with the best estimate a population of fewer than 50 individuals. The global population of the species is around 205,000 birds. The species is declining in parts of its range because of overgrazing and trampling by cattle, and poorly timed burning of grasslands. Woody "weeds" are steadily invading the habitat. Conservation action is particularly targeted at the population of around 5000 birds on Cape York, which the Australian Government considers a distinct and endangered race. The Star Finch is listed as globally Near-threatened.*

[*Neochmia ruficauda*, Australia. Photo: Graeme Chapman]

millet and white millet, along with millet spray, canary grass (*Phalaris canariensis*) seed, fresh soaked seed and sprouted grass seed. When nestlings are being fed, seeds without hulls should be included, as some birds do not remove the hulls when feeding their young. Bunches of switchgrass (*Panicum virgatum*) are used by the finches for climbing and for their seeds. Fresh green vegetables are readily taken by many estrildids, with bib or romaine lettuce, frozen peas and corn/maize, dandelion leaves, sliced cucumber and zucchini, fresh sliced broccoli stems, broccoli flowers and fruiting heads accepted, and also common chickweed (*Stellaria media*), which can be grown in aviaries. The frozen vegetables are convenient and free of pests, but they should be thawed, and not cooked, before being offered. Insect food is necessary for the successful breeding of some species. This can include pyralid moth larvae, known as "waxworms", for large species such as the Purple Grenadier, and also termites, dried ant eggs or pupae, live fruit flies (*Drosophila*), green aphids (Aphidoidea) and dried insects. In some areas, ant pupae can be collected from wood-ant mounds and frozen for later use; cultures of *Drosophila* can be kept in the aviary, where the birds will have immediate access to emerging adults. Commercially available food supplements such as "insect diet" or "nestling mix" are useful when the finches are rearing young. Vitamins and grit are often provided, but more important is a source of calcium. Pieces of chicken eggshell, roasted to kill bacteria and crushed into small pieces, are most important for the finches; interestingly, birds new to the aviary readily take eggshell before they take seeds. In addition, covered wicker nests should be provided in large numbers for nesting and roosting, and to prevent competition between individuals for these sites. Grass, burlap strips 10 cm in length or strips of other fibrous material is provided for nest-building, and feathers, properly sterilized, for nest lining.

Social considerations include the mix of birds to be housed in the same aviary, or even within earshot of one another. For example, twinspots normally are solitary in the field, and in captivity they often become stressed if they simply hear another twinspot. Some estrildids, the African Firefinch being one example, are aggressive and no more than one pair of such species should be in the same aviary, but others, such as the Red-billed Firefinch, are tolerant and show no interference when other pairs of the same species are nesting close by. Some birds will attack and kill conspecifics or other birds with similar colours to their own. A further important consideration when planning an aviary is the need to avoid placing together species that may hybridize, such as Red-throated and Blue-faced Parrotfinches, or *Poephila* grassfinches of more than one species. Finally, there is an art in avoiding checking the nests of species that may desert their eggs or young, and skill is required when switching nestlings to the foster care of a breeding pair of Bengalese Finches.

In addition to their prominent position in aviculture, estrildid finches are the avian models of choice in research on social behaviour, mate selection and song development. Ever since the field and laboratory studies of Immelmann in the 1950s and 1960s, the Australian Zebra Finch has been the most popular of all finches for research. It has been the subject in at least 25 important studies, covering imprinting, brain correlates of behaviour, extra-pair mating and parental care, the genetics of sexual selection, sex determination, genes and social behaviour, songbird genomics, song development and cultural evolution.

A long-standing practice in many parts of southern Asia has been that of catching birds and offering them for later release. This is based on the belief that somebody who releases a captured bird will be blessed with good fortune. In places such as Thailand, many hundreds of small birds, especially weavers and munias, are trapped and kept in groups in portable cages, the "owner" of the birds then offering other people, especially tourists, the chance to achieve good fortune by releasing one of the birds. Not surprisingly, the captor charges a small price for each release.

On the negative side of their relationship with humans, some estrildid finches are regarded as agricultural pests. Several munias and mannikins feed in large flocks and are pests in, especially, rice cultivation, mainly in their native areas and perhaps also in places where they have become feral as introduced populations. In Borneo, the Pin-tailed Parrotfinch and the Chestnut Munia are two of the most serious pests of the rice fields, and are proscribed in Iban prayer because of their intrusion on crops; the other pests so proscribed are bugs, locusts (Acrididae) and rodents. Several estrildid species survive in feral populations in places where they were introduced. Species living in two or more introduced populations include the Red Avadavat, Orange-cheeked Waxbill, Black-rumped Waxbill, Common Waxbill, Bronze Mannikin,

Indian Silverbill, Java Sparrow, Scaly-breasted Munia, Tricoloured Munia and Chestnut Munia. These introduced populations occur mainly on islands in the Pacific Ocean and the Caribbean region, but also in the USA and Europe. In addition to being potential agricultural pests, the introduced finches may be ecological competitors of native bird species, and they may be involved in disease transmission, possibly as vectors of avian malaria.

Status and Conservation

The population sizes of most species of estrildid are not known, having not been documented over a number of years, and the geographical extent of many populations can only suggest the potential number of individuals. Because many species do not sing loud songs on their territories, it is difficult to survey their populations and census their numbers.

Several members of the family are of conservation concern, because their numbers are low or have declined over recent years. In most cases, the habitat occupied by these species is undergoing rapid change and is likely soon to become unsuitable for the birds, or the species have small populations because their geographical extent is limited. There is some concern over the status of 16 estrildid species, or 12% of the family total. Eight species are considered globally threatened, and a further eight are Near-threatened. In addition, one subspecies is globally threatened.

Currently, the species thought to be at most serious risk is the Gouldian Finch, which is listed as Endangered. Its numbers have declined in recent years as a result of continued habitat alteration. Its global population size is small, estimated at between 2000 and 10,000 adults at the start of the breeding season. Recent studies indicate that it is probably nearer the top end of that range. Monitoring of the population at its best-known site, near Katherine, in north Northern Territory, has revealed that its numbers there are stable, and similar work at Mornington Wildlife Sanctuary, in central Kimberley, produced no evidence of a decline during the years 2004–2007. The principal threat appears to be overgrazing by cattle and horses, which prevents grasses from seeding, combined with degradation of water-holes caused by trampling and grazing of the surrounding vegetation by cattle and buffalo (*Bubalus*). The impacts of these herbivores are probably exacerbated by the current fire regime in north Australia, which involves the setting of frequent hot wildfires over extensive tracts of land in the late dry season, destroying the mosaics of burnt and unburnt habitat that the finches require. In addition, fire has an adverse effect on the seed productivity of wet-season grasses on which the Gouldian Finch relies during the period of food scarcity early in the year, and, moreover, the species tends not to nest in burnt tree hollows. In the past, it was suspected that the parasitic air-sac mite *Sternostoma tracheacolum* was a cause of the decline in this finch's numbers, but infestation by the mites is now believed to be a result of ecological stress. Ultimately, climate change is likely to alter the timing and amount of wet-season rainfall, resulting in potential increases in the frequency or intensity of wildfires, changes in the abundance of important grass species, and changes in the availability of surface water during the dry season.

Several measures have been taken in an attempt to ensure the survival of the Gouldian Finch. A recovery plan has been implemented, regional operations groups have been set up, and detailed research on the species' ecology and movements has been undertaken at Mornington Wildlife Sanctuary, where fire and its effects have also been studied. A database of all known sight records has been established, enabling a review of the patterns of distribution, habitats, potential threats and conservation status of savanna-dwelling granivorous birds. A monitoring programme has been set up at four sites. Attempted reintroductions of the species have so far had equivocal results. Further conservation proposals include research on the response of grasses and Gouldian Finches to various pastoral and fire-management regimes, and co-operation between conservationists and landholders to implement regimes that are beneficial or, at least, not harmful to these birds. The control of feral herbivores is also desirable, and this could be achieved in consultation with the Jawoyn Aboriginal Corporation. Finally, research aimed at improving reintroduction methods and investigation of the factors limiting survival has been proposed.

Three Australian species are listed as Near-threatened. The global population of the Diamond Firetail is estimated at about 200,000 individuals and is declining. Much of the woodland habitat suitable for the firetail has already been cleared, and the remaining fragments have become unsuitable owing to changes in vegetation through overgrazing, weed invasion, and salinization



*The range of the Near-threatened **Diamond Firetail** is shrinking. The remaining population of around 200,000 birds is fragmenting into isolated subpopulations, which are declining and in some cases, reportedly, disappearing. Many habitat remnants are becoming unsuitable, with the loss of key food plants and their replacement by exotic grasses more suitable for the flock-foraging Red-browed Finches* (Neochmia temporalis), *a species which is expanding in some areas, possibly at the Diamond Firetail's expense. Conservation proposals include protecting all remaining woodland occupied by Diamond Firetails, and the reconnection of subpopulations.*

[*Stagonopleura guttata*, Hillston, New South Wales, Australia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



The white-rumped nominate race of the ***Black-throated Finch*** *historically occurred in grassy woodlands from north-east New South Wales to Queensland's Atherton Tablelands, and west to central Queensland. Its range has contracted by up to 80% in 20 years, and this race now appears to be confined to the northern portion. It remains locally common in north Queensland near Townsville and Charters Towers, where open eucalypt woodlands with water sources and a mosaic of grasses remain. Conservation action includes maintaining and reconnecting these sites, with a buffer zone free from development. The black-rumped northern race* atropygialis *is also declining. The species is Near-threatened.*

[*Poephila cincta atropygialis*, Mareeba, Queensland, Australia. Photo: Peter Fuller]

and other consequences of poor water management. Moreover, its habitats have lost key foodplants owing to invasion by exotic grasses that are more suitable for the flock-foraging Red-browed Finch. In the north of its range, a change in fire and grazing management may have been involved in the decline in the firetail's numbers.

The nominate race of the Star Finch, confined to east-central Queensland, is thought to be extinct, having last been reliably observed in 1994. Elsewhere, this species has a stable population of about 5000 individuals in Cape York Peninsula, in north Queensland, and another extending from north and west Western Australia eastwards across north Northern Territory. This last population occurs in Pilbara, the Fitzroy River valley and Gibb River and the northern part of Northern Territory, where it is common in Victoria River District and at Kununnura, around the Ord River Irrigation Scheme; its total population is estimated at 200,000 individuals. The primary concern for the Star Finch is habitat degradation caused by overgrazing and trampling by livestock, the area of suitable habitat decreasing at a rate of 10% per decade. Other threats include feral cats and introduced foxes (*Vulpes*), invasive weeds in livestock areas, and cyanide contaminants at sites of mining operations. The species persists in irrigated grasslands and in towns where seeding, weedy grasses remain ungrazed. With global warming, the estimated sea-level rise across northern Australia would result in inundation of the coastal refuges that are used by the Star Finch early in the wet season.

The third Near-threatened estrildid in Australia is the Black-throated Finch, which was once found in grassy woodlands throughout north-east Australia, from Cape York Peninsula south to north-east New South Wales. During the twentieth century, however, the southern, nominate race declined substantially, finally disappearing in south-east Queensland in the 1990s. This subspecies was previously believed to be decreasing at a rate of 20% every ten years, and this rate of decline is assumed to be continuing. The northern subspecies, *atropygialis*, also appears to have contracted in range and decreased in density since the 1980s. In both cases, the decline appears to be linked with the spread and intensification of pastoralism, changes in the fire regime, and increases in the density of native woody weeds in grassland areas. Although the species has suffered from woodland clearance, it has declined also in uncleared savanna. In the past, trapping for the cagebird trade may have caused local extinctions in areas where the population had already been reduced. A recovery plan has been prepared for the nominate race. Searches for remnant subpopulations of this race in New South Wales were unsuccessful.

Another species giving cause for concern occurs in mainland Asia. The Green Avadavat is listed as Vulnerable, as its population is in rapid decline owing to habitat loss and degradation through agricultural intensification, and to trapping for the cagebird trade. Its distribution seems always to have been patchy, but it was once locally common, and possibly abundant. It is now scarce, very local, and erratic in occurrence, although in west India it still common around Mount Abu, in Rajasthan. A recent report of up to 2000 individuals of this species on sale in markets indicates that sizeable populations still exist in other areas, but these are thought to be in rapid decline, and bird-trappers report that this species is becoming more difficult to find. The Green Avadavat has been traded since the late nineteenth century, and has been found to be one of the most popular cagebirds in domestic markets. Every year, at least 2000–3000 individuals are illegally exported from India to Europe and America; many die in transit. Almost certainly, trapping for trade is the greatest threat to the species, and has already extirpated several local populations. On Mount Abu, the Green Avadavat is also trapped by local tribal communities for use in medicinal preparations. In addition to trapping, and habitat loss and degradation, a further potential threat is that of increased usage of pesticides, and increases in fire frequency may have an adverse effect on some populations. The species is present in four protected sites: the Desert National Park and Tal Chhapar Wildlife Sanctuary, in Rajasthan, Kanha National Park, in Madhya Pradesh, and Melghat Wildlife Sanctuary, in Maharashtra.

Although the trapping and selling of the Green Avadavat has been illegal in India since 1972, this species is still offered for sale in bird shops. Unscrupulous traders, unwilling to give up a lucrative part of their business, catch females of the Red Avadavat and dye them with light green and pale yellow colours, and also pluck out the red tail feathers; having thereby made the birds



*Despite large areas of apparently suitable habitat, with no known threats, the population of the **Anambra Waxbill** seems to be very small, restricted to a few localities in southern Nigeria; the species is classed as Vulnerable. Nevertheless, it is unclear whether this apparent rarity is genuine or owing to a lack of thorough surveys. The species thrives on the seeds of weeds associated with cultivation and disturbance, and is often seen close to human settlements. An as-yet-unidentified factor may be working against the species, and detailed studies of its population and ecology are urgently needed.*

[*Estrilda poliopareia*, near Yenagoa, Bayelsa, SE Nigeria.
Photo: A. P. Leventis]

look more like Green Avadavats, they then sell them as such to people who wish to possess "a rare bird". The exporting of Red Avadavats was legally permitted until 1989. More recently, however, this species, too, has become rarer, and some bird-traders now dye Indian Silverbills with an orange-red colour and offer these as Red Avadavats. The dyes utilized in these processes contain poisonous chemicals, which can cause the birds treated with them to perish within a few days.

Formerly widespread and abundant in Java and Bali, the Java Sparrow is now listed as Vulnerable. Although introduced populations can be found in many areas of the world, this species is scarce in its original range in Java and Bali, where it is subject to intense trapping for the cagebird trade. Moreover, historically introduced populations in southern and South-east Asia have crashed, and many populations have been extirpated not only by continued trapping for trade, but also because of changes in their commensal relationship with humans, who have altered methods of rice cultivation and crop management, and built modern rice mills that no longer offer easy pickings and buildings for nesting opportunities. In a four-year period during 1961–1965, the number of Java Sparrows exported from Java was 445,102, and such intense trapping has practically exterminated the species on the island. Formerly regarded as a serious pest in Javan rice fields, this species is now local in flocks in Baluran National Park and at Gajah Mungkur reservoir, in central Java. A recent population survey of 64 known former locations in its original distributional range in Java and Bali revealed only 109 individuals at 17 localities. The Java Sparrows now observed in the field and in bird markets in Java may be mainly survivors of transmigration from other Indonesian islands, and reintroductions from China for the bird trade. In 1995, an embargo was placed on the capture quota for Java and Bali. This threatened estrildid occurs in very few protected areas, with recent records from only four; these are the Cikepuh Wildlife Reserve and Baluran and Meru Betiri National Parks, in Java, and Bali Barat National Park, in Bali. In Venezuela, feral individuals are controlled by rice-farmers and trapped for the bird trade, which is augmented by domesticated Java Sparrows imported from Cuba, as well as from the Netherlands.

The Grey-banded Mannikin, found only in the Vogelkop Peninsula, in north-west New Guinea, is another Vulnerable species. It is very poorly known, but appears to be confined to grasslands around the lake Anggi Gigi, in the Arfak Mountains. Although it may occur elsewhere in these extensive mountains, there are no confirmed records away from Anggi Gigi, and its grassland habitat is scarce and fragmented. This region, however, has not been well explored ornithologically, and it is possible that this estrildid survives also in some other remote parts of the Arfaks. Concern for this species is based on its small range and on the possibility of conversion of its habitat to agricultural use. Reports that it figures in the international cagebird trade are considered likely to be due to misidentifications of other species, as the Arfak Mountains are very remote and difficult of access.

North-west of New Guinea, in the north and central Philippines, the Green-faced Parrotfinch is thought to be declining rapidly in numbers and is categorized as Vulnerable. It has been recorded on only four islands, with most records from Luzon. Since 1980, this species has been reported from four localities on Luzon and one on Panay, with a recent report from Cebu; there are no recent records from either of the two localities on Negros where it was formerly found. The main threat to this estrildid is destruction of forests for cultivation; it appears to be dependent on the seeds of bamboo, which is unevenly distributed in the forests. Although forest disturbance does, in the initial stages, improve the conditions for bamboo growth, the total clearance that follows removes this food source entirely. By the end of the 1980s, the estimated amount of forest cover was just 24% on Luzon, 8% on Panay and a mere 4% on Negros. In the past, at least, this estrildid was trapped for the cagebird trade, an activity that may have had a serious adverse impact on the populations. In 1935, for example, large numbers were caught in many districts



*Common only in a few threatened forests in the Albertine Rift mountains, **Shelley's Crimsonwing** shows unexplained fluctuations in abundance. It is found in a few protected areas, but its population is fragmented and declining, along with its habitat, and it is listed as Vulnerable.*

[*Cryptospiza shelleyi*, Mount Tshiaberimu, DRCongo.
Photo: The Gorilla Organization]

of Manila, on Luzon, and exported in their hundreds to the USA. The Green-faced Parrotfinch occurs in two protected areas, the Northern Sierra Madre Natural Park and Bataan Natural Park/ Subic Bay, both on Luzon.

Another parrotfinch species, the Pink-billed Parrotfinch, occurs only on the Fijian island of Viti Levu, where its small estimated population of 2500–10,000 individuals is thought to be in decline owing to loss of suitable habitat, old-growth forest. It is listed as Vulnerable. Conservation of old-growth forest is recommended for its survival. Although it has always been considered rare, this may be merely a reflection of its unobtrusive behaviour and patchy distribution. All records of this parrotfinch are from the wetter central and eastern parts of Viti Levu, where recent surveys indicated that it is widespread at low densities. It was found at eight of 13 recently surveyed sites, but these were preselected as having the densest old-growth forest. Only about 50% of Viti Levu is still forested, and small-scale logging and clearance for agriculture is continuing. After Joske's Thumb, formerly the most reliable site for the species, was logged in the early 1980s, a dramatic decline in the number of sightings was evident. This estrildid is protected under Fijian law.

The Red-headed Parrotfinch, a distinctive estrildid of the south-west Pacific region, includes two subspecies in Vanuatu, *regia* in the north and *serena* in the south, which are sometimes treated together as a separate species, the "Royal Parrotfinch". When treated as a distinct species, the Vanuatu form is classified as Vulnerable, on the basis of its very small global range; its small estimated population, numbering fewer than 10,000 individuals; and the ever decreasing extent of suitable habitat, as forest is logged and cleared for gardens. The parrotfinch is no longer seen on Anatom, the southernmost island in its range. On some of the smaller islands, however, it appears to be still reasonably common. It is perhaps often overlooked, as it is difficult to detect. Unfortunately, the "Royal Parrotfinch" is highly valued in the bird trade, and it is trapped on what is, thankfully, a relatively small scale. On most of the islands of Vanuatu, people carry catapults with them and shoot small birds for fun. The extent to which this parrotfinch is affected by this practice, however, is not known.

Four Afrotropical estrildids are of conservation concern. Shelley's Crimsonwing (*Cryptospiza shelleyi*) is listed as Vulnerable because of its small fragmented range in the Albertine Rift, and it is likely to be at risk owing to continuing deforestation and forest degradation. A rare and declining species in most of its range, it occurs in areas with increased human pressure as a result of war, the forests in the Itombwe Mountains and Kahuzi-Biéga National Park being used by pastoralists, farmers, loggers, miners and hunters. It is fairly common in a few forests, although these habitats are at risk, and its numbers appear to fluctuate for reasons unknown. In recent surveys in Uganda, it has been encountered only rarely; this may be because it is much rarer than was previously believed, or because it is very difficult to locate. Shelley's Crimsonwing is found in several protected areas, including the Virunga National Park, in DRCongo, Nyungwe Forest Reserve, in Rwanda, and Rwenzori Mountains National Park and Bwindi-Impenetrable National Park, in Uganda. At Bwindi Forest, there is a research project on this and other crimsonwings.

Like the previous species, the Anambra Waxbill is categorized as Vulnerable, primarily because of its small geographical range and very small global population. This estrildid is restricted to a few localities in southern Nigeria, where recent field observations suggest a population of at least 500 individuals. It was reported as common at Onitsha in 1954, but since 1980, despite considerable fieldwork, only a few records have been made. These include sightings of possibly five individuals at Onitsha in 1987, and a flock of 40 birds in the grounds of a nursing home at Tombia, south of Yenagoa, in 2002; in addition, on nine dates between March 2001 and April 2002, groups of 1–30 individuals were observed at twelve sites in the Niger Delta. It is not known why this species is so rare and sparsely distributed. Its long-grass habitat alongside wetlands and on the fringes of open deciduous forest seems not to be under threat, and this waxbill is often seen near human habitations and activity; its diet consists principally of grass seeds.

The two other African species possibly at risk are both considered Near-threatened. The Red-fronted Antpecker has a fragmented range in West Africa, where it inhabits moist lowland forest. It is reasonably common in Liberia, but is uncommon in protected areas elsewhere: in the Gola Forest, in Sierra Leone, Taï Forest National Park, in Ivory Coast, and Kakum and Anksa National Parks and Subri River and Tano Offin Forest Reserves, in Ghana. Continuing logging and clearance of forest for agriculture are likely to be causing further reductions in its population, which has already undergone declines as a result of deforestation throughout its range.



*Trapping for the bird trade has extirpated several populations of the **Green Avadavat**, and is almost certainly the greatest threat to the species. The trappers themselves report that the birds are increasingly hard to find. Trapping and trade in the species have been banned in India since 1981, but an annual minimum of 2000–3000 birds are smuggled into Europe and North America. This species is very susceptible to stress, and large numbers regularly die during trapping or in transit. The rapid decline in population is compounded by habitat loss and degradation, and the Green Avadavat is listed as Vulnerable.*

[*Amandava formosa*, Mt Abu, Rajasthan, India. Photo: Ian Merrill]



*In 1971, the **Java Sparrow** was described as "one of the most common species in the cultivated parts of Java". The species is now difficult to find, and a recent survey of 64 historic sites found it at just 17, with a total of 109 individuals. This precipitous decline can be attributed primarily to its exploitation as a cagebird. However, the role of pesticides requires further exploration. Java Sparrows are also heavily persecuted as pests of rice crops, adult birds being shot with airguns, and nests and nestlings destroyed. The Java Sparrow has been widely introduced elsewhere in the world, and the current population in Java is at least partly derived from birds reintroduced from other Indonesian islands and from China.*

[*Lonchura oryzivora*, Bali.
Photo: James Eaton]

The Cinderella Waxbill has a relatively small geographical range and is believed to be in decline following degradation of its woodland habitat. It is still locally common to frequent in western Angola, where it inhabits thornbush, scrub, open mopane woodland and riverine acacia woodland at 200–500 m. Its range extends a little into north-west Namibia, where its population, estimated at fewer than 2,000 individuals, is found mainly in mopane and riverine woodlands of the Cunene river system. This estrildid is potentially threatened by an increase in human habitation around springs and streams, wood-cutting, land clearance for agriculture, overgrazing and trampling by cattle and goats, and the over-utilization of water. Furthermore, the proposal for a hydro-electric dam plant at Epupa Falls, on the River Cunene, could threaten the species' survival in Namibia and also in adjacent parts on the Angolan side of the border. No decision has yet been made on whether the dam project, which is opposed by local people, should proceed. The Cinderella Waxbill occurs in several protected areas in Angola, including Iona National Park and possibly Chimalavera Regional Nature Park, and is present also in proposed protected areas at Chongoroi and Tundavala.

Three further members of the family are currently considered Near-threatened. These are the Mount Katanglad Parrotfinch, the Timor Sparrow and the Black Mannikin. The first of these has a rather small range on Mindanao, in the south Philippines, where it is not uncommon at Mount Katanglad and is probably present on all other mountains in central Mindanao. This parrotfinch, which appears to be very local, is a very unobtrusive species and is easily overlooked, as a consequence of which its population size is not well known. In parts of its range its shrubby habitat is being cleared for agriculture. The Timor Sparrow, confined to that island and a couple of its satellites, may be undergoing a moderately rapid decline owing to habitat loss, hunting, and trapping for the bird trade. It is highly prized as a cagebird, and large numbers are trapped for this purpose; indeed, more than 4000 individuals have been imported by European Union countries since 1997. Although widespread, and locally moderately common, the Timor Sparrow is sparsely distributed. Surveys have revealed flocks of 30–50 of these birds within a few hectares, and local inhabitants report flocks containing hundreds or even thousands of individuals, but such gatherings appear to be rather rare. As is nowadays so common, habitat destruction in both West Timor and Timor-Leste has been extensive. Tropical monsoon forest now covers no more than about 4% of West Timor, where it survives in seven unprotected patches, all of which are subject to further reduction as a result of intensive grazing and burning. Much of the remaining habitat in Timor-Leste is contained within three recently identified Important Bird Areas. Like the Java Sparrow, this species is considered a pest in rice fields, from which it is chased off by people using slingshots and throwing stones. The last of these Near-threatened species, the Black Mannikin, lives in southern New Guinea. It has a small global range and a small population, which is likely to be in decline owing to trapping and habitat degradation. Evidently, it is locally common, with reports of flocks of up to 20 individuals, but it appears to be less numerous than the Grey-crowned Mannikin, which is largely sympatric with it. It is possibly at risk because of the destruction of reedbeds by introduced rusa deer (*Cervus timorensis*), and the encroachment of woodland onto grassland. In addition, it is trapped in large numbers for the cagebird trade. In August 1993, 250 were being exported from Merauke Airport, and more than 1200 have been imported into European Union countries since 1998. This mannikin is particularly susceptible to trapping, as it concentrates in large numbers around drinking pools.

Finally, one estrildid taxon is placed in the category of Data-deficient. The subspecies *nigriloris* of the Common Waxbill is restricted to south-east DRCongo, and is often treated as a separate species, the "Black-lored Waxbill". It is very poorly known, however, and even its precise geographical limits have not been ascertained. It seems to be restricted to an area of perhaps less



*From millions of birds in the 1950s, the **Gouldian Finch** has declined steadily across northern Australia. Cattle grazing has deprived the birds of food, by preventing grasses from seeding, and the modern regime of extensive dry-season burning has created too uniform a landscape for a species that requires a mosaic of habitat throughout the year. With a wild population of some 2000–10,000 birds, the species is listed as Endangered, though the population may be stabilizing. Conservation measures include reintroductions into suitable managed habitat, and sourcing breeding birds from the large numbers in captivity, although many of these are bred as colour mutants, and have lost genetic variability and resistance to disease.*

[*Erythrura gouldiae*, Mt Barnett, Western Australia, Australia. Photo: Don Hadden]

than 2600 km² around the River Lualaba and Lake Upemba, but there are no known records of this taxon since 1950. On the assumption that *nigriloris* is not extinct, there is a need for taxonomic studies in order to clarify its status. If it is found to merit full species rank, surveys will be required with the aim of determining its distribution, its population and its habitat requirements. Old records indicate that it occurred in small flocks in grassy plains with tall grasses and bushes.

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Subfamily ESTRILDINAE

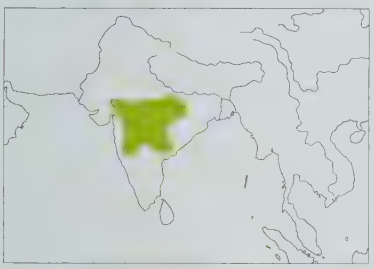
Genus *AMANDAVA* Blyth, 1836

1. Green Avadavat

Amandava formosa

French: Bengali vert **German**: Olivastrild **Spanish**: Bengalí Verde
Other common names: Green Munia, Green Tiger Finch

Taxonomy. *Fringilla formosa* Latham, 1790, India.
Genus sometimes subsumed in *Estrilda*. This species sometimes placed in a monotypic genus, *Stictospiza*; recent studies of mitochondrial DNA, however, indicate monophyly with *A. amandava* and *A. subflava*. Monotypic.
Distribution. C India from S Rajasthan, C Uttar Pradesh and S Bihar S to Maharashtra, N Andhra Pradesh and Orissa.



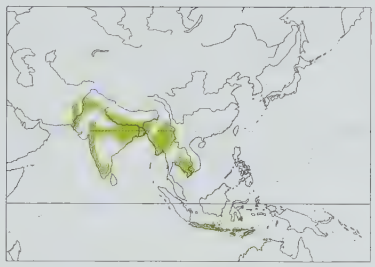
Descriptive notes. 10 cm. Male is olive-green above, rump greenish-yellow, tail glossy black; yellow below, brightest on undertail and its coverts, flanks barred black and white; iris brown, eyering grey; bill red; legs pinkish. Female is similar to male but duller, dull grey-green above, with throat greyish-white, breast greyish-buff, lower breast to undertail-coverts yellowish-white, flanks weakly barred; bill blackish above, red below. Juvenile is olive-grey above, and buffy white below, darkest on breast, undertail-coverts whitish; bill black, becoming red at base. VOICE. Calls include distinctive squeaky "swee, swee" and "chip"; song a prolonged twitter ending with loud trill.
Habitat. Tall grass and low bushes, open dry woodland, sugar-cane fields, mango orchards, *Lantana* scrub, boulder-strewn scrub; typically near water.
Food and Feeding. Small grass seeds, small insects. Forages mostly on ground. Gregarious; occurs in flocks in non-breeding season, sometimes mixing with *A. amandava*.
Breeding. Breeding records in May–Jan. Semi-colonial, in small groups. Male displays on ground and on perch, holds a stem in bill, fluffs nape, rump and belly feathers, bows or turns head to female, brushes the stem against her breast; the two perch in parallel, heads touching; if display successful, male pecks female's nape, she quivers tail, and partners copulate. Nest built by both sexes, a large ball, with short neck around entrance tunnel, made from coarse grass, lined with finer grass, sited 1–2 m above ground, often in reeds, sometimes attached to sugar-cane leaves. Clutch 5–6 eggs; incubation by both sexes, period 11–12 days; nestling sparsely covered with natal down, has narrow white gape-flange with black spots (gape-flanges dull grey at fledging), pale palate with four small black spots (including double medial spot) and two more spots behind these, tongue has two black spots and black tip, lower mandible bill has short black crescent; begging young swings head upside-down and moves it from side to side, raises wing on side away from parent; fledging period 18–21 days; young independent 1–2 weeks after fledging.
Movements. Resident.
Status and Conservation. VULNERABLE. Scarce to very locally quite common; decreasing. Formerly locally common or even abundant, but has declined rapidly; still fairly common around Mt Abu, in Rajasthan. In the past, a small colony in E Pakistan (near Lahore), believed to have originated from escaped cagebirds. Was apparently always patchily distributed. Main cause of decline is widespread trapping for the cagebird trade, this exacerbated by loss and degradation of habitat through agricultural intensification. Trapping has already eliminated several populations. Has been traded since late 19th century, and is one of the most popular cagebirds in domestic markets; every year, minimum of 2000–3000 individuals smuggled out of India to Europe and North America; high mortality of trapped birds noted. Recent observations of up to 2000 birds of this species in markets, suggesting that sizeable populations still exist in other areas, but presumably in rapid decline. On Mt Abu, this species is trapped by local tribal communities also for use in medicinal preparations. In addition, widespread destruction and alteration of scrub and grassland likely to contribute to declines. Increased usage of pesticides a potential threat, and increased frequency of fires may have adverse impact on some populations.
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2. Red Avadavat

Amandava amandava

French: Bengali rouge **German**: Tigerastrild **Spanish**: Bengalí Rojo
Other common names: Avadavat, Red Munia, Strawberry Finch/Waxbill

Taxonomy. *Fringilla amandava* Linnaeus, 1758, Calcutta, West Bengal, India.
Genus sometimes subsumed in *Estrilda*. Three subspecies recognized.
Subspecies and Distribution.
A. a. amandava (Linnaeus, 1758) – patchily in Pakistan, India, Nepal and Bangladesh.
A. a. flavidiventris (Wallace, 1864) – Myanmar, S China (SW Yunnan), NW & C Thailand, and Lesser Sundas (Lombok, Flores, Sumba, Roti, Timor).
A. a. punicea (Horsfield, 1821) – SE Thailand, Cambodia, S Vietnam, Java and Bali.
Introduced in Spain, Portugal, Italy, Egypt, Israel, Saudi Arabia, Bahrain, Iran, SE China (Hainan, Guangdong, Hong Kong), Japan, Indian Ocean islands (Comoros, Mauritius, Reunion), Borneo, Fiji, Hawaiian Is, and Caribbean (Hispaniola, Puerto Rico, Guadeloupe, Martinique).



Descriptive notes. 9·5 cm; 7·2–9·5 g. Male nominate race breeding is red from head to back and uppertail-coverts, crown and back tinged brown, upperwing and tail brownish-black, scapulars, tertials, wing-coverts, rump and uppertail-coverts, flanks and tips of tail feathers with rows of white spots; lores and line through eye black, narrow white line below eye; breast and flanks red, belly and undertail-coverts black; iris red to brown, eyering black; bill red, often with black line on culmen; legs pinkish. Male non-breeding is like female, but with white spots on red uppertail-coverts, larger pale tips on greater coverts, face grey, underparts buff to buffish-brown. Female is greyish-brown above, rump and uppertail-coverts red with few indistinct white spots, small white or pale buff tips on upperwing-coverts and tertials; lores black, throat whitish, breast and belly pale buffish, often with slight orange tinge. Juvenile resembles female, but lacks red, has rump and uppertail-coverts brown, buff wingbars (tips of median and greater coverts), tertials edged and tipped buff, face unmarked grey, underparts grey to buffy white, iris brown, bill dark. Race *flavidiventris* is paler than nominate, male orange-red to yellowish-buff below, white spots on breast; *punicea* is slightly brighter than nominate, with spots smaller, dark line across lores small or absent. VOICE. Call a high "teei" or "tsi", also high-pitched chirps; nest call "teh teh teh teh"; bill-snapping used in threat. Song a high-pitched descending whistled twitter, beginning with a contact call and ending in quiet trill, "swee s-s-sui zee s(w)eee sweee swiee", the notes and sequences varied in a song bout. Female gives a short song.
Habitat. Grassland, low marshy plains, damp grass, reeds, rice fields, sugar-cane fields, tamarisk (*Tamarix*) scrub, wetlands along rivers and canals, and grassy clearings near cultivation and villages. Mainly lowlands, below 300 m; to 2100 m in India, 1250 m in Thailand, 1500 m in Java and 2400 m in Lesser Sundas.
Food and Feeding. Small grass seeds; occasionally insects, including termites (Isoptera). Clings to stems to take ripening grass seeds; takes ripe seeds also from ground, often from dry earth below overhanging grass. Feeds in flocks. Outside breeding season, often in larger flocks, sometimes with other waxbills and sparrows (Passeridae); roosts in reedbeds.
Breeding. Season generally late in rains and early dry season, in India mainly during Jun–Dec monsoon in N, Jun–Aug in Assam, Oct–Mar in S; Dec–Jan in Thailand (Bangkok area) and Aug–Jan in Myanmar; in Java, breeding recorded May in W and Jun and Dec in C; Jan–Jul in Flores; in Europe (introduced), Jul–Oct in Spain and Nov–Dec in Italy; in Egypt (introduced), Apr–May at Suez and Nov at L Quarun. In courtship display on ground or low branch, male holds a feather or stem in bill, body feathers fluffed, tail fanned, he raises head and bill, bows slowly towards female, twists tail (bright uppertail-coverts towards her), and sings between bows, sometimes bows slowly to one side, raises head, and bows to other side; on ground, hops in semicircle in front of female, facing her, and bows; displays also in horizontal posture, crouches, raises and flutters wing on side farther from mate, turns head towards her and gives soft twitter, some females responding sexually to this display (which given usually to a new mate); in displays ending in copulation, male pecks female's nape, she quivers tail (established pairs copulate with no preliminary display). Nest a hollow ball of coarse grass, lined with fine materials, with side entrance hole, built within 1 m of ground or water in thorny bush, grass, reeds or coarse herbs. Clutch 4–6 eggs (larger clutches the product of more than one female); incubation 11–13 days; hatchling pink with long white natal down, inconspicuous whitish swelling at gape, upper and lower gape each with three black spots on inner surface, palate white with four small black spots (including a double medial spot) and two smaller spots behind in a ring of six spots, tongue pinkish-white with two lateral spots, below it a sublingual crescent; begging nestling (and fledgling) lowers head, twists it to side, swings head from side to side, and raises wing on side away from parent; young leave nest in 17–21 days, fed with regurgitated seeds by parents further 10–14 days.
Movements. Resident in most of range. In NW border region of Pakistan recorded mostly May–Oct; some N birds move seasonally into SE Asia, where nominate race a winter visitor in Myanmar. Wanders variable distances, depending on availability of fresh grass seed. Introduced populations in Spain and Egypt resident, also locally nomadic.
Status and Conservation. Not globally threatened. Uncommon to locally common in Indian Subcontinent; scarce to locally common in SE Asia; locally not uncommon in E Java and Bali, rarer in W Java; generally uncommon and local in Lesser Sundas, but locally common on Flores and fairly common on Sumba. Origins of populations in SE China uncertain; thought to have been introduced, but presence possibly natural. Introduced widely in many parts of the world, also feral populations established in many places from escaped cagebirds: e.g. in Egypt, widespread and locally common in parts of Nile Delta area and near Suez, common along R Nile S of Cairo, and frequent on borders of L Qarun; introduced populations formerly in Sumatra and Philippines, now extinct, also unsuccessfully introduced in Andaman Is; escaped birds reported in Singapore, but no evidence of breeding.
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3. Zebra Waxbill

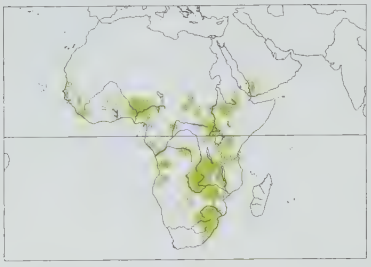
Amandava subflava

French: Bengali zébré **German**: Goldbrustastrild **Spanish**: Bengalí Cebra
Other common names: Orange(-breasted)/Gold(en)-breasted Waxbill, Goldbreast

Taxonomy. *Fringilla subflava* Vieillot, 1819, Senegal.
Genus sometimes subsumed in *Estrilda*. Present species sometimes placed in a monotypic genus, *Sporaeginthus*; recent studies of mitochondrial DNA, however, indicate monophyly with *A. formosa* and *A. amandava*. Proposed race *niethammeri* (described from Huíla, in SW Angola) considered inseparable from nominate. Two subspecies recognized.

On following pages: 4. Locust Finch (*Paludipasser locustella*); 5. African Quailfinch (*Ortygospiza atricollis*); 6. Cut-throat Finch (*Amadina fasciata*); 7. Red-headed Finch (*Amadina erythrocephala*).

Subspecies and Distribution.
A. s. subflava (Vieillot, 1819) – SW Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone, N Liberia, N Ivory Coast, SW Mali, C Burkina Faso, N Ghana, Togo, Nigeria, Cameroon, S Chad, Central African Republic, W & S Sudan, Ethiopia, N, C & E DRCongo, Uganda, Kenya and NW Tanzania, also SW Saudi Arabia and W Yemen.
A. s. clarkei (Shelley, 1903) – S Gabon, S PRCongo, S DRCongo and Tanzania (except NW) S to Angola, Zambia, Malawi, Zimbabwe, Mozambique and SE South Africa.



Descriptive notes. 9 cm; 5·2–10·9 g. Male nominate race has crown to back and wings olive-green to olive-grey, rump and uppertail-coverts red, tail black with whitish on outer edges of lateral rectrices; broad red superciliary stripe from bill to behind eye, lores black, cheek greyish yellow; throat yellow, side of breast light olive, centre of breast to belly orange, undertail-coverts red-orange, flanks broadly barred with yellow and olive-grey; iris brown-red, eyering grey; bill red, black upper and lower ridge; legs grey to pinkish-brown. Female lacks red supercilium, has underparts pale yellow, undertail-coverts pale orange, iris reddish-brown. Juvenile is dull olive-grey above, rump brown, plain buff below, paler on throat, iris brown, bill black. Race *clarkei* male has underparts bright yellow, orange spot on upper breast, orange undertail-coverts, female paler underparts than nominate. Voice. Calls high, thin, nasal downslurs, "seet", "sip" and "cheep", often paired; flight-intention call a series of "trip" notes, flight call a repeated "tink", nest call a series of high-pitched soft "tri tri, tri" notes by male as he inspects nest sites. Male song, usually at dawn, a series of high-pitched notes, also a jumbled series of metallic notes, "cheup, chip, cheet, chink, cheup, chink, chink, chi, cheet...". Female also sings.
Habitat. Open grassy areas, seasonally wet grasslands, marshes, grassy woodland near water, and edges of cultivation. Generally below 1600 m; at 750–2400 m in Ethiopia.
Food and Feeding. Small grass seeds, including those of *Digitaria milinjana*, *Hyparrhenia cymbaria*, *Melinus repens*, *Panicum novenmere* and *Setaria sphacelata*; also filamentous algae, taken from surface water; also alate termites (Isoptera). Nestling diet small seeds and small insects, including beetle larvae (Coleoptera), termite workers and ants (Formicidae). Takes seeds mainly by clinging to a stem and feeding on fruiting head; feeds also feeds on ground. Forages in small groups; in non-breeding season also in large flocks.
Breeding. Season Jun–Sept in Sudan, Dec in Ethiopia, Jul and Aug in Uganda, during regional rains in Kenya, Jan–Jun (mainly Mar–May) in Zambia, Mar–Aug in Malawi, and mainly Jan–Jun in South Africa. Male displays usually without holding stem in bill, points his tail towards female or fans it, sometimes hops on ground around her, body upright, flank and belly feathers fluffed, head and rest of plumage sleeked, facing her; on occasion upright fluff and hop with a stem held in bill; in bowing display, he stands next to female and bows deeply; head bow occurs in courtship and at other times, when bird presents its head and nape to the socially dominant partner for preening; pair copulates in the open. Nest built by both sexes, an untidy hollow sphere of grass, lined with finer grass and feathers, a side entrance with porch, and sometimes a cock's nest on top, placed in tall grass; alternatively, adopts old covered grass nest of other songbird, adding lining to nests of grasswarblers (*Cisticola* and *Prinia*), *Ploceus* weavers or Southern Red Bishops (*Euplectes orix*), sometimes in neighbouring nest in bishop colony. Clutch usually 4–6 eggs; incubation from second or third egg, period 13–14 days; hatchling pink-skinned with long white tufts of down, skin changing to dark grey before feathers erupt, mouth has inconspicuous narrow whitish gape-flange with three black spots on oral surface of upper flange and three on lower flange, palate whitish with two large black chevrons in front of a ring of five small black spots (three on palate, two smaller ones behind), tongue whitish with two black spots and black tip, and sublingual crescent (in frontal view closed mouth shows two black spots surrounded by whitish gape); gape swelling small and grey by time of fledging; nesting period 19–21 days; fledglings raise wing on side away from parent, fed by parents for a further 10–14 days. Nominate race is brood-parasitized by Jambandu Indigobird (*Vidua raricola*); and race *clarkei* may be parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Mainly resident; partly nomadic, some moving to drier grasslands during rains.
Status and Conservation. Not globally threatened. Locally common to scarce or rare. Rare to fairly common and generally very local in extreme NW of range; in Senegal and Gambia was formerly locally common, but now rare as a result of habitat destruction for rice cultivation. In S Africa, estimated populations of 7000 individuals in Swaziland, 5000 in S Mozambique (Sul do Save), and 10–100 in Lesotho; has evidently decreased in Lesotho and in Transkei region of South Africa, possibly because of overgrazing of vleis. Density 37·5 birds/100 ha in acacia (*Acacia*) savanna in Swaziland.
Bibliography. Ash & Atkins (2009), Carswell *et al.* (2005), Chapin (1917), Colahan (1982), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1960, 1962, 1982), Harrison (1962a, 1962b, 1962c), Hochmal (2008b), Hockey *et al.* (2005), Hollom *et al.* (1988), Immelmann *et al.* (1965), Kunkel (1959), McCarthy (2006), Payne (2005a), Payne & Payne (1994), Redman *et al.* (2009), Salewski (2004), Schönborn (1980a), van Someren (1956), van Someren & Cunningham-van Someren (1949), Sorenson *et al.* (2004), Steyn (1996), Wolters (1969).

Genus *PALUDIPASSER* Neave, 1909

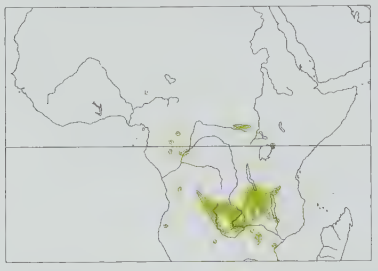
4. Locust Finch

Paludipasser locustella

French: Astrild-caille à gorge rouge **Spanish**: Estrilda Saltamontes
German: Heuschreckenastrild
Other common names: Common Locustfinch, Red/Locust Quailfinch, (Red) Marsh Finch; Zaire Locustfinch (*uelensis*)

Taxonomy. *Paludipasser locustella* Neave, 1909, marshes near Lake Bangweulu, Zambia.
Genus sometimes subsumed in *Ortygospiza*, but the two appear not to be closely related. Relationships uncertain; in recent studies of mitochondrial DNA, appears to be basal to all other estrildids in one model, but in other models associated variously with *Ortygospiza* or *Amandava* or *Amadina*. Two subspecies recognized.

Subspecies and Distribution.
P. l. uelensis Chapin, 1916 – N Nigeria, extreme SE Cameroon, SE Gabon, S PRCongo, W & N DRCongo and W Kenya.
P. l. locustella Neave, 1909 – patchily Angola, SE DRCongo (S Katanga), Tanzania (Ufipa Plateau and Iringa highlands), Zambia, Malawi, N Botswana, N Zimbabwe and N Mozambique.



Descriptive notes. 9–10 cm. Male nominate race has crown and most of upperparts brownish-black, mantle, scapulars, back and inner upperwing-coverts with fine white spots, rump unspotted red, tail black; inner wing-coverts and much of flight-feathers orange-rufous (fading with wear); face to upper breast red, lower breast to undertail-coverts black, a few pale spots on rear flanks and undertail-coverts; iris yellow; bill red, culmen black; legs light brown. Female is duller than male, has face black, throat to belly white, sides and flanks barred black and white. Juvenile is like female but still duller, upperparts scaly brown, upperwing brown, throat and upper breast whitish, barred dark grey, iris dark brown, bill black. Race *uelensis* differs from nominate in lacking white spots. Voice. Calls "tissep", "chit", "cheep", "tsee-tset", "see-see-see", rattling "chichichichichit", and downslurred "chyew" or "tyee-tyee-tyee"; flight call "chyew", downslurred from 3·7 kHz to 3·2 kHz.
Habitat. Flat, open grassland with tufts of short, wiry grass, edges of swamps and seasonal floodplains, low marshy sites that have dried and been burnt; also abandoned cultivation in highlands. Uplands; in Zambia at 950–1670 m.
Food and Feeding. Small grass seeds, taken from ground. Terrestrial; spends almost all of its time on the ground. Forages in pairs and in family groups; in non-breeding season in large flocks. When disturbed, it crouches, motionless, and then rises suddenly to fairly high height and flies directly or erratically, before landing; often simply walks away out of sight on ground.
Breeding. Breeds in Oct in Nigeria, Jan–May in Zambia and Zimbabwe, and Jan and Feb in Malawi. No information on courtship behaviour. Nest ball-shaped, with thick base, entrance hole on one side, made from soft, fine dry grass, interior made from green grass stems, sometimes feathers or vegetable down, well hidden on ground in grass or in wet, damp or dried soil. Clutch usually 3–5 eggs, sometimes up to 8; incubation by both sexes, mainly by female, no information on duration; nestling has short down on head, gape initially with small black-bordered red ball, later (day 3 to day 6) two small red balls on each side, palate whitish with bright red centre bordered by blackish-edged red U-shaped arc, which by day 3 divides medially into two arcs, and a black transverse line appears at lateral base and extends half-way to edge of mouth, tongue pale with red spots; chicks fed by both parents, no information on duration of nestling period; fledglings tended by both parents.
Movements. Resident and partially migratory. Seasonal in occurrence in some regions; in S Africa wanders extensively in dry season; a vagrant in Kenya.
Status and Conservation. Not globally threatened. Generally uncommon and local. Few records in many countries, e.g. in NW of range; more widespread but rather local in N & W parts of Zambia.
Bibliography. Anon. (2008g), Borrow & Demey (2001), Butchart & Stattersfield (2004), Chapin (1916, 1954), Demey (2003), Dowsett & Dowsett-Lemaire (2000), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Irwin (1958, 1981), Lynes & Sclater (1934), McCarthy (2006), McGregor & Wilson (2003), Neave (1909, 1910), Payne (2005a), Payne & Sorenson (2003), Penry (1986), Sclater (1932), Sorenson & Payne (2001a, 2001b), Stevenson (1992), Vincent (1949b), Zimmerman *et al.* (1996).

Genus *ORTYGOSPIZA* Sundevall, 1850

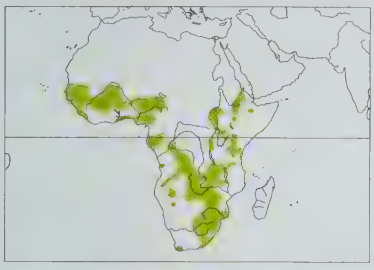
5. African Quailfinch

Ortygospiza atricollis

French: Astrild-caille à lunettes **German**: Wachtelastrild **Spanish**: Estrilda Codorniz
Other common names: Common/White-chinned/Black-billed Quailfinch, (Kenya) Partridge Finch; Black-chinned/Black-faced/Red-billed Quailfinch (*gabonensis*, *fuscata*, *dorsostriata*); Ethiopian/Dark-vented Quailfinch (*fuscocrissa*, *muelleri*, *digressa*, *smithersi* and *pallida*)

Taxonomy. *Fringilla atricollis* Vieillot, 1817, Senegal.
Taxonomy complex. Races often treated as comprising two or three separate species, one consisting of nominate race, *ansorgei* and *ugandae*, one comprising black-chinned races *gabonensis*, *fuscata* and *dorsostriata*, and one containing white-spectacled *fuscocrissa*, *muelleri*, *digressa*, *smithersi* and *pallida*. Such treatment supported by studies of mitochondrial genes, which indicate that these groups form three separate clades, with "*gabonensis* group" and "*fuscocrissa* group" more closely related to each other than either is to "*atricollis* group"; on other hand, races intergrade in facial pattern, and groups do not form genetically monophyletic lineages, do not differ in vocalizations, in bill colour when breeding, or in nestling mouth markings and colours. Treatment as a single species considered preferable, pending further study. Proposed races *minuscula* (described from upper Zambezi at Balovale, in Zambia), intermediate in plumage between *fuscata* and *muelleri*, and *bradfieldi* (from Okahandja, in Namibia), mostly paler than latter, are both synonymized with *muelleri*. Eleven subspecies recognized.
Subspecies and Distribution.
O. a. atricollis (Vieillot, 1817) – S Mauritania, Senegal (except Casamance) and S Mali E to Nigeria, SW Chad and Cameroon.
O. a. ansorgei Ogilvie-Grant, 1910 – SW Gambia, S Senegal (Casamance), Guinea-Bissau, Guinea and Sierra Leone E, discontinuously, along coast to Togo.
O. a. ugandae van Someren, 1921 – S Sudan, Uganda and W Kenya.
O. a. fuscocrissa Heuglin, 1863 – Eritrea and Ethiopia.
O. a. gabonensis Lynes, 1914 – Gabon E to C DRCongo.
O. a. fuscata W. L. Sclater, 1932 – N Angola, S DRCongo and NW Zambia.
O. a. dorsostriata van Someren, 1921 – E DRCongo E to S & W Uganda.
O. a. muelleri Zedlitz, 1911 – S Kenya, Tanzania, Malawi, Zambia, Angola, Namibia and Botswana.
O. a. smithersi Benson, 1955 – NE Zambia.

O. a. pallida Roberts, 1932 – N Botswana.
O. a. digressa Clancey, 1958 – E Zimbabwe, S Mozambique and N, E & SW South Africa.



Descriptive notes. 9–10 cm; 9–12·4 g (nominate). Male nominate race is grey-brown above, tail and upperwing brown; face black, small white crescent on chin, incomplete feathered white crescents around eye; throat black, upper breast and sides grey with black and white barring, lower breast chestnut, belly paler, undertail-coverts whitish with black bars; iris yellowish-brown to dark brown, unfeathered eyering grey; bill red during breeding, black upper mandible in non-breeding season; legs light orange to pinkish-flesh. Female differs from male in having face grey, upperparts less streaked, sides less barred; iris dark brown. Juvenile is like female but duller, sides indistinctly barred, iris dark brown, bill black. Race *ansorgei* slightly darker above, with black of face extending onto ear-coverts and upper breast; *ugandae* differs from nominate in having more extensive white on chin and tawny belly, lores sometimes white; *fuscocrissa* has conspicuous white spectacles (white broken in centre of lores), upperpart feathers have pale fringes contrasting more noticeably with darker centres, differs from previous in having more white on chin, throat, area around eye and lores, and blacker breast and flanks; *muelleri* differs from last in having less streaking on back, belly buff; *pallida* differs from preceding race in paler brown-grey back and whitish belly; *digressa* differs in darker brown-grey back; *smithersi* is darker than previous races, and more heavily streaked above; *gabonensis* differs from nominate in absence of white around eye, chin and throat, in darker back, and in paler belly, resembles *ansorgei* but lacks white on head and has streaked back and whitish belly; *fuscata* differs from last in blackish back, darker chestnut breast and light chestnut belly; *dorsostriata* differs from *gabonensis* in occasional white around eye and on chin/throat, less streaking on back, and tawny belly. Voice. Call a harsh, flat metallic "klek" or "klink". Song loud, of harsh irregularly alternating notes in phrases repeated with some variation, "klik klak kooik kluk kluk", continues for several seconds; female songs short and discreet. Same sound elements given in contact calls and rattling flight calls. Loud songs nearly identical across Africa. A soft song, a burbling "gru grie gritty" used in sexual behaviour at close range and at nest, differs little between W African races *ansorgei* and *atricollis* and SC African *muelleri*.

Habitat. Short dry grassland, seasonally wet fields, wet marshy grassland; treeless floodplains, rice fields, airfields, ploughed fields and cultivation, where it nests in dry season. Black-chinned birds generally in wetter grasslands than white-chinned birds. Lowlands and hills; at 1500–2700 m in Ethiopia.

Food and Feeding. Small grass seeds, taken on ground; also filamentous algae, taken from water surface (fish-farm ponds in Nigeria); also small insects and spiders (Araneae). Forages alone, in pairs, and in groups of up to 20 individuals.

Breeding. Season Sept–Dec in Senegal and Gambia, Sept–Dec and Feb in Nigeria, Jan–Feb in Cameroon, mainly Jan–Apr in Kenya, Jan–May (white-chinned form) and Feb–Apr (black-chinned form) in Zambia, mainly Jan–Apr in Zimbabwe, and Jan–May in N South Africa. In courtship, male runs on ground, head and front of body held high, in front of female, paces to one side and then to other, in half-circles or behind her, and flutters wings; when she responds and quivers tail, the two copulate; male also has nest display, holds nesting material crossways in bill, body erect (as in courtship run), gives soft song, shows material to female, turns and runs to nest-site, and begins to build. Nest a hollow ball with low side entrance, on ground next to clump of grass or in hollow, built of grass stems and blades and rootlets, lined with finer grasses and seedheads. Clutch 4–6 eggs; incubation period 14 days; nestling (nominate race and *muelleri*) has pink skin and grey down, gape with rounded pale blue papillae, two on each side of upper mandible and one on lower, each separated by black at base, corner of gape a grey swollen pad (blue papillae and black areas form bold checkerboard pattern on closed mouth), palate pinkish-white to yellowish-white with ring of six black spots (formed by two spots in centre of palate, a lateral spot on each side of it, and two smaller mediolateral spots), race *fuscata* ("*gabonensis* group") also has three greenish-blue papillae on each side of gape and a yellowish palate with six black spots; begging chick twists neck down and directs roof of mouth upwards, often raises wing on side away from adult, on both sides if adult in front; nestling period 19–21 days; young independent at 30 days. Brood-parasitized by Quailfinch Indigobird (*Vidua nigeriae*) in W Africa.

Movements. Resident, with some short-distance movement. Seasonal on floodplains and grasslands; in dry season appears in areas where not known to breed.

Status and Conservation. Not globally threatened. Locally common or very common to uncommon; rare in Mauritania. Population in S Mozambique estimated to number a minimum of 50,000 individuals.

Bibliography. Barlow *et al.* (1997), Carswell *et al.* (2005), Chapin (1954), Chappuis (2000), Dowsett *et al.* (2008), Fry & Keith (2004), Goodwin (1982), Günther & Feiler (1986), Güttinger (1970), Hockey *et al.* (2005), Kunkel (1966a), McCarthy (2006), Nuttall (1992, 1993), Payne (2005a), Payne & Payne (1994), Payne & Sorenson (2007), Penry (1986), Redman *et al.* (2009), Schifter (1963), Sclater & Mackworth-Praed (1918), van Someren (1956), Steyn (1996), Stjernstedt (1993), Traylor (1963b), White (1963).

Genus *AMADINA* Swainson, 1827

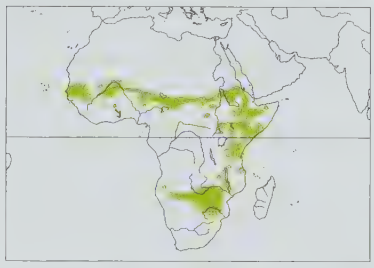
6. Cut-throat Finch

Amadina fasciata

French: Amadine cou-coupé **German**: Bandamadine **Spanish**: Estrilda Degollada
Other common names: Cut-throat, Cut-throat Weaver

Taxonomy. *Loxia fasciata* J. F. Gmelin, 1789, no locality = Senegal.
Genus has been considered closer to *Lonchura* than to estrildine genera, as it has a thick bill; both behaviour and the molecular phylogeny, however, support a relationship with estrildine waxbills, rather than with lonchurine munias. This species sometimes thought to form a superspecies with *A. erythrocephala*. Four subspecies recognized.

Subspecies and Distribution.
A. f. fasciata (J. F. Gmelin, 1789) – S Mauritania, Senegal, Gambia, N Guinea, C & S Mali, N Burkina Faso, N Ghana, S Niger and N Nigeria E to Sudan and Uganda.
A. f. alexanderi Neumann, 1908 – Eritrea, Ethiopia, Somalia, Kenya and Tanzania.
A. f. meridionalis Neunzig, 1910 – S Angola, N Namibia, S & E Zambia, N & E Botswana, W Zimbabwe, Malawi and N Mozambique.
A. f. contigua Clancey, 1970 – S Zimbabwe, S Mozambique and N South Africa.



Descriptive notes. 11–12 cm; 15–32 g (Chad). Male nominate race, is sandy brown with black bars above, upperwing brown with buff and black spots and bars, tail brown, outermost rectrices with white spots at tip and white outer fringe; head light buff-brown, lores broadly pale grey; red band from ear-coverts to throat, bordered above by white band from below eye to chin, bordered below by narrow white band; breast buff, central belly chestnut, lower breast and flank feathers buff with black edges (scalloped pattern), undertail-coverts buff; iris dark brown, eyering blue-grey; bill stout, creamy horn; legs pale pink. Female is duller than male, has most of plumage sandy-coloured, with fine barring on head and upperparts; lacks red throat patch and chestnut belly patch. Juvenile male is warm buff, with red band from ear to throat (red feathers with black tips), upperparts and underparts more buff and less distinctly marked than on adult, upper belly pale chestnut; juvenile female less distinctly marked on upperparts and underparts, few dark marks on face and throat. Geographical variation limited, and somewhat obscured by individual variation; race *alexanderi* is greyer and more broadly barred dark above than nominate; *meridionalis* has head and face grey or pale whitish, not brownish; *contigua* has blackish marbling on feathers more pronounced, smaller than previous, male upperparts more reddish, almost no white on lower throat, breast and flanks ochraceous, female underparts more ochraceous buff. Voice. Contact calls are chirps, nesting pairs call "kee-air", flight call a thin "eee-eee-eee". Song a quiet, low-pitched buzzing with low-pitched irregular bubbling warbles, often repeated without a break. Female often sings when juvenile, rarely so after having mated, and song then variable (unlike male song, which standardized).

Habitat. Semi-arid open grassy woodland, dry bush, acacia (*Acacia*) savanna, mopane (*Colophospermum mopane*) woodland, *Hyphaene* palm savanna, and scrub at edges of cultivation and villages; usually below 1500 m.

Food and Feeding. Grass seeds, taken on ground; also termites (Isoptera) and some other insects. Forages in small groups and flocks, also sometimes in pairs; in non-breeding season in mixed flocks with other estrildids and with weavers (Ploceidae).

Breeding. Season Aug and Dec–Mar in Senegal, Jan in Nigeria, Apr, May, Nov and Dec in Ethiopia, Dec and Mar–Apr (at end of long rains, when weaver nests available) in Kenya, Mar, May and Jun in Zambia, in all months (mainly Apr–May) in Zimbabwe, and Dec–May in South Africa. Male perches upright, raises head and body, fluffs red throat and scalloped belly plumage in frontal display to female; faces her, sings, turns head and body side to side, and bobs up and down as he stretches and bends legs. Nest an untidy ball, with side entrance and sometimes tunnel, made from dry grass stems and twigs, lined with feathers, placed in a shrub or tree, or sometimes in tree hole; more often, takes over old nest or undefended nest of other bird, especially colonial weaver (*Ploceus*) or bishop (*Euplectes*), and adds feather lining; nesting pair tolerates other pairs nearby. Clutch usually 5 eggs (occasional larger clutches of up to 9 the product of more than one female); incubation period 12–13 days; nestling skin dark greyish, long pale grey down on head and back, gape-flange swollen and white, the white continuous on inner surface (no black streaks), flange becoming blackish-blue with age, palate white and continuous with white of gape swellings, five large black spots recessed into white palate, palate yellow anterior to spots and shaded reddish-black behind last spots, lower mouth black, tongue pink with broad black band; nestling period 21–27 days; young fed by parents for a further 21 days, first sing at 46 days.

Movements. Mostly resident, with some wandering. In drier areas of W Africa seasonally migratory, a dry-season visitor in Gambia and N Nigeria; passage observed in spring and autumn in Chad and NE Nigeria. Nomadic and locally unpredictable in Zimbabwe; individuals recovered 30–285 km from ringing locality.

Status and Conservation. Not globally threatened. Common to locally common; rare in SW part of range (Angola, Namibia). Estimated population in S Mozambique at least 5000 individuals. Numbers increasing in S Zambia, perhaps owing to long-term drying conditions. Among the most popular species in captivity throughout the world.

Bibliography. Ash & Atkins (2009), Beckham (2009), Brickell & Wright (1992), Chapin (1917), Clancey (1970c), Clement *et al.* (1993), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Güttinger (1976), Harrison (1962a), Harrison *et al.* (1997), Hochmal (2008a), Hockey *et al.* (2005), Immelmann *et al.* (1965), Kunkel (1959), Markus (1970), McCarthy (2006), Morel & Morel (1990), Morris (1954, 1958), Nicolai *et al.* (2007), Payne (2005a), Redman *et al.* (2009).

7. Red-headed Finch

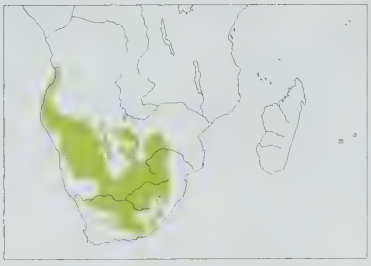
Amadina erythrocephala

French: Amadine à tête rouge **German**: Rotkopfamadine **Spanish**: Estrilda Cabecirroja
Other common names: Paradise Sparrow

Taxonomy. *Loxia eryocephala* [sic] Linnaeus, 1758, Africa = Angola.
Genus has been considered closer to *Lonchura* than to estrildine genera, as it has a thick bill; both behaviour and the molecular phylogeny, however, support a relationship with estrildine waxbills, rather than with lonchurine munias. This species is sometimes thought to form a superspecies with *A. fasciata*. Slightly darker birds from Bergville (W KwaZulu-Natal), in NE South Africa, described as race *dissita*, but appear inadequately differentiated from birds in rest of species' range to warrant recognition. Monotypic.

Distribution. SW Angola (S from SW Bengo), Namibia, Botswana, S Zimbabwe, South Africa and lowland Lesotho.

Descriptive notes. 12–13 cm; 17·5–30 g. Male has head to nape, cheek and throat red, broad pale grey area on lores; hindneck and mantle unmarked grey, rest of upperparts greyish-brown, rump and uppertail-coverts with fine black subterminal bars and buff tips; tail slightly graduated, dark brown, outer feathers tipped white and with white outer fringe; upperwing light grey with buff and black spots and bars; below, whitish-buff to brown along sides, chestnut patch on upper belly, feathers with white centre and black tip (producing barred and scalloped pattern), undertail-coverts whitish; iris dark brown, eyering pale grey; bill stout, light horn-colour, tinged pink in breeding season; legs pale pink. Female is duller than male, has head unmarked greyish-brown but often with some rusty orange tips, upperparts browner, underparts buff, upper belly lacks chestnut patch, pattern less boldly barred and scalloped. Juvenile is paler, less boldly marked below, male head



greyish-brown or sometimes rusty orange, female head pale greyish-brown. Voice. Call "shep", similar to that of a sparrow (*Passer*), also "zree-zree" in flight; alarm a sharp "tek". Male song is a repeated pattern of soft churring or buzzing notes.

Habitat. Densely wooded thornbush in breeding season; at other seasons in more open semi-desert grassland in acacia (*Acacia*) thorn and bush savanna, *Terminalia* and mopane (*Colophospermum mopane*), borrow pits, and borders of cultivated fields, including in small towns.

Food and Feeding. Grass seeds and insects, including termites (Isoptera). Gregarious, foraging in small groups; flocks of hundreds appear at water-holes during droughts.

Breeding. Breeds in all months (mainly Feb–Jul) in Botswana, and in South Africa Feb–Sept in NW and Jan–Oct (mainly Apr–May) in N. Male perches upright, raises head and body, and fluffs throat and belly plumage in frontal display to female. Nest globular, with side entrance, built with grass and straw, lined with feathers and plant down, placed in cavity or in tree; also uses old nest of other bird, mainly sparrows, *Ploceus* weavers and Sociable Weaver (*Philetairus socius*), sometimes two or three pairs in neighbouring nests in tree, or takes over active nest of other species e.g. Chestnut Weaver (*Ploceus rubiginosus*), or nests in hole in building, adding soft lining material. Clutch 4–6 eggs; incubation period 14 days; nestling skin purplish-black with long, dense grey to white down on head and back, swollen white gape-flange, the white continuous on inner surface (no black streaks), palate white (contiguous with gape) with five large black spots, palate yellow in front of spots and reddish-black behind, lower mouth black, tongue pink with broad black band (mouth like that of *A. fasciata*); nestling period 20 days.

Movements. Seasonal in occurrence in most areas; also irregular and unpredictable nomadic movements, including irruptive movements. Vagrant in Mozambique.

Status and Conservation. Not globally threatened. Considered locally common in most of range. Locally common to abundant in SW Angola, and locally common in NC Namibia and NE & SE Botswana; uncommon in Zimbabwe. In South Africa, commonest in North West Province and N Free State.

Bibliography. Archibald (1987), Ash & Atkins (2009), Beckham (2009), Brickell (1986), Fry & Keith (2004), Goodwin (1982), Harrison *et al.* (1997), Hockey *et al.* (2005), Hoesch & Niethammer (1940), Immelmann & Immelmann (1967), Immelmann *et al.* (1977), Markus (1970), McCarthy (2006), Nicolai *et al.* (2007), Oppenborn (1998a), Payne (2005a).

PLATE 15 ➤


inches 2
cm 5
PLATE 15
8
9
10
ssp fusconotus
ssp uropygialis
11
ssp bicolor
12
ssp saturatior
ssp alexanderi
ssp luteifrons
13
ssp candidus
14
ssp emiliae
ssp canicapillus
15
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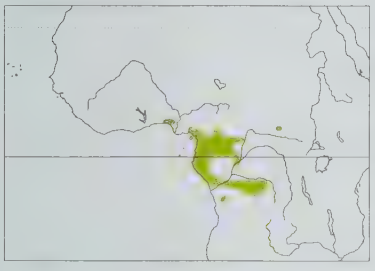
Genus *PARMOPTILA* Cassin, 1859

8. Woodhouse's Antpecker

Parmoptila woodhousei

French: Parmoptile à gorge rousse **Spanish**: Estrilda Piquifina de Woodhouse
German: Woodhouse-Ameisenpicker
Other common names: Flowerpecker Finch, Flowerpecker Weaver/Weaver-finch

Taxonomy. *Parmoptila Woodhousei* Cassin, 1859, Camma River, Gabon.
Thought to form a superspecies with *P. rubrifrons* and *P. jamesoni*, and sometimes treated as conspecific; occurs close to latter in Central African Republic (R Ouissi) and in DRCongo (Ituri), but the two not known to be locally sympatric. Two subspecies recognized.
Subspecies and Distribution.
P. w. woodhousei Cassin, 1859 – S Nigeria, S Cameroon and Gabon E to S Central African Republic, PRCongo and W DRCongo.
P. w. ansorgei E. J. O. Hartert, 1904 – N Angola.



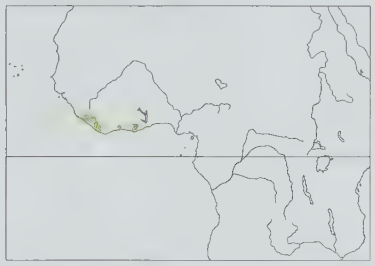
Descriptive notes. 11 cm; c. 9·4 g. Male nominate race has forehead rufous with brighter red bars, crown and upperparts brown, mottled dark brown and with buff shaft streaks, upperwing and tail brown; face and throat unmarked rufous, underparts whitish with scaly brown pattern, undertail-coverts with broken brown bars; iris reddish-brown; bill slender, slightly decurved at tip, black; legs light brown. Female similar, but forehead brown (like crown), feathers lacking reddish tips. Juvenile more uniformly brown above with few pale shaft streaks, pale brown below, flanks indistinctly barred darker brown. Race *ansorgei* slightly paler. Voice. Call or song a long, shrill, high-pitched "tcseeep"; high-pitched whistle, pitch descending from 5·2 kHz to 3·8 kHz and with strong harmonic band, 0·4 seconds in duration, repeated at intervals of 1 second.
Habitat. Primary and secondary lowland forest, gallery forest, coffee forest, manioc (*Manihot esculenta*) plantations, edges of clearings.
Food and Feeding. Arboreal ants (Formicidae), also other small insects, including small caterpillars; also fruits, e.g. *Xylopia aethiopica*. In captivity, takes up to 30 ants per minute. Forages mostly within 3–12 m of ground, sometimes lower. Ants taken from forest canopy and near ground. Forages among leaves in manner of Old World warbler (Sylviidae); feeds at papier-mâché nests of ants, inspects dry leaves, opens green leaves stuck together with insect silk. In pairs and small groups; joins mixed-species flocks.
Breeding. Breeds in all months in Gabon; nest with eggs in Apr, in Cameroon. Courtship behaviour not described. Nest a large, bulky domed structure, large side entrance with roof over opening, made from mass of leaves and bits of bark, decorated on outside with green moss, lined with fine fibres, placed in horizontal fork c. 1·4–4·5 m up in tree. Clutch 3–4 eggs; no information on incubation period, but one nest in Cameroon observed with eggs for 12 days, when hatching took place; nestling has three large whitish lobes on gape (two on upper mandible, one on lower mandible) and a smaller lobe at base of lower mandible, the black base of the balls extends between them to inside mouth, yellow palate with three large spots and two smaller ones behind them, tongue unmarked; no information on nestling period.
Movements. Resident.
Status and Conservation. Not globally threatened. Generally uncommon to rare. Rare in Nigeria; widespread but infrequent to rare in Cameroon forest zone; evidently uncommon in Central African Republic; widespread and locally common to uncommon in Gabon; local and fairly common to uncommon in PRCongo; uncommon and very local in DRCongo; rare in Angola. In Gabon, densities of 4–5 pairs/km² on M'Passa Plateau and 7–8 pairs/km² on islands in R Ivindo. Occurs in several protected areas, e.g. frequent to common in Korup National Park, in Cameroon; quite common in Lopé National Park, in Gabon; and fairly widespread in Odzala National Park and local in Dzanga-Ndoki and Nouabalé-Ndoki National Parks, in PRCongo.
Bibliography. Bates (1909, 1930), Brosset & Érard (1986), Chapin (1954), Chappuis (2000), Christy & Clarke (1994), Clement *et al.* (1993), Dean (2000), Dowsett-Lemaire & Dowsett (1991), Friedmann (1978), Friedmann & Williams (1971), Fry & Keith (2004), Goodwin (1982), Günther & Feiler (1986), Mitsch (1973), Sammler (2010), Sharpe (1874, 1885), Woodcock (2003).

9. Red-fronted Antpecker

Parmoptila rubrifrons

French: Parmoptile à front rouge **Spanish**: Estrilda Piquifina Frentirroja
German: Rotstirn-Ameisenpicker
Other common names: (Red-fronted) Flowerpecker Weaver-finch, Red-faced Flower-pecker

Taxonomy. *Pholidornis rubrifrons* Sharpe and Ussher, 1872, Denkera, Ghana.
Thought to form a superspecies with *P. woodhousei* and *P. jamesoni*; sometimes treated as conspecific with latter or, less often, with both. Monotypic.
Distribution. Sierra Leone, SE Guinea, Liberia, S Ivory Coast and S Ghana.
Descriptive notes. 11 cm; 8–10·5 g. Male has forehead and forecrown red, hindcrown olive with pale grey scaly markings, upperparts dark greyish-tinged olive-brown, upperwing and tail brown; face olive to deep brown with blackish markings and small white streaks, chin buffy, grading to unmarked rufous-chestnut on throat and entire underparts; iris reddish-brown; bill black; legs light brown. Female is unmarked dark grey-brown above, face dark grey with fine white spots, throat and underparts buffy white with small black spots, spots forming irregular bars on flanks. Juvenile has crown and upperparts like adult female, underparts uniformly rufous-brown. Voice. Call "pee-you".
Habitat. Mature and secondary forest, also logged forest, not far from water or at border of high-forest swamps; preference for primary forest. Sometimes in forest above swamp or inundated ground.



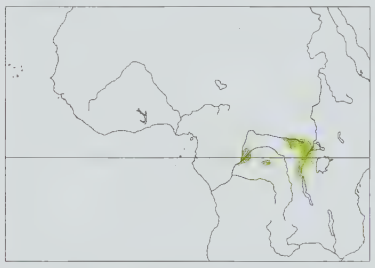
Food and Feeding. Insects, especially red ants (Formicidae), also small beetles (Coleoptera) reported; some small seeds. Forages mostly at lower levels, generally below 5 m. Feeds at ant nest for as long as a minute; gleans insects on stems. Forages in pairs and family parties; often in mixed-species flocks.
Breeding. Several nests in Oct–Nov, female with oviduct egg in Apr and birds in breeding condition in Sept and Jan–Apr, and juveniles in Ivory Coast in Dec, Jan and Jun. Nest a large mass (17–25 × 25–40 cm) of vegetation, placed 2·5–3·5 m above swamp or inundated ground in understorey tree; one built solely by male, work taking c. 8 days. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Scarce or rare to locally fairly common; one record also from extreme SW Mali. Possibly often overlooked owing to unobtrusive habits, but mist-netting data indicate genuine scarcity. This species' range is already fragmented, and population probably in moderately rapid decline because of continuing deforestation and logging. Occurs in several protected areas, including Gola Forest, in Sierra Leone, Taï Forest National Park, in Ivory Coast, and Kakum and Ankasa National Parks and Subri River and Tano Offin Forest Reserves, in Ghana.
Bibliography. Anon. (2008g, 2009j), Balchin (1988), Clement *et al.* (1993), Colston & Curry-Lindahl (1986), Demey & Fishpool (1991), Dickerman *et al.* (1994), Eyre (2004), Fry & Keith (2004), Gatter (1997), Grimes (1987), Karr (1976), Woodcock (2003).

10. Jameson's Antpecker

Parmoptila jamesoni

French: Parmoptile de Jameson **Spanish**: Estrilda Piquifina de Jameson
German: Kongoameisenpicker

Taxonomy. *Pholidornis jamesoni* Shelley, 1890, Yambuya, Aruwimi River, DRCongo.
Thought to form a superspecies with *P. woodhousei* and *P. rubrifrons*, and sometimes treated as conspecific with latter or, less often, with both. N part of range closely approaches that of *P. woodhousei*, but the two not known to be locally sympatric. Monotypic.
Distribution. W, NC & NE DRCongo, W Uganda (Albertine Rift) and extreme NW Tanzania (Minziro Forest).



Descriptive notes. 11 cm; one male 9·5 g. Male has forehead red, face unmarked bright rufous, crown and upperparts dark greyish olive-brown, upperwing and tail brown; underparts uniformly rufous-chestnut; iris brownish-red; bill black; legs light brown. Female is greyish olive-brown above, unmarked rufous from ear-coverts to chin and throat; breast to undertail-coverts olive to light buff, feathers edged brown to olive-brown (scaly pattern). Juvenile has crown and upperparts like adult female, face brown (rather than rufous), throat and underparts uniformly warm brown. Voice. Few details; "whseet" call recorded.
Habitat. Moist forest along rivers, logged forest, border of forest swamps, gallery forest, scrub along forest edge; in Uganda between 700 m and 1800 m.
Food and Feeding. Small insects, e.g. ants (Formicidae) and small beetles (Coleoptera), including larvae and pupae; also small seeds. Of stomachs of nine specimens from DRCongo, five contained only ants (adults, larvae, pupae) and the remaining four various small insects. Forages both near ground and in canopy, moving along branches; examines green foliage and hanging brown (dead) leaves, pokes head into flowers and behind peeling bark; feeds at ant nests. Forages in pairs and family groups; often in mixed-species flocks.
Breeding. Few data. In DRCongo, birds in breeding condition in Feb, May and Sept in Ituri, and in Itombwe breeding Oct–May and juveniles observed Feb, May, Jun and Nov. Recently fledged young had gape black with three yellowish balls (lobes or wattles), interior of mouth pale yellow, with five black spots on palate and black crescent under tongue. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Fairly common. Frequent to common in DRCongo, where main populations in NE from Ituri and Itombwe S to Kivu; common at 880–1600 m in Itombwe. Uncommon in Uganda, where restricted to W forests: Kibale Forest and Bwindi-Impenetrable Forest National Parks, as well as Bwamba Forest (within Semliki National Park) and Budongo and Kalinzu Forest Reserves. Uncommon in Tanzania, where recorded only in Minziro Forest Reserve.
Bibliography. Carswell *et al.* (2005), Chapin (1917, 1954), Clement *et al.* (1993), Eyre (2004), Fry & Keith (2004), Goodwin (1982), Short *et al.* (1990), Woodcock (2003).

Genus *NIGRITA* Strickland, 1843

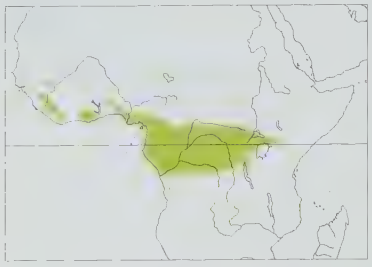
11. White-breasted Negrofinch

Nigrita fusconotus

French: Nigrette à ventre blanc **German**: Mantelschwärzling **Spanish**: Negrita Pechiblanca
Other common names: Negrofinch, White-breasted Nigrita/Blackfinch

On following pages: 12. Chestnut-breasted Negrofinch (*Nigrita bicolor*); 13. Pale-fronted Negrofinch (*Nigrita luteifrons*); 14. Grey-headed Negrofinch (*Nigrita canicapillus*); 15. Angola Swee (*Coccopygia bocagei*); 16. Yellow-bellied Swee (*Coccopygia quartinia*); 17. Swee Waxbill (*Coccopygia melanotis*).

Taxonomy. *Nigrita fusconotus* Fraser, 1843, Clarence, Bioko.
Two subspecies recognized.
Subspecies and Distribution.
N. f. uropygialis Sharpe, 1869 – Guinea-Bissau, extreme SW Mali, SE Guinea, Sierra Leone, Liberia, Ivory Coast, Ghana, Benin and SW Nigeria.
N. f. fusconotus Fraser, 1843 – SE Nigeria, Bioko I (Fernando Póo), S Cameroon and extreme SW Central African Republic E to Uganda and W Kenya, S to Gabon, PRCongo, N Angola, SW & SC DRCongo, Rwanda and Burundi.



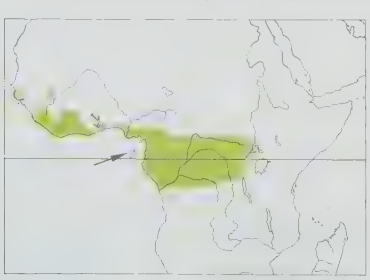
Descriptive notes. 10–11·5 cm; 7–11 g (nominate). Nominate race has top and side of head glossy black, upperparts brown, rump, uppertail-coverts and tail black, flight-feathers black; chin and throat white, breast to undertail-coverts whitish; iris dark brown to dark red, eyering pale blue to grey; bill black; legs dark grey. Sexes similar. Juvenile is like adult but duller, head browner and unglossed, rump and tail dark brown (not black), underparts tinged grey. Race *uropygialis* differs slightly in upperpart coloration and has rump contrastingly whitish-buff. Voice. Song given from tops of trees, in Ivory Coast and Ghana (race *uropygialis*) slow, sweet whistles, long and slurred, variations on "weee-hyooo-hyooo" theme: sometimes with brief introductory notes. Nominate race has different song, a high-pitched descending trill which decelerates, notes progressively longer and more widely spaced near end, "tsrrrrrrrrrrrr-ee-tee-tee-tee-tay-taytay-too-too", final notes sometimes double; in Gabon a series of rising whistles, "sui-suit-suit-suit-suit-suit-suit", accelerating into trill and then slowing.
Habitat. Lowland and intermediate primary and secondary forest, forest edges and clearings, palms, cocoa plantations; moss forest in Bioko. Lowlands and hills; in Uganda between 700 m and 1800 m.
Food and Feeding. Insects, including heteropteran bugs, caterpillars; also fruits, including figs (*Ficus*), euphorbs (of genus *Macaranga*), and the oil, fruit pulp and oily fibrous husks of oil palm (*Elaeis guineensis*) fruits; some seeds and nectar also taken. In primary forest usually in canopy above 30 m. Gleans insects from small twigs, and forages in flowers and buds of canopy trees. Usually in pairs or family groups; often with *N. canicapillus* in canopy, and joins mixed-species flocks.
Breeding. Season mainly Jan–Apr in W Africa, Nov in Bioko, in breeding condition in Jun in Cameroon; Jan, Jun–Sept and Nov in DRCongo, and birds in breeding condition Mar and Aug–Sept in Angola; nest found in Jul and birds in breeding condition Apr–May and Nov–Dec in Uganda, and nesting in Sept in Kenya. Nest a hollow structure with side entrance, built with variety of materials, fine fibres of dry leaf stalks, dry grass leaves, thin twigs, bits of torn and shredded bark and a little moss, placed 6–10 m above ground in angle of palm fronds or near end of thin leafy branch. Clutch 3–6 eggs. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally fairly common to uncommon. Rather uncommon in W Africa; widespread and common in PRCongo and Gabon; locally common in N Angola; uncommon to locally very common in DRCongo; fairly common in E Africa. In Kenya an old record from Mt Elgon, but all recent records from Kakamega Forest, where it is reasonably common. Densities of 2–4 males/km² in Liberia and average of 3–4 pairs/km² in Gabon. Occurs in many protected areas.
Bibliography. Bannerman (1949), Bates (1911, 1930), Brosset & Érard (1986), Carswell *et al.* (2005), Chappuis (2000), Christy & Clarke (1994), David & Gosselin (2002b), Dean (2000), Dean *et al.* (1988), Dodman *et al.* (2004), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Short *et al.* (1990).

12. Chestnut-breasted Negrofinch

Nigrita bicolor

French: Nigrette à ventre roux **German**: Zweifarbenschwärzling **Spanish**: Negrita Pechirrufa
Other common names: Cinnamon-breasted Negrofinch, Chestnut-breasted Nigrita

Taxonomy. *Pytelia bicolor* Hartlaub, 1844, Ghana.
Poorly differentiated race *saturatior* sometimes synonymized with *brunnescens*. Three subspecies recognized.
Subspecies and Distribution.
N. b. bicolor (Hartlaub, 1844) – W Gambia, SW Senegal (Casamance), Guinea-Bissau, Guinea, SW Mali, E Sierra Leone and Liberia E to Togo.
N. b. brunnescens Reichenow, 1902 – S Nigeria, Príncipe I, C & S Cameroon and S Central African Republic S to N Angola and DRCongo (from lower R Congo E to Upper Uele, C Ituri, Kasai and Manyema).
N. b. saturatior Reichenow, 1902 – Albertine Rift in NE DRCongo and Uganda.



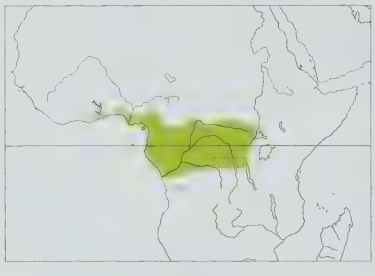
Descriptive notes. 11–12 cm; 8·6–11·7 g (nominate). Male nominate race has hindcrown and upperparts, including upperwing and tail, dark slaty grey, forehead, side of head, throat and underparts dark reddish-chestnut; iris red to reddish brown, orbital ring greyish; short deep-based bill black; legs dark grey-brown. Female is like male, but underparts a little paler chestnut. Juvenile is grey-brown above, cheek and throat buffy grey, underparts cinnamon buff, brightest on undertail-coverts. Race *brunnescens* is duller than nominate, upperparts slaty brown; *saturatior* is very like previous, but underparts darker and more richly coloured. Voice. Song a wide variety of loud mellow musical whistles, sometimes with chattering notes; in Liberia, dialectal difference between songs on coast and those in interior. Transcriptions of call include ringing "chi-chi-hooeee" and onomatopoeic "kitty come here".
Habitat. Primary and secondary guinean forest, gardens, open woodland, savanna; uncommon in coffee forest. Lowlands and hills; in Uganda occurs between 700 m and 1800 m.
Food and Feeding. Insects, including caterpillars and winged termites (Isoptera); oily husks and fruit pulp of oil palm (*Elaeis guineensis*), and figs (*Ficus*); also seeds and nectar, and egg masses of tree frogs. In lowland forest forages near ground, along creeks, also in canopy. Gleans twigs and flowers for insects and nectar, takes seeds from ground; tears open egg masses of tree frogs and consumes eggs. Forages singly or in pairs or small groups; often with *N. canicapillus* in canopy, and joins mixed-species flocks. In dry season, individuals concentrate around oil palm fruits, where they maintain distance and rank in access to fruit clusters.
Breeding. Season Jul–Aug in Sierra Leone; young seen in most months in Liberia, nest-building Feb–Apr in Ghana, breeds Mar–Jul in Cameroon, a nest in Dec in Gabon; probably breeds all year in DRCongo; Jun–Aug in Uganda. In courtship, male sings in upright posture, moves to and fro, sometimes holds stem in bill, chases partner. Nest a large ball with side entrance, made from dry grass leaves and stems, covered in large leaves, moss and grass stems, lined with grass tops, placed 1–25 m (most records c. 8 m) above ground in tree, often mango (*Mangifera*), often in tree swarming with ants (Formicidae). Clutch 3–4 eggs; incubation period 12–13 days; nestling skin blackish, gape whitish with four small lemon-yellow balls at each side, base of each ball black, palate whitish with five black spots, posterior pair small; nestling period 17–21 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common to uncommon; rare in Gambia. Reports of this species in W Kenya considered unfounded. Density c. 4–5 pairs/km² in Gabon. Occurs in many protected areas throughout range.
Bibliography. Anon. (2008e, 2009h), Bannerman (1949), Barlow *et al.* (1997), Bates (1911, 1930), Brosset & Érard (1986), Chapin (1917, 1954), Cheke & Walsh (1996), Christy & Clarke (1994), Dean (2000), Dean *et al.* (1988), Dodman *et al.* (2004), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Grimes (1987), Kleefisch (1990), McCarthy (2006), Nicolai *et al.* (2007), Sammler (2010), Short *et al.* (1990).

13. Pale-fronted Negrofinch

Nigrita luteifrons

French: Nigrette à front jaune **German**: Blassstirnschwärzling **Spanish**: Negrita Frentigualda
Other common names: Pale-fronted Nigrita

Taxonomy. *Nigrita luteifrons* J. Verreaux and É. Verreaux, 1851, Gabon.
Two subspecies recognized.
Subspecies and Distribution.
N. l. luteifrons J. Verreaux & É. Verreaux, 1851 – E Sierra Leone, NE Liberia, SW Ivory Coast, S Ghana, S Togo, S Nigeria and S Cameroon S to Gabon, PRCongo and NW Angola, E to S Central African Republic, N DRCongo and W Uganda (Semliki Forest).
N. l. alexanderi Ogilvie-Grant, 1907 – Bioko I (Fernando Póo).



Descriptive notes. 11·5 cm; 12–14·5 g. Male nominate race has forehead whitish, tinged pale buff, crown to back grey, rump paler grey, tail black, upperwing black; face (from lores and just over eye) to side of neck black, throat and underparts black; iris red, eyering grey; bill short and stubby, black; legs flesh-coloured to grey-brown. Female has lores and area around eye slaty black, rest of face and underparts entirely grey; iris yellowish to greyish-white. Juvenile is uniformly grey on face and upperparts, wings slightly darker, brownish-grey below, iris pale. Race *alexanderi* differs from nominate in having forehead, crown and nape yellowish, iris black. Voice. Distance contact call a series of 4 descending whistles, "fue-fee-fee-fee"; close contact call a faint "choo"; song a simple whistled phrase on descending scale, "whee-hee-hee-hay-hay-chooooooo".
Habitat. Forest clearings and forest edge, secondary forest, lowland thickets at edge of forest, and plantations of cocoa, palm and coffee.
Food and Feeding. Small insects, especially scale insects (Coccoidea); fruits of oil palm (*Elaeis guineensis*), figs (*Ficus*); some seeds. Forages mostly in canopy, also at lower levels. Mainly a foliage-searcher; also hawks flying insects in manner of Old World flycatcher (Muscicapidae); also visits flowers. Forages singly, in pairs and in family parties; joins mixed-species flocks.
Breeding. Season Oct in Bioko, May–Jun in Cameroon, Mar–Apr in Gabon, May and Jul in PRCongo, and Mar, Jun and Nov in NE DRCongo (Itombwe). Nest a large ball with side entrance, made from grass, or from dry green moss and a few grass stems, lined with seeding grass-heads, placed 2–5 m above ground in tree or bush. Clutch 4 eggs; nestling gape margin has four white balls (one at gape angle, two above it and one below), palate has five black spots, tongue has two spots. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Generally uncommon to locally common; rare in NW of range (Sierra Leone E to Togo). Occurs in numerous protected areas throughout range.
Bibliography. Bannerman (1949), Bates (1911, 1930), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1954), Dean (2000), Dowsett-Lemaire & Dowsett (2007), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Grimes (1987), Nicolai *et al.* (2007), Rand *et al.* (1959), Serle (1965).

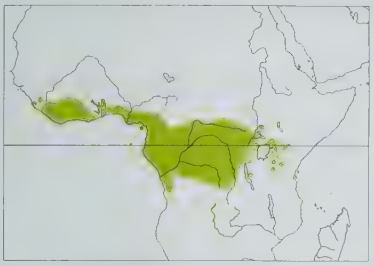
14. Grey-headed Negrofinch

Nigrita canicapillus

French: Nigrette à calotte grise **German**: Graunackenschwärzling **Spanish**: Negrita Canosa
Other common names: Grey-headed Nigrita, Grey-crowned Negrofinch/Blackfinch; Western Negrofinch (*emilae*); Kungwe Negrofinch (*candidus*)

Taxonomy. *Aethiops canicapillus* Strickland, 1841, Bioko.
Races *emiliae* and *candidus* may represent two separate species. Nominate race intergrades with *schistaceus* in NE DRCongo. Proposed race *sparsimguttatus*, described from extreme NW Tanzania (Bukoba, on W L Victoria), treated as synonym of *schistaceus*. Six subspecies recognized.
Subspecies and Distribution.
N. c. emiliae Sharpe, 1869 – Sierra Leone E to Togo.
N. c. canicapillus (Strickland, 1841) – S Benin, S Nigeria and W & S Cameroon S, including Bioko I (Fernando Póo), to Gabon and PRCongo, E to N & C DRCongo.
N. c. schistaceus Sharpe, 1891 – S Sudan, E DRCongo, Uganda, Burundi, W Kenya and N Tanzania.
N. c. angolensis Bannerman, 1921 – NW Angola and S DRCongo.

N. c. diabolicus (Reichenow & Neumann, 1895) – montane C & SE Kenya S to N Tanzania (Crater Highlands, Mt Kilimanjaro).
N. c. candidus Moreau, 1942 – Mt Kungwe, in W Tanzania.



Descriptive notes. 13–14 cm; 17–21 g. Nominate race has forehead and side of head black, bordered white above, crown to back grey, rump and uppertail-coverts pale grey, tail black; upperwing black, each wing-covert with a rounded white spot at tip, white on tips of tertials; face, throat and entire underparts black; iris cream to orange-red, eyering grey; bill black; legs dark grey. Sexes similar. Juvenile is dark grey, wings and tail blackish, indistinct white spots on wing-coverts and tertials, iris pale grey. Race *angolensis* has crown to back darker grey than nominate, rump greyish-white with darker grey barring; *schistaceus* has darker grey upperparts, fewer spots on wing-coverts; *diabolicus* is sooty grey on upperparts, including rump, underparts dull grey; *candidus* has crown and nape wholly whitish, rump whitish, wing-coverts and tertials with smaller white spots; *emiliae* is smaller than nominate, lacks white on crown and side of nape, has very fine grey tips on wing-coverts and tertials. Voice. Clear plaintive 3-note whistle, "hooeee, hoooeeee, hoo", sometimes introduced with a soft bubble and harsh chatter, given in all seasons.
Habitat. Forest edge, clearings, roads and streams in primary guinean forest, gallery forest, also palm, cocoa and coffee plantations. Coastal forests to inland mountains, up to 1600 m; in Uganda to 2100 m, and in highlands of Kenya 1700–3500 m.
Food and Feeding. Small insects, including ants (Formicidae), termites (Isoptera) and insect larvae; also fruits, seeds, occasionally nectar. Nestlings fed with small fruits and ant pupae. Forages from 25 m into canopy of largest emergent trees, also at lower levels; feeds on oil palm (*Elaeis guineensis*) pulp and among *Bombax* flowers and fruits in canopy, and on items or near ground. Gleans insects from surface of small twigs; preys on swarms of termites. Forages singly, also in pairs and family parties; often with *N. bicolor* and *N. fusconotus* in canopy, and in mixed-species flocks.
Breeding. Nest-building in Feb, Mar and Jul–Oct in Liberia; season mainly Sept–Mar in Ivory Coast, and Dec–Feb in Ghana; nest-building in Aug in Togo; breeds in all months (mostly during Apr–Oct rains) in Nigeria, and in Jan–Mar and Jun–Aug in Cameroon; in all months in DRCongo; Dec–Mar in Sudan, and Mar, May–Jul and Oct in Kenya. In courtship, male holds a long plant stem in bill, his tail up, stretches body upwards and turns head and body from side to side, bends head forward and shakes it, stem still in bill. Nest occasionally built by more than two birds together, large, rounded and domed, with wide side entrance, a bulky, loose and untidy mass of grass stems and leaves, grass roots, fibres, moss and leaves, lined with fresh grass-heads and plant down, placed high in tree, sometimes near active wasp (Hymenoptera) nest. Clutch 3–6 eggs; incubation period 12–13 days; nestling has greyish-white down, gape with four yellowish-white papillae on each side (one at angle of gape, two above it, one below), palate with five black spots, black crescent under tongue; no information on duration of nestling period.
Movements. Resident.
Status and Conservation. Not globally threatened. Common and widespread in most of range. Densities of 5–9 pairs/km² in secondary forest and 3–5 pairs/km² in primary forest in Liberia; 5–6 pairs/km² in Gabon.
Bibliography. Bannerman (1949), Bates (1911, 1930), Brosset & Érard (1986), Carswell *et al.* (2005), Chappuis (2000), Cheke & Walsh (1996), David & Gosselin (2002a, 2002b), Dean (2000), Dean *et al.* (1988), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Grimes (1987), Immelmann *et al.* (1965), Kleefisch (1984), Lachenaud (2006), Nicolai *et al.* (2007), Rand *et al.* (1959), Short *et al.* (1990).

Genus *COCCOPYGIA* Reichenbach, 1863

15. Angola Swee

Coccopygia bocagei

French: Astrild de Bocage **German**: Angolagrünastrild **Spanish**: Estrilda de Bocage
Other common names: Angola Waxbill, Swee Waxbill, Bocage's Swee Waxbill

Taxonomy. *Coccopygia bocagei* Shelley, 1903, Huíla, Angola.
Genus often subsumed in *Estrilda*, but not closely related to latter. This species and *C. quartinia* and *C. melanotis* thought to form a superspecies; often treated as conspecific, but differ morphologically and in behaviour. Monotypic.
Distribution. W Angola (SW Malanje S to N Namibe and NW Huíla).



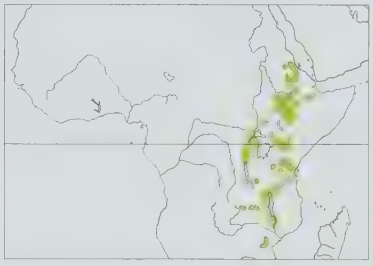
Descriptive notes. 9–10 cm. Male has crown and nape grey, back and upperwing olive-green, crown to back finely barred dark grey, rump and uppertail-coverts red, tail black; face and throat black, white band extending from behind cheek to beneath throat; upper breast grey, lower breast to belly bright yellow, flanks yellowish-grey, barred dark grey, undertail-coverts pale yellow; iris deep red-brown; bill black above, red below; legs black. Female lacks black, has face yellowish-grey, chin and throat white. Juvenile is like female, but greyer, with bill black. Voice. No information.
Habitat. Tall grass and undergrowth at edge of forest and riverine woodland, evergreen woodland and along streams in montane region.
Food and Feeding. Few data. Recorded items small grass seeds. Forages in pairs and small groups.
Breeding. No information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Common. Surprisingly poorly known species.
Bibliography. Clement *et al.* (1993), Dean (2000), Dickinson (2003), Fry & Keith (2004), Goodwin (1982), Immelmann *et al.* (1965), Pajain (1975).

16. Yellow-bellied Swee

Coccopygia quartinia

French: Astrild à ventre jaune **Spanish**: Estrilda Ventrigualda Oriental
German: Gelbbauchastrild
Other common names: Yellow-bellied/Grey-headed Waxbill, East African Swee (Waxbill)

Taxonomy. *E.[strelda] quartinia* Bonaparte, 1850, "Abyssinia".
Genus often subsumed in *Estrilda*, but not closely related to latter. This species and *C. bocagei* and *C. melanotis* thought to form a superspecies; often treated as conspecific, but differ morphologically and in behaviour. Three subspecies recognized.
Subspecies and Distribution.
C. q. quartinia (Bonaparte, 1850) – Eritrea and Ethiopia.
C. q. kilimensis Sharpe, 1890 – SE DRCongo, extreme SE Sudan, Kenya and Uganda S to C Tanzania.
C. q. stuartirwini (Clancey, 1969) – S & E Tanzania, E Zambia, Malawi, E Zimbabwe and S Mozambique (Mt Gorongoza).



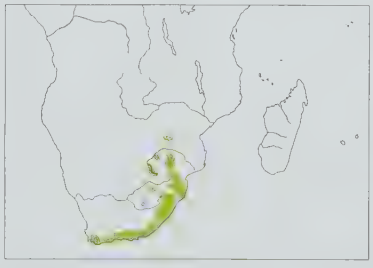
Descriptive notes. 9–10 cm; 6–8 g (*kilimensis*). Male nominate race has head to nape, throat and breast grey, back and upperwing light olive-green, rump and uppertail-coverts bright red, tail black; belly light yellow, flanks grey, undertail-coverts yellow; iris dark crimson to dark brown; bill black above, red below; legs black. Female is like male, but slightly less yellow. Juvenile resembles female, but greyer, with rump reddish-brown, bill black. Race *kilimensis* is similar to nominate, but slightly darker and less green above, darker below, undertail-coverts orange-yellow; *stuartirwini* is like previous, but head and nape paler, more bluish-grey. Voice. Call a soft whistled "see-see" or "swee-swee", also high-pitched sharp "tsweee"; song a soft penetrating "teeeeeeeit" or "tuuuuueeet" or "spui-sit-tu-si-li". Observed variations appear to be related to state of excitement of individual.
Habitat. Shrubby grass, undergrowth, bracken briar or dense grass, scrub on rocky hills, small forest clearings, edge of montane forest. Uplands, in Ethiopia at 900–2700 m; 900–3000 m in Kenya, 900–2500 m (mostly above 1500 m) in Malawi, and 1200–2200 m (but recorded down to 400 m in early Sept) in Zimbabwe; in Zambia, mostly 1620–1800 m in Northern Province, and as low as 1200 m on Muchinga escarpment.
Food and Feeding. Small grass seeds. Active. Clings to grass stems and flowerheads; forages also on ground. Takes small insects in flight. Occurs in flocks in non-breeding season.
Breeding. Season Mar, Jun and Aug–Oct in Ethiopia and Apr, Jul–Aug and Oct in Uganda; in Kenya varies with regional rainfall, in Aug on Mau Narok; Jan in Zambia, Feb–May in Malawi and Dec–Apr in Zimbabwe. Male hops near female, body upright, bill pointed downward, feathers of flanks and lower belly fluffed and other feathers sleeked, tail bent towards female, he mandibulates and gives soft, rapid song; copulation not seen with this behaviour, which perhaps a greeting display. Nest a flimsy, elongate covered structure of coarse grass, with side entrance, lined with fine grass-heads and white plant down, placed 1·2–5 m above ground in dense foliage in shrub or small tree, often in mistletoe (Loranthaceae) clump, sometimes near wasp (Hymenoptera) nest. Clutch 3–6 eggs; incubation 13–14 days; nestling skin dark pink and blackish, long grey down dense on head, back and thighs, gape black with bluish-white swollen arc above, proximal end curved ventrally to end in white ball, lower gape with two balls of white to bluish-white, palate unmarked creamy white distally and bright reddish-pink proximally, tongue, lower mouth and edge of mandible unmarked grey; nestling period 21–22 days. Longest known survival of marked birds 3 years. Nest occasionally parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. No information; possibly some elevational movement in Zimbabwe.
Status and Conservation. Not globally threatened. Locally common in most of range; abundant in W & SE highlands of Ethiopia.
Bibliography. Ash & Atkins (2009), Benson (1953), Carswell *et al.* (2005), Clancey (1969, 1996), Desfayes (1975), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Herkner (1987), Hockey *et al.* (2005), Irwin (1981), Lewis & Pomeroy (1989), Nicolai *et al.* (2007), Payne (2005a), Redman *et al.* (2009), van Someren (1956), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996), Zottman (1960, 1964).

17. Swee Waxbill

Coccopygia melanotis

French: Astrild à joues noires **Spanish**: Estrilda Ventrigualda Meridional
German: Kapgrünastrild
Other common names: Black-faced Swee Waxbill, Yellow-bellied/Green/Dufresnaye's Waxbill, Southern Swee

Taxonomy. *Fringilla melanotis* Temminck, 1823, "Pays de Cafres" = eastern Cape Province, South Africa.
Genus often subsumed in *Estrilda*, but not closely related to latter. This species and *C. bocagei* and *C. quartinia* thought to form a superspecies; often treated as conspecific, but differ morphologically and in behaviour. Monotypic.



Distribution. SC Zimbabwe, N E & S South Africa, Swaziland and E Lesotho, also extreme SW Mozambique (Lebombo Mts).
Descriptive notes. 9–10 cm; 5·7–7·5 g. Male has crown and nape grey, back and upperwing olive-green, rump and uppertail-coverts bright red, tail black; face and throat black, white band extending from behind ear-coverts forwards to beneath throat; upper breast pale grey, lower breast to belly yellowish-buff, flanks grey, undertail-coverts buffy whitish; iris deep red-brown; bill black above, red below; legs black. Female resembles male, but face grey, becoming whitish on chin and throat. Juvenile is like female, but duller and more brown-grey, lacks white on throat, bill black. Voice. Call a soft

whistled "see-see" or "swee-swee", alarm call sharp "teerrrr"; high-pitched sharp "tsweee". Song a soft penetrating "teeeeeeeit" and "tuuuuueeet", or "sii-sii-soo-sii".
Habitat. Open grassland, shrubby grass, coastal bush, around farmsteads and houses; sea-level to 1800 m.
Food and Feeding. Small grass seeds; also small insects. In captivity, also spiders (Araneae), aphids (Aphidoidea), termites (Isoptera), mealworms and small moths (Lepidoptera). Forages mostly in pairs and small groups.
Breeding. Nest-building in Jul in Zimbabwe; in South Africa, nests in Nov–Feb in N, Nov–Apr in KwaZulu-Natal, Nov–Jan in Eastern Cape and Oct–May in S. Male hops near female, body upright, bill pointed slightly downwards, feathers of flanks and lower belly fluffed and other feathers sleeked, tail bent towards female, he mandibulates and gives soft, rapid song; in more high-intensity courtship, male stands beside mate, faces in same direction as she, and bows repeatedly. Nest a loosely constructed ball of dry grass, with side entrance and short spout, lined with grass-heads and feathers, which sometimes protrude from entrance, built low down, to 2 m above ground, in bush or creeper. Clutch 4–5 eggs; incubation 12–13 days; nestling has long grey down, black gape bordered with white, unmarked pale palate, and plain or barred tongue, so far as is known is identical to that of *C. quartinia*; nestling period 19–22 days. Nest occasionally parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident; perhaps some altitudinal movements.
Status and Conservation. Not globally threatened. Locally common. In Mozambique, confined to Lebombo Mts (on Swaziland border), where uncommon; population probably not more than 500 individuals. Apparently expanding in S South Africa.
Bibliography. Brickell (1985a), Chappuis (2000), Fry & Keith (2004), Goodwin (1982), Harrison (1962a), Herkner (1987), Hockey *et al.* (2005), Maclean (1985), Nicolai *et al.* (2007), Puschner & Rösel (2001), Zottman (1960, 1964).

PLATE 16 ➤



PLATE 16

inches 3

cm 8

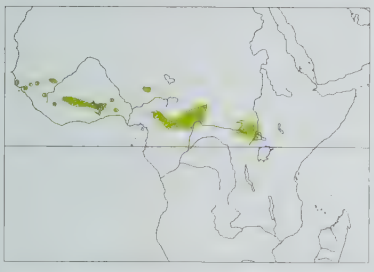
Genus *NESOCHARIS* Alexander, 1903

18. Grey-headed Oliveback

Nesocharis capistrata

French: Dos-vert à joues blanches **German**: Weißwangenastrild **Spanish**: Olivino Carigrís
Other common names: Grey-breasted/White-cheeked Oliveback, White-cheeked Olive Weaver, White-cheeked Waxbill/Oliveback

Taxonomy. *Pytelia capistrata* Hartlaub, 1861, Bissão, Guinea-Bissau.
Recent studies of mitochondrial genes suggest that this species is closer to *Estrilda* than to current congeners; perhaps merits placement in separate genus, for which the name *Delacourella* is available. Monotypic.
Distribution. Guinea-Bissau, Guinea, S Mali and Ivory Coast E to Togo, Benin, N & E Nigeria, Cameroon, Central African Republic, S Sudan, NE DRCongo and NW Uganda.



Descriptive notes. 14 cm; 10·8–13·2 g. Crown, nape and neck and most of underparts grey, upperparts and tail olive to golden-olive, upperwing greyish-brown, wing edged yellowish-olive; forehead, lores and face to behind eye and cheek white, black bib from chin to throat and extending laterally as half-collar across neck; flanks yellow; iris dark brown to dark red, eyering dark grey; bill black; legs dark grey. Sexes alike. Juvenile like adult, but grey darker, face patch grey, flanks olive-buff, bill grey with dusky base and tip. Voice. Call a lisping "tsssp". Song a series of clear, slurred whistles, begins with downslurred notes, then shorter notes, progressively lower in pitch through the series, "chwee-chwee-chwee-chwi"; another song theme a repeated series of notes on high pitch.
Habitat. Grassy savannas and forest edge, riparian woodland, grassy guinean woodland, undergrowth, near swamps, streams and rivers; in Uganda, below 1200 m.
Food and Feeding. Seeds of wild figs (*Ficus*), other fruits and grasses; also small insects, including ants (Formicidae) and caterpillars, and snails. Forages from canopy down to ground. Acrobatic; gleans leaves and twigs, flies from leaf to leaf. Takes seeds on ground. Forages singly and in pairs.
Breeding. Nest-building in Jul–Aug in Togo, and breeds Jun–Jul in Nigeria, Jul–Oct in NE DRCongo (Uele) and May–Jun in Uganda. Nest a hollow tangle of dry weeds and grass stems, with side entrance and drooping spout, sited c. 2·5 m above ground in fork in bush or tree. Clutch 3–5 eggs, incubation period 15–16 days; nestling skin black, grey down on head and back, upper gape with curved white arc and white ball below it, lower gape with two white balls (white swellings backed with black), palate pale pink to yellowish with five large black spots on pale bluish background, tongue pink with dusky band and grey tip; nestling period 21–22 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Widespread, but generally uncommon to scarce. Very few records from W parts of range. Recorded once in Gambia (in 1968). Occurs in many protected areas throughout range.
Bibliography. Bates (1930), Carswell *et al.* (2005), Chapin (1917, 1954), Cheke & Walsh (1996), Clewing (1991, 1992), Demey & Fishpool (1991), Dodman *et al.* (2004), Dowsett-Lemaire & Dowsett (2005), Dunning (2008), Fry & Keith (2004), Goodwin (1982), Herkner (1992), Nicolai *et al.* (2007), Ziegler (1971).

19. Shelley's Oliveback

Nesocharis shelleyi

French: Dos-vert à tête noire **German**: Meisenastrild **Spanish**: Olivino Carinegro
Other common names: Fernando Po Oliveback, Little Olive Weaver/Waxbill, Little Oliveback

Taxonomy. *Nesocharis shelleyi* Alexander, 1903, Moka, Bioko.
May form a superspecies with *N. ansorgei*, and sometimes considered conspecific. Two subspecies recognized.
Subspecies and Distribution.
N. s. bansoensis Bannerman, 1923 – mountains of SE Nigeria (Obudu Plateau, Mambilla Plateau, Ngel Nyaki, Gashaka Gumti) and W Cameroon (Bamenda Plateau S from Tchabal Mbabo, S to Mt Mananguba and Mt Kupé).
N. s. shelleyi Alexander, 1903 – Mt Cameroon (SW Cameroon) and Bioko I (Fernando Póo).



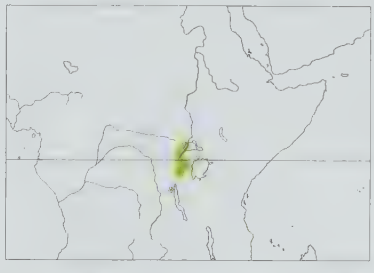
Descriptive notes. 8 cm; 7–9 g. Male nominate has head and throat black, grey nape-collar, vertical white line behind ear-coverts; upperparts olive, tinged golden on rump, tail blackish; upperwing blackish-brown, feathers edged olive-yellow; breast olive, belly and undertail-coverts grey; iris dark brown, eyering dark grey; bill pale blue-grey, dusky tip; legs dark grey. Female has white line behind face reduced or lacking, has breast grey and continuous with grey of neck and belly. Juvenile like female but duller, grey plumage areas with brownish tinge. Race *bansoensis* very similar, but underparts darker. Voice. Contact calls high-pitched, thin, sharp or squeaky, low twittering while foraging; also short trills, e.g. "tsi-tsi-", "tsrr" and "tsi-tsrr".
Habitat. Montane forest and cocoa plantations above 1200 m, in Cameroon mostly at 1550–2100 m; 50 m and higher in Bioko.
Food and Feeding. Small insects and seeds. Active from undergrowth to canopy. Gleans branches and leaves; often hangs upside-down. Forages singly, in pairs and in small groups of up to c. 8–10 individuals.
Breeding. Season Jan in Nigeria and Dec–Mar in Cameroon. In display, male holds wisp of grass in bill, and hops along branch turning body from side to side, sometimes changing branches, and giving squeaky trills every few seconds. Two breeding attempts known: in one case old nest of Northern Double-collared Sunbird (*Cinnyris reichenowi*) of race *preussi* used and in other old nest of Black-billed Weaver (*Ploceus melanogaster*) used, the nest lined with plant down. Clutch 3 eggs. No other information.
Movements. Resident. Possible altitudinal movements in Bioko.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cameroon Mountains EBA. Locally common to uncommon; easily overlooked, so perhaps commoner than thought.
Bibliography. Bannerman (1915), Chapin (1954), Chappuis (2000), Eisentraut (1963, 1973), Fry & Keith (2004), Goodwin (1982), Grimes (1972), Mills (2010b), Nicolai *et al.* (2007), Robiller & Scholz (2003a, 2003b), Serle (1981), Stuart & Jensen (1986), Wilkinson (2008).

20. White-collared Oliveback

Nesocharis ansorgei

French: Dos-vert à collier **German**: Halsbandastrild **Spanish**: Olivino Acollarado
Other common names: Olive Weaver-finch

Taxonomy. *Pytelia ansorgei* E. J. O. Hartert, 1899, Wemo [= Wimi] River, Toru, Uganda.
May form a superspecies with *N. shelleyi*, and sometimes considered conspecific. Monotypic.
Distribution. Albertine Rift region of E DRCongo, Uganda, Rwanda and extreme NW Tanzania.



Descriptive notes. 10 cm; 8–9·5 g. Male has head and throat black, nape grey, narrow white collar extending from rear of ear-coverts to beneath throat; upperparts olive, tail blackish; upperwing blackish-brown, feathers edged olive-yellow; breast olive, yellowish in centre, belly to undertail-coverts grey; iris dark brown, eyering dark grey; bill blue-grey, dusky tip; legs dark grey. Female has white line behind face reduced or lacking, entire underparts, including breast, grey. Juvenile undescribed. Voice. Calls lisping or "tssep"; song a trill beginning with 2 clear, slurred whistles, like that of *N. shelleyi*.
Habitat. Marshy forest edge, streams bordered by bushes and trees, lakeshore thickets, and papyrus (*Cyperus papyrus*) swamps; at 1000–1900 m.
Food and Feeding. Small seeds, especially those of the aster *Melanthera scandens*; removes husks by cracking them. Active, foraging at all levels. Gleans branches and leaves; hangs upside-down. Forages singly, in pairs and in small groups.
Breeding. Breeds in wet season (Nov–Jul) in DRCongo. In courtship, partners perch in upright posture, bodies turned away and heads turned towards each other, feathers of belly and flanks fluffed and tail angled towards mate, male nods or bows towards female repeatedly, sings between bows, wipes bill on perch, mutual bill-pecking sometimes follows. Partners choose nesting site together; use old nests of other birds, notably those of Strange Weaver (*Ploceus alienus*) and Spectacled Weaver (*Ploceus ocularis*) that hang from tip of drooping branch, lining nest-chamber with plant down and grass tops. Clutch 2–3 eggs; incubation by both sexes; nestling has down on head and back, swollen gape with long arc of light green-blue above and two light green-blue balls below, all outlined in black, yellow palate with single black spot, tongue and lower mouth unmarked. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Generally uncommon to scarce; fairly common locally. Possibly overlooked. Occurs in several protected areas.
Bibliography. Baker & Hirslund (1987), Chapin (1954, 1959b), Chappuis (2000), Friedmann (1968), Friedmann & Williams (1969), Fry & Keith (2004), Goodwin (1982), Vande weghe (1978).

Genus *MANDINGOA* E. J. O. Hartert, 1919

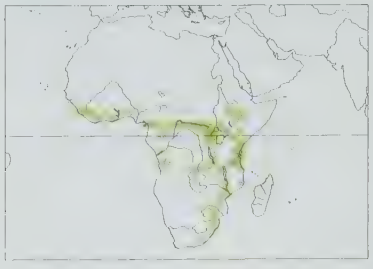
21. Green Twinspot

Mandingoa nitidula

French: Astrild vert **German**: Tropfengrünastrild **Spanish**: Estrilda Verde
Other common names: Green-backed Twinspot; Schlegel's Twinspot (*schlegeli*)

Taxonomy. *Estrelda nitidula* Hartlaub, 1865, KwaZulu-Natal, South Africa.
Genus sometimes subsumed in *Hypargos*, but more closely related to *Cryptospiza*. Proposed race *virginiae* (described from R Opu, on Bioko I) treated as a synonym of *schlegeli*. Three subspecies recognized.
Subspecies and Distribution.
M. n. schlegeli (Sharpe, 1870) – W Guinea and Sierra Leone E, discontinuously, to DRCongo and W Uganda, S to NW Angola; also Bioko I (Fernando Póo).
M. n. chubbi (Ogilvie-Grant, 1912) – Ethiopia, Kenya, Tanzania (including Pemba I), Zanzibar, Zambia and N Malawi.
M. n. nitidula (Hartlaub, 1865) – S Malawi, Mozambique, Zimbabwe, E South Africa (Limpopo Province, KwaZulu-Natal and E Eastern Cape) and W Swaziland.
Descriptive notes. 10–11 cm; 8·5–10 g (*chubbi*). Male nominate race has area from lores to behind eye and to chin red, crown, upperparts, upperwing and tail olive-green; rear ear-coverts, side of neck, throat and upper breast dull olive green, lower breast to belly and flanks black with white rounded spots, undertail-coverts pale olive-green with dark grey bases; iris dark brown, orbital ring bluish-grey to pink; bill black, tip and side of lower mandible red; legs light brown. Female is duller than male, face mask dull yellow to yellow-buff or orange-tinged peach-buff, underparts dark grey with white spots, orbital ring grey to blackish. Juvenile is grey-green above, face mask yellow to buff, throat to undertail-coverts dull green without spots, bill black. Races differ mainly in tone of plumage coloration: *chubbi* male is green above, face patch orange-red, throat to neck and upper breast olive-green, washed yellow to orange on throat and centre of breast, female rump green, breast greenish;

On following pages: 22. Shelley's Crimsonwing (*Cryptospiza shelleyi*); 23. Dusky Crimsonwing (*Cryptospiza jacksoni*); 24. Red-faced Crimsonwing (*Cryptospiza reichenovii*); 25. Ethiopian Crimsonwing (*Cryptospiza salvadorii*); 26. Black-faced Waxbill (*Estrilda erythronotos*).



schlegeli male has upperparts bright olive-green with orange wash, lower back and uppertail-coverts brownish-orange, face red, throat to upper breast red to rusty orange, side of breast tinged orange, lower breast and belly black with white spots, undertail-coverts light reddish-grey. female face dull yellow, breast tinged golden-yellow, belly dull green with white spots, undertail-coverts olive. Voice. Contact call a chirping "tzeeet", alarm a low "dzzhurrrr". Song a medley of calls and buzzy, chipping and whistled notes, "tssrrrdzeeeee-jip-jibit-wayee-tsip-tsip...", a seemingly disconnected series of slow melodious whistles and a harsh trill, or a complex mixture of very high-pitched phrases with varied sibilant trills and slurs.
Habitat. Evergreen scrub, forest understorey and forest edge, thickets, bamboo, riverine forest, plantations, gardens; locally present in suitable thicket habitat, as in Zambia. Lowlands to 2400 m.
Food and Feeding. Small grass seeds, especially those of creeping forest grass (*Oplismenus hirtellus*) in shady areas under trees, also rice, seeds of amaranth (*Amaranthus*), seeds of *Laportea* stinging nettles, and fruits of the nettle *Urera cameroonensis*, pieces of manioc (*Manihot esculenta*) root, and fallen husks of oil palm (*Elaeis guineensis*); also small insects, including ants (Formicidae) and woolly aphids (Eriosomatinae). Feeds mainly on the ground, and sometimes in understorey vegetation; also in canopy when trees are seeding. Forages singly, in pairs and in small groups.
Breeding. Season Sept–Oct in Liberia, Nov–Dec in Gabon, Jan–May in Zambia and Malawi, Oct–Nov in Zimbabwe, and Dec–Apr in E South Africa (KwaZulu-Natal). In courtship, male holds nesting material in bill, bobs up and down, straightens and bends legs, the head raised in vertical posture during upward thrust, head and tail towards female, and sings, female flies to nest and enters, followed by male, and copulation occurs outside or inside nest. Male brings nest material and female places it; nest a large untidy ball of grass stems, leaf skeletons, rootlets and lichens, covered with leaves, lined with fine grass, feathers or other materials, placed 3–15 m above ground in dense foliage; sometimes old nest of Dark-backed Weaver (*Ploceus bicolor*) used. Clutch 3–6 eggs; incubation 12–14 days; nestling has yellow skin (becoming grey), long whitish-grey down, gape on each side has three bluish-white papillae edged inside with black, palate pink to whitish with three black spots and two small posterior spots, tongue pale pink with two black spots connected by a line below (race *schlegeli*); chicks fed by both parents, nestling period 21–23 days.
Movements. Chiefly resident. Some altitudinal movements indicated by breeding-season records at higher altitudes in E Zambia (on Nyika Plateau) and in South Africa (in Eastern Cape); ringing study suggests altitudinal migration in N South Africa (Limpopo).
Status and Conservation. Not globally threatened. Scarce or uncommon to locally abundant. Known distribution very patchy, but this species is possibly overlooked because of its secretive habits and cryptic coloration. Occurs in many protected areas.
Bibliography. Amadon (1953), Ash & Atkins (2009), Bates (1911, 1930), Bielfeld (1996, 2008), Brosset & Érard (1986), Chapin (1917, 1954), Chappuis (2000), Chittenden & Nichols (2006), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Harrison *et al.* (1997), Hockey *et al.* (2005), Hofmann & Mettke-Hofmann (2004), Karl (1961), Maclean (1993), Neff (1964), Nicolai *et al.* (2007), Proebsting (1964), Quickelberge (1989), Redman *et al.* (2009), Short *et al.* (1990), Tarboton *et al.* (1987).

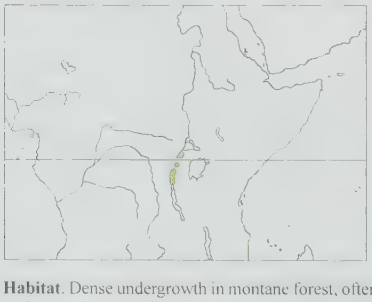
Genus *CRYPTOSPIZA* Salvadori, 1884

22. Shelley's Crimsonwing

Cryptospiza shelleyi

French: Astrild de Shelley **German**: Rotmantelastrild **Spanish**: Estrilda de Shelley
Other common names: Red-billed Crimsonwing

Taxonomy. *Cryptospiza shelleyi* Sharpe, 1902, Rwenzori, DRCongo–Uganda border. Monotypic.
Distribution. Mountains of Albertine Rift in Uganda, E DRCongo, Rwanda and Burundi.



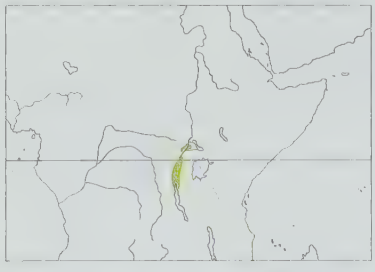
Descriptive notes. 13 cm; 15–19 g. Male has head to below eye, ear-coverts, nape and upperparts maroon-red, tail black, upperwing black, inner tertials edged red; chin to throat, side of neck and upper belly olive, lower belly and undertail-coverts black, flanks peach-orange; iris dark brown, eyering pink; bill red; legs black. Female has head and most of underparts light olive-green, upperparts red, wings slightly tinged brown, lower belly and undertail-coverts sooty black. Juvenile is like female, but lacks orange wash on flanks. Voice. Call a series of twittering notes, rising and falling, "tu-tu-tu-ti-ti-ti".
Habitat. Dense undergrowth in montane forest, often in valley bottoms near water; low second growth at forest edge, and forest clearings with bamboo thickets. At 1600–3400 m in Rwenzori Mts and Bwindi Forest, in Uganda, and at 2200–3000 m in Virunga Mts, on DRCongo–Uganda–Rwanda border.
Food and Feeding. Small seeds, notably of balsam (*Impatiens*), also insects. Feeds on and close to ground. Forages mainly in pairs and in small groups.
Breeding. No information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Albertine Rift Mountains EBA. Rare in almost entire range. Has declined in some areas, possibly because of continuing deforestation and forest degradation; population probably seriously fragmented, and decreasing. Occurs in many parts of Albertine Rift in DRCongo (Itombwe Mts, Kahuzi-Biéga National Park, mountains W of L Kivu), Rwanda (Nyungwe, Gishwati, Makwa and Mukura Forests), Burundi (Bururi Forest and elsewhere), Uganda (Rwenzori Mts, and Bwindi Forest), as well as in Virunga Mts, on border separating DRCongo, Uganda and Rwanda. Few individuals found in recent surveys in Uganda, where the species may be much rarer than was previously believed, or perhaps because it is very difficult to locate; possible declines in period from late 1970s to early 1990s. Principal threat throughout its range is loss and degradation of forest habitat, mainly for agriculture and timber; forest loss widespread, and has increased in recent years as a result of war. Present in various protected areas, e.g. Virunga National Park, in DRCongo, Nyungwe Forest Reserve, in Rwanda, and Rwenzori and Bwindi-Impenetrable Forest National Parks, in Uganda.
Bibliography. Anon. (2008g, 2009j), Butchart & Stattersfield (2004), Carswell *et al.* (2005), Chapin (1954), Chappuis (2000), Cichon (2009), Dowsett-Lemaire & Dowsett (1990), Dunning (2008), Espley (2009a), Fry & Keith (2004), Goodwin (1982), Nicolai *et al.* (2007), Stattersfield & Capper (2000).

23. Dusky Crimsonwing

Cryptospiza jacksoni

French: Astrild de Jackson **German**: Jacksonastrild **Spanish**: Estrilda de Jackson
Other common names: Jackson's Crimsonwing

Taxonomy. *Cryptospiza jacksoni* Sharpe, 1902, Rwenzori, DRCongo–Uganda border. Monotypic.
Distribution. Mountains of Albertine Rift in E DRCongo, Uganda, Rwanda and Burundi.



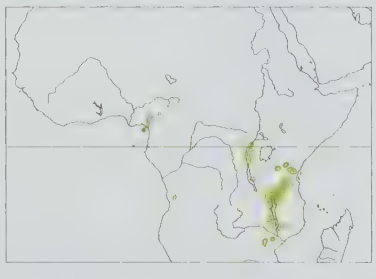
Descriptive notes. 11 cm; c. 14 g. Male has most of head red, nape grey, upperparts dark crimson-red, tail and upperwing blackish-grey; side of neck to chin, throat and underparts dark grey, red patch on flanks; iris dark brown, eyering pink; bill black; legs dark olive-brown. Female resembles male, but red face patch smaller, red restricted to forehead and area around eye, eyering grey. Juvenile is like female, but lacks red on face and flanks, has back and rump dark reddish-grey. Voice. Call a soft "tzeck" or "tsit", also soft trilling "geegeegeegee"; song a drawn-out version of these phrases, and sometimes a high-pitched whistling "peeeee".
Habitat. Montane forest, thick undergrowth, bracken briar, bamboo, clearings along forest roads, cultivation near forest, and patches of seeding grasses. At 1500–2700 m.
Food and Feeding. Small seeds of grass, fallen on ground; also beetles (Coleoptera), small snails. Forages mostly in pairs and small groups.
Breeding. Breeding records in most months in DRCongo and in May, Aug and Sept in Uganda. In courtship, male holds nesting material in bill, fluffs feathers of belly and flanks, directs head towards mate, bobs up and down. Nest built from grass and green moss, placed 1·6 m up between branches and near trunk in cypress tree; one was made from grass, with lining of hair and feathers, 4 m above ground in cypress. Clutch 2 eggs; nestling gape has small pale yellow papillae, two above and two below corner of mouth on each side, oral surface of each papilla lined black, palate yellow with three large triangular spots and two small spots behind them, tongue with two spots; no data on nestling period.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Albertine Rift Mountains EBA. Locally not uncommon. Most numerous of the four crimsonwing species in DRCongo and in Bwindi-Impenetrable Forest, in Uganda; very common in Burundi.
Bibliography. Carswell *et al.* (2005), Chapin (1954), Dowsett-Lemaire & Dowsett (1990), Dunning (2008), Fry & Keith (2004), Goodwin (1982), Nicolai *et al.* (2007), Prigogine (1956), Schouteden (1918).

24. Red-faced Crimsonwing

Cryptospiza reichenovii

French: Astrild de Reichenow **German**: Bergastrild **Spanish**: Estrilda de Reichenow
Other common names: Nyasa/Reichenow's Crimsonwing

Taxonomy. *Pytelia reichenovii* Hartlaub, 1874, Bondongo, Cameroon. Thought to form a superspecies with *C. salvadorii*. Proposed race *homogenes*, described from E Zimbabwe (Stapleford Forest Reserve, in Umtali district), treated as a synonym of *australis*. Three subspecies recognized.
Subspecies and Distribution.
C. r. reichenovii (Hartlaub, 1874) – SE Nigeria (Obudu Plateau), W Cameroon, Bioko I (Fernando Póo) and NW Angola (Gabela region).
C. r. ocularis Sharpe, 1902 – mountains of Albertine Rift in E DRCongo, Uganda, Rwanda and Burundi.
C. r. australis Shelley, 1896 – mountains in Tanzania, E Zambia, Malawi, W Mozambique and E Zimbabwe.



Descriptive notes. 10–11 cm; 10·5–14·5 g (*australis*). Male nominate race has red mask on lores and around eye, rest of head and underside olive, flanks deep crimson; upperparts dark crimson-red, tail blackish, upperwing-coverts edged red, flight-feathers blackish-brown; iris dark brown, eyering pink; bill black; legs brown. Female differs from male in having upperparts more olive, less crimson, small patch around eye yellowish-buff to whitish; eyering grey. Juvenile is like female, but lacks pale patch around eye, has underparts duller, more greyish. Race *ocularis* is like nominate, but on average paler olive below; *australis* is paler and greyer below. Voice. Call a high metallic "sit-sit", often given in trills; also louder "sweeee" or "tzeet". Song soft, of 4 long sweet notes descending in pitch, each followed by a chirp, first note plaintive and tremulous; another song theme has short "tik" notes and long nasal note, "tikatik-wraaaaaangh".
Habitat. Thickets, dense undergrowth of primary and secondary forest, also exotic pine plantations with understorey, often near streams. In most of range found at montane and submontane elevations: mainly in montane regions in Cameroon; in Tanzania from 2500 m down to as low as 300 m in E Usambara foothills, mostly at 1800–2400 m in Albertine Rift, 2000–2200 m in Zambia,1200–2200 m in Malawi highlands, 1400–2000 m in Zimbabwe. In several regions moves to lower altitude during dry and cold season.
Food and Feeding. Seeds of Acanthaceae, grasses, balsam (*Impatiens*), *Urera* creeper, *Hagenia abyssinica*, patula pine (*Pinus patula*); around villages takes maize (*Zea mays*) meal; also small invertebrates. Food items taken on ground and at up to 4 m or more in trees. Forages mostly in pairs and small groups; joins mixed-species flocks with other estrildids.
Breeding. Season Oct–Dec in Cameroon, Apr–Jun and Aug–Oct in DRCongo, nearly all year in Tanzania, Jun–Sept in Zambia, Mar–Jul and Sept in Malawi, and Sept–Mar in Zimbabwe. Display-

ing male holds nesting material in bill, fluffs feathers of belly and flanks, head directed towards mate, and bobs up and down by stretching and bending legs. Nest a large loosely constructed ball with side entrance and porch or tunnel, built with grass blades, stems, moss, fungi and dead leaves (looks like old abandoned nest), lined with soft seedheads, plant down, feathers and hair-like mycelia of fungus, placed 2–6 m above ground in thicket of bracken briar, shrubs and herbs near streams, sometimes in tree-ferns or in sapling with thorny stems; breeding territory 1–4 ha. Clutch 3–6 eggs; incubation by both sexes, period 13–14 days; nestling gape with small, pale yellow papillae, two above and two below corner of mouth on each side of gape, oral surface of each papilla lined black, palate yellow with three large triangular spots and two small spots behind them, black field associated with yellow papillae around the choana, tongue with two spots, pair of spots under tongue; young beg by stretching necks towards parent (rather than twisting neck and head around and upside-down); nestling period 21 days; fledglings fed by male for a further 10–12 days.

Movements. Resident, seasonal altitudinal migrant and local wanderer. Appears near sea-level in non-breeding season in Cameroon; moves to lowland forest during dry and cold seasons in Tanzania; ringed individuals in Malawi recovered up to 3 km away.

Status and Conservation. Not globally threatened. Scarce or uncommon to locally abundant. Fairly common in NW of range (Nigeria, Cameroon); uncommon in Angola. Common in most regions in E parts of range, and locally abundant in E Tanzania and E Zimbabwe.

Bibliography. Carswell *et al.* (2005), Chapin (1954), Chappuis (2000), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (1990, 2006), Eisentraut (1963), Fry & Keith (2004), Goodwin (1982), Herkner (1993), Hockey *et al.* (2005), Irwin (1981), Kunkel & Kunkel (1975), Maclean (1993), Markus (1970), Mills (2007, 2009), Nicolai *et al.* (2007), Prigogine (1984b), Sclater & Moreau (1933), Sieberer (1972).

25. Ethiopian Crimsonwing

Cryptospiza salvadorii

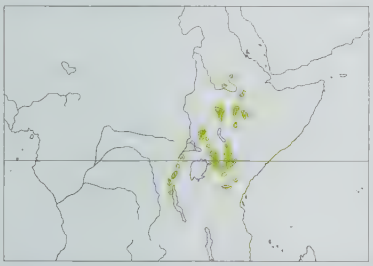
French: Astrild de Salvadori **German**: Salvadoriastrild **Spanish**: Estrilda de Salvadori
Other common names: Abyssinian/Salvadori's Crimsonwing, Crimson-backed Forest-finch

Taxonomy. *Cryptospiza salvadorii* Reichenow, 1892, Shoa (Shewa), Ethiopia.

Thought to form a superspecies with *C. reichenovii*. Proposed race *crystallochresta* (described from Challa, in SW Ethiopia) synonymized with nominate. Three subspecies recognized.

Subspecies and Distribution.

C. s. salvadorii Reichenow, 1892 – Ethiopia and N Kenya.
C. s. kilimensis Moreau & W. L. Sclater, 1934 – S Sudan, E Uganda, W, C & S Kenya and N Tanzania.
C. s. ruwenzori W. L. Sclater, 1925 – mountains of Albertine Rift (in E DRCongo, SW Uganda, W Rwanda and W Burundi).



Descriptive notes. 10–11 cm; 10·9–14 g. Male nominate has top of head to uppermost mantle dark olive-grey, rest of upperparts dark crimson-red, tail blackish; upperwing dark grey-brown, wing-coverts dark crimson-red; face greyish, lores dusky, chin and throat whitish-buff, merging into olive-grey on breast, darker on lower belly and undertail-coverts, lower flanks dark red; iris dark brown, orbital ring dull pinkish to orange-red; bill black; legs greyish. Female like male, but less red on wing-coverts and flanks, eyering duller, greyish. Juvenile like female, but upperparts less red, underparts washed olive. Race *kilimensis* paler below than nominate; *ruwenzori* has head and neck greyer, underparts paler. Voice. Call a soft "tsip tsip" when flushed; song a soft plaintive "dee-goo-goo-dee", or high-pitched sibilant "tsit tsit..." which can become rapid series of even higher notes.

Habitat. Montane-forest clearings and grassy edges, fern-covered ridges, thick forest undergrowth, bamboo thickets, bracken briar; in Ethiopia in mixed olive–podocarpus–juniper (*Olea–Podocarpus–Juniperus*) forest and secondary growth with amaranth (*Amaranthus*), in coffee cultivation, along streams. At 1820–3030 m in Ethiopia; above 2100 m in Uganda (in Rwenzori and in Bwindi-Impenetrable Forest); at 1750–3000 m in Kenya; in Tanzania, 1700–2500 m on Mt Kilimanjaro.

Food and Feeding. Seeds of grasses, including *Setaria*, seeds of balsam (*Impatiens*) and stinging nettles (of genus *Laportea*); probably some insects taken. Forages for fallen seeds on ground, in low grass and along forest tracks. Forages singly, in pairs and in small groups.

Breeding. Season Apr and Aug in Ethiopia, and in Uganda breeds in Mar at Bwindi and in Jun and Nov on Mt Elgon; all records in dry months following rains. Displaying male holds nesting material in bill, fluffs belly and flank feathers, turns head towards mate, and bobs up and down. Nest a ball of grass, twigs and tendrils, with side opening and sometimes a tunnel, covered in moss, sited 2–4 m above ground in sapling or liana. Clutch 3–5 eggs; incubation period 14–16 days; nestling skin pale, pale down on head and body, each side of gape with two small yellow papillae above corner of mouth and two below, palate yellow with three large triangular spots (the mediolateral spots elongate), and two small spots behind them, black field associated with yellow papillae around choana, tongue with two spots; nestling period 20–21 days.

Movements. No information.

Status and Conservation. Not globally threatened. Locally fairly common; rather patchily distributed. Densities of 1 bird/ha in primary forest at Kijabe, in S Kenya, and 17 birds/km² at Chilimo, in C Ethiopia. In Tanzania, common on Mt Kilimanjaro on W slopes, less common on drier and disrupted S slopes. Occurs in several protected areas throughout range.

Bibliography. Ash & Atkins (2009), Burkard (1968), Carswell *et al.* (2005), Chapin (1954), Chappuis (2000), Chittenden & Nichols (2006), Desfayes (1975), Dowsett-Lemaire & Dowsett (1990), Fry & Keith (2004), Immelmann, Nicolai *et al.* (1977), Immelmann, Steinbacher & Wolters (1965), Neff (1978b), Nicolai *et al.* (2007), Nikolaus (1987), Redman *et al.* (2009), Short *et al.* (1990), Zimmerman *et al.* (1996).

Genus *ESTRILDA* Swainson, 1827

26. Black-faced Waxbill

Estrilda erythronotos

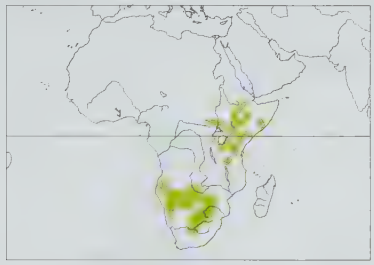
French: Astrild à moustaches **German**: Elfenastrild **Spanish**: Estrilda Carinegra
Other common names: Abyssinian Red-rumped Waxbill; Red-rumped/(Pink-bellied) Black-cheeked/Pink-bellied Black-faced/Charmosyna Waxbill (*charmosyna*, *kiwanukae*)

Taxonomy. *Fringilla erythronotos* Vieillot, 1817, "l'Indie"; error = Kurrichane, northern South Africa.

Sometimes placed in a monotypic genus, *Brunhilda*, but such treatment seems unwarranted. Pink-ish-bellied races *charmosyna* and *kiwanukae* often considered to represent a separate species, distinct from darker-bellied nominate and *delamerei*; variation, however, apparently clinal, with belly colour becoming darker from N to S, and no differences in vocalizations or nestling appearance; reported sympatry of the two groups in S Kenya not confirmed, and, in any event, some birds might have been non-breeding migrants or wanderers. Proposed race *pallidior* (described from N Guaso, on R Nyiro, in Kenya) is considered to be inseparable from *charmosyna*, and *soligena* (from Otjomassu Sandfield, in C Namibia) is synonymized with nominate. Four subspecies currently recognized.

Subspecies and Distribution.

E. e. charmosyna (Reichenow, 1881) – S Sudan, Ethiopia, S Somalia, NE Uganda and E Kenya.
E. e. delamerei Sharpe, 1900 – SW Uganda, SW Kenya and W & C Tanzania.
E. e. kiwanukae van Someren, 1919 – SE Kenya and N Tanzania.
E. e. erythronotos (Vieillot, 1817) – S Angola, SW Zambia, Namibia, Botswana, N Zimbabwe and N South Africa (Limpopo S to Northern Cape and W Free State).



Descriptive notes. 11–12 cm; 7·3–10·2 g. Male nominate race has forehead to nape dull grey-brown, forehead paler, lower nape and side of neck grey, lores to ear-coverts and chin black; mantle, scapulars and back grey-brown, washed pinkish, finely barred black, lower back to uppertail-coverts deep red; median and greater upperwing-coverts and inner flight-feathers light grey with pinkish wash and black bars, outer remiges black; tail long, graduated, black; throat, breast and belly grey, finely barred blackish, flanks (from side of upper breast) dark reddish, belly and undertail-coverts black; iris red to reddish-brown, eyering grey; bill bluish-grey, black tip; legs dark grey. Female is duller and paler than male, back less pink, rump lighter red, flanks pinkish-red and this colour barely extending to side of breast, undertail-coverts barred grey and black. Juvenile is like female, but more sooty, bill black. Race *delamerei* is paler than nominate, paler grey on head and neck, lighter red rump and uppertail-coverts, black face finely outlined below with pale grey, breast and belly paler grey with pink wash, female more grey and less pink, undertail-coverts grey, iris brown; *kiwanukae* has lower nape and side of neck grey with pink wash, back and scapulars pinkish-washed grey with fine dark grey barring, lower back to uppertail-coverts red, black face mask from lores to ear coverts outlined whitish behind and below, light grey chin with line of black feathers, throat to belly pinkish-grey with fine dark grey bars, side of breast pinkish, lower belly and undertail-coverts darker pinkish-grey, lower flanks reddish, female more grey and less pink, iris brown; *charmosyna* is paler than previous, black on chin much reduced, lower belly and undertail-coverts pale pink, female more grey. Voice. Close contact call during foraging is a high-pitched "tip-tip"; alarm call is shorter and more explosive, "tsip tsip tsip". Distance contact call or song a whistled "tee" or "tee-eee", the last part rising in pitch.

Habitat. Acacia (*Acacia*) scrub and thickets, riverine thornbush. In Kenya, race *delamerei* in semi-arid country above 1000 m and within region with at least 500 mm rainfall; *kiwanukae* as low as 100 m in arid and semi-arid country with 250–1000 mm rainfall. In Ethiopia, in semi-arid thornbush at 190–1820 m.

Food and Feeding. Small grass seeds, also small insects and nectar. In N South Africa, grass seeds taken were those of *Panicum laevifolium*, *Panicum maximum*, *Urochloa mosambicensis*, *Tricholaema monachne*, *Setaria verticillata* and *Eragrostis*; insects, especially small termites (Isoptera) and beetles (Coleoptera), and nectar of aloe (*Aloe*). Forages on ground, and takes seeds from heads on stems; flies up and lands on culm, bending it to the ground. Forages in pairs and in small groups; also in larger flocks outside breeding season.

Breeding. Season Apr or May in Ethiopia, Jan and Feb in Zambia; in E Africa breeds in long rains, Apr–Jun in Kenya and Jun in Tanzania (Serengeti); Jan–May (most records Feb and Mar) in Namibia, Sept–Apr (most Jan–Mar) in Zimbabwe, and Dec–May (most Dec–Mar) in N South Africa. Courting male (nominate race and *delamerei*) holds grass stem by the end in bill, black cheek feathers fluffed, bobs body up and down and sings (displays and sings alone, as well as when a female present), in stem display, feathers raised on nape and cheek and rump, sleeked on crown; in greeting, partners perch upright, head half-turned to mate, anterior black face feathers fluffed, tail angled towards partner, move side to side and nod head. Nest a large ovoid ball, long downward-directed entrance tube at side, built from grass stems and panicles, lined with fine grass, some with a feather-lined cock's nest on top, placed 3–9 m above ground in thorny *Acacia tortilis* tree in S Africa, sometimes near remains of old nests; in Kenya, 2–6 m above ground in tree, in S (near Olorgesailie) in *Acacia mellifera*, in Athi River in *Commiphora shimperi*, *Acacia brevispica*, *Balanites aegyptiaca* and *Capparis tomentosa*. Clutch 3–6 eggs; incubation period 12 days; nestling skin black, with light grey down, gape has swollen curved white arc above and white arc below extending to swollen ridge along jaw, each arc lined black on inner surface, palate white with five black spots, tongue flesh-coloured with black spots, mouth pattern black and white; nestling period 19–23 days; fledglings feed themselves 10–14 days after leaving nest. Races *delamerei* and *kiwanukae* parasitized by Steel-blue Whydah (*Vidua hypocherina*) in Kenya; species also parasitized occasionally by Shaft-tailed Whydah (*Vidua regia*).

Movements. Resident; some local movements. In Kenya, local movements suggested by irregular appearance of differently plumaged birds (presumably different races) in Athi Plains; in Zambia, appears outside normal range in unusually cold seasons; in S Africa, moves into drier parts of Kalahari in seasons with high rainfall.

Status and Conservation. Not globally threatened. Locally common. Generally uncommon in N of range; locally fairly common in E Africa; sparse and very local in Zimbabwe, mainly in W & S of C plateau; elsewhere in S of range, main concentrations in C Namibia, NW Botswana (Okavango), and hardveld of E Botswana and N South Africa (North West Province). In 250-ha study site in N South Africa, 118 birds trapped in period of 40 months.

Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Brown & Britton (1980), Clement *et al.* (1993), Dowsett *et al.* (2008), Friedmann & Loveridge (1937), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Immelmann *et al.* (1965), Kunkel (1967b), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1960), Maclean (1993), Mayer (1996b), McCarthy (2006), Nicolai (1989), Nicolai *et al.* (2007), Plumb (1978), Redman *et al.* (2009), Scheer (1991), Schmidl (1982), Sclater (1930), Skead, D.M. (1975), van Someren (1978), Zimmerman *et al.* (1996).



PLATE 17

inches 3

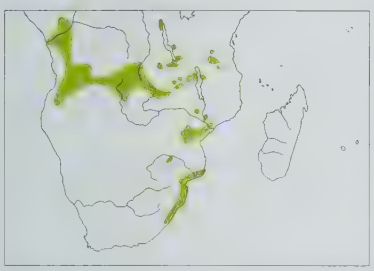
cm 8

27. Black-tailed Waxbill

Estrilda perreini

French: Astrild à queue noire **Spanish**: Estrilda Colinegra
German: Schwarzschwanz-Schönbürzelastrild
Other common names: Black-tailed (Lavender) Finch, (Black-tailed) Grey Waxbill, Black-tailed Lavender Waxbill, Lavender Waxbill(!)

Taxonomy. *Fringilla Perreini* Vieillot, 1817, Malimbe, Cabinda, Angola.
Has been thought to form a superspecies with *E. caerulescens*, possibly with *E. thomensis* included in same grouping. Proposed race *poliogastra* (described from Inhambane, in S Mozambique) is treated as a synonym of *incana*. Two subspecies recognized.
Subspecies and Distribution.
E. p. perreini (Vieillot, 1817) – S Gabon, S PRCongo, S & E DRCongo, Angola, Zambia, S Tanzania and Malawi.
E. p. incana Sundevall, 1850 – S Malawi, E Zimbabwe, Mozambique, N & E South Africa and E Swaziland.



Descriptive notes. 10·5–11 cm; 6·1–9 g (*incana*). Male nominate race is mostly pearly grey above and below; black streak from lores through eye, red rump and uppertail-coverts, black tail; belly and flanks sooty grey, undertail-coverts black; iris dark brown, eyering black; bill blue-grey, blacker about tip and cutting edges; legs dark blue-grey to black. Female is like male, but lower belly and flanks dark grey. Juvenile is paler than female, lacks black eyestripe. Race *incana* is slightly smaller and paler grey than nominate, rump brighter red. Voice. Contact call a thin explosive "pseeu pseeu" whistle at 4·5 kHz, rising to steady pitch and then falling, duration c. 0·3 seconds; male has plaintive drawn-out "fweeeee", held at c. 3·6 kHz, soft at beginning and end, lasting c. 0·8 seconds, sometimes followed by shorter notes.
Habitat. Open woodland with scattered trees and grass, edge of lowland and middle-altitude evergreen forest, *Cryptosepalum* forest, bamboo, dense riparian forest, secondary growth and thickets, and light miombo (*Brachystegia*) on rocks near streams. Lowlands to c. 1900 m; 950–1950 m in Zambia, 60–1900 m in Malawi, and to 700 m in Zimbabwe.
Food and Feeding. Small grass seeds, seeds of stinging nettles (of genus *Laportea*); also insects, nectar, fruits of marula (*Sclerocarya birrea*). When feeding, holds grass-heads under foot, and takes fallen seeds on ground. Forages singly, in pairs and in small groups.
Breeding. Breeds late in rains: Jan and Apr in S DRCongo (Katanga), Dec–May in Zambia, Feb and Apr in Malawi, Jan–Apr in Zimbabwe, and Oct–Feb in E South Africa (KwaZulu-Natal). Courting male flies around with long grass stem held by one end in bill, perches with body horizontal, swings body from side to side; during allopreening female crouches and quivers tail. Nest rounded in shape, with short entrance tube, made from long fine grass stems and flowering heads, placed 1·5–5 m above ground in shrub or small tree, occasionally near active nest of wasps (Hymenoptera); often uses old nest of *Ploceus* weaver, lining it with fine grass. Clutch 2–5 eggs; incubation period 12 days; nestling skin pink or flesh-coloured, sparse down on head and back, skin darkens to grey in 3–4 days; nestling period 18–21 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common to uncommon. Uncommon to scarce in NW of range in Gabon and PRCongo; fairly common in S DRCongo. Uncommon and local in Zambia, very local in Malawi; very local and generally uncommon in Zimbabwe, but very common to abundant to 700 m in Rusitu–Haroni area; rare to uncommon and local in South Africa. Uncommon and very local in Mozambique, where estimated population in S fewer than 5000 individuals; thought to have declined in region because of habitat loss along coast and capturing of birds for cagebird trade.
Bibliography. Brickell (1985b), Chapin (1954), Clancey (1996), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Güttinger & Nicolai (1973), Hockey *et al.* (2005), Irwin (1981), Maclean (1993), Nicolai *et al.* (2007), Pöhland (1969), Verheyen (1953), Vincent (1949b).

28. Cinderella Waxbill

Estrilda thomensis

French: Astrild de Sao Tomé **Spanish**: Estrilda Cenicienta
German: Cinderella-Schönbürzelastrild
Other common names: Sao Tome/Neumann's Waxbill, Red-flanked Lavender Waxbill

Taxonomy. *Estrelda thomensis* Sousa, 1888, São Tomé, Gulf of Guinea.
Was earlier sometimes referred to by name *E. cinderella* (described from Benguela, in W Angola), but present name has priority. Type specimen said to have originated from São Tomé, but documentation uncertain; species not recorded there since, and it is believed that its presence at that time, if true, was probably result of escape from captivity. Has sometimes been thought to be part of a superspecies formed by *E. perreini* and *E. caerulescens*. Monotypic.
Distribution. W Angola and extreme NW Namibia (R Cunene).
Descriptive notes. 11 cm; 6·8–8·5 g. Male is mostly light pearly grey above and below; black streak from lores through eye, red rump and uppertail-coverts, black tail; belly sooty grey (sometimes washed red), red from flanks to vent, undertail-coverts black; iris dark brown; bill greyish-pink at base turning to black on tip, culmen and cutting edges; legs black. Female is slightly paler than male, lower belly and flanks dark grey. Juvenile is like female, but lacks black eyestripe and red flanks, bill black. Voice. Contact call a harsh "brrrt, brrrt", and more intense repeated version given in alarm; during preening and socializing a drawn-out soft and variable "swee-swee-swee", and a far-carrying (audible to beyond 100 m) "hu-wee". Male song a drawn-out repeated whistle, "see-eh, see-eh, sueee"; female gives single "seee".
Habitat. Riverine vegetation in acacia (*Acacia*) and mopane (*Colophospermum mopane*) woodland in Angola; in Namibia restricted to mopane and riverine woodlands, near water.



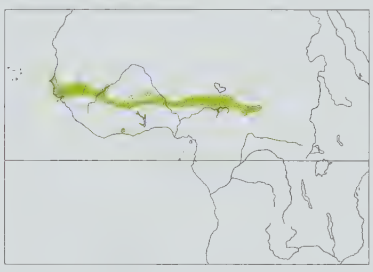
Food and Feeding. Feeds on small grass seeds and other small seeds, and flowers (parts of plant or nectar); insects, including termites (Isoptera) and honey-producing scale insects (Coccoidea) on mopane trees. Picks grass seeds from flowering heads by climbing on stems or by hanging from branches and trees. Forages also in bush and tree canopy; catches emerging termites on the wing. Forages in pairs and in small flocks; joins mixed-species flocks in canopy.
Breeding. Nest-building in late Nov and Dec, after first rains, in Namibia. Nest undescribed in wild; in captivity, builds large ball of grass and coconut fibres, with long, narrow downsloping entrance tube, sometimes with "cock's nest" on top. Clutch 3–4 eggs; incubation period 12–14 days; nestling period 17–21 days. No other information.
Movements. Resident in Angola; in Namibia moves after rain, in wet season absent or difficult to find.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Western Angola EBA. Locally common; rare in Namibia, where total population probably fewer than 2000 individuals. Global population thought to be decreasing as a result of loss and degradation of habitat. Survival of this and other species in Namibia potentially threatened from proposed dam-building project in R Cunene (at Epupa Falls).
Bibliography. Anon. (2008g, 2009j), Butchart & Stattersfield (2004), Dean (2000), Fry & Keith (2004), Goodwin (1982), Güttinger & Nicolai (1973), Hockey *et al.* (2005), Nicolai *et al.* (2007), Pöhland (1969, 1970), Stattersfield & Capper (2000).

29. Lavender Waxbill

Estrilda caerulescens

French: Astrild queue-de-vinaigre **Spanish**: Estrilda Azulada
German: Lavendel-Schönbürzelastrild
Other common names: Lavender Finch/Firefinch, Red-tailed Lavender Waxbill

Taxonomy. *Fringilla caerulescens* Vieillot, 1817, Senegal.
Has been thought to form a superspecies with *E. perreini*, possibly with *E. thomensis* included in same grouping. Monotypic.
Distribution. Senegal, Gambia, Guinea-Bissau, N Guinea and S Mali (upper R Niger) E to N Nigeria, N Cameroon, S Chad and N Central African Republic.
Introduced in Hawaiian Is.



Descriptive notes. 10 cm; 8–15·1 g. Male is mostly pearly grey above and below; black streak from lores through eye, red rump and uppertail-coverts, outermost pair of rectrices dark grey, central rectrices crimson, rest of rectrices dark grey with crimson on outer web; belly and flanks sooty grey, flanks with a few white spots (few individuals), undertail-coverts red; iris dark brown, eyering black; bill pinkish-grey, tip, upper and lower ridges and cutting edges black; legs black. Female resembles male, but lower belly and flanks dark grey. Juvenile is paler than female, lacks black eyestripe, has rump, tail and undertail-coverts less bright red, flanks lack white spots. Voice. Calls high, piping, at constant pitch and thin in tone, "see-see-squee-see"; female contact call "tseeht-tseet", male "seet-tyoo" with accent and highest pitch at beginning of second note.
Habitat. Thickets and thicket edge, extending into woodland, rank patches on more open land, rocky hillsides, at margins of cultivation.
Food and Feeding. Diet includes small seeds of grasses, small fruits, and flowers (pollen and nectar), and also some insects. Forages in pairs and small groups; joins mixed flocks with other estrildids.
Breeding. Breeds in Aug–Sept rains in Senegal and Gambia and in Oct–Nov in Nigeria. Male takes slender stem of grass, flies to perch, stem held in bill, bill pointed upwards, and bobs up and down while singing. Nest a bulky ball with long entrance tunnel, made from grass, concealed well above ground in creepers; sometimes old nest of *Ploceus* weaver used. Clutch 4–6 eggs; incubation 11–12 days; nestling has bluish-white single swollen gape-flange with arc above and another below, swellings lined inside with black, pale pink palate with ring of five black spots, posterior two smaller than central and lateral spots; nestling period c. 19 days; young fed by parents for a further 14 days. Estimated annual survival in Nigeria 0·68.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common to scarce. Outside normal range recorded also in Liberia, where said to have been rare on Mt Nimba during 1967/68. In Ivory Coast, where frequent in N, several seen in S (Abidjan) in 1987 considered probably to have escaped from captivity.
Bibliography. Barlow *et al.* (1997), Dowsett-Lemaire & Dowsett (2005), Elgood *et al.* (1994), Fry & Keith (2004), Goodwin (1982), Immelmann *et al.* (1965), Kunkel (1959), McCarthy (2006), McGregor *et al.* (2007), Morel & Morel (1990), Nicolai *et al.* (2007), Puschner (2001b).

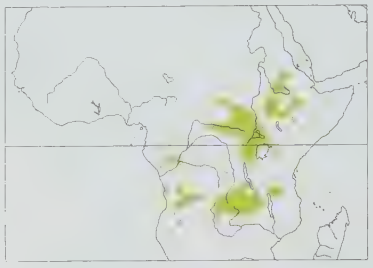
30. Fawn-breasted Waxbill

Estrilda paludicola

French: Astrild à poitrine fauve **German**: Sumpfastrild **Spanish**: Estrilda Pechiparda
Other common names: Abyssinian/Marsh/Buff-bellied Waxbill; Benguella Waxbill (*benguellensis*); (Uhehe) Rosy-flanked Waxbill (*roseicrissa*); Abyssinian (Fawn-breasted) Waxbill (*ochrogaster*)

On following pages: 31. Orange-cheeked Waxbill (*Estrilda melpoda*); 32. Crimson-rumped Waxbill (*Estrilda rhodopyga*); 33. Arabian Waxbill (*Estrilda rufibarba*); 34. Black-rumped Waxbill (*Estrilda troglodytes*); 35. Anambra Waxbill (*Estrilda poliopareia*); 36. Common Waxbill (*Estrilda astrild*).

Taxonomy. *Estrelda paludicola* Heuglin, 1863, middle course of Bahr el Ghazal, south-west Sudan.
Race *ochrogaster* sometimes considered a separate species; *benguellensis* and *ruthae* might form another species. In recent analysis of mitochondrial phylogeny, nominate race, *ochrogaster* and *roseicrissa* comprised a clade that included also *E. melpoda*, which occurs sympatrically with present species and is clearly a distinct species; *benguellensis* and *ruthae* comprised another, multi-species clade, with closest relatives nominate race, *ochrogaster* and *roseicrissa* and also *E. melpoda*, *E. troglodytes*, *E. rhodopyga* and *E. rufibarba*. Further study required. Six subspecies recognized.
Subspecies and Distribution.
E. p. ruthae Chapin, 1950 – S Gabon, S PRCongo, and SW DRCongo (along middle R Congo near Kinshasa).
E. p. paludicola Heuglin, 1863 – S Sudan, E Central African Republic, N DRCongo (E to Ituri), N Uganda and W Kenya.
E. p. ochrogaster Salvadori, 1897 – Ethiopia and SE Sudan.
E. p. roseicrissa Reichenow, 1892 – E DRCongo S of L Edward, SW Uganda, Rwanda, Burundi and NW Tanzania.
E. p. benguellensis Neumann, 1908 – Angola, S DRCongo (Upper Katanga) and Zambia.
E. p. marwitzi Reichenow, 1900 – SC Tanzania.

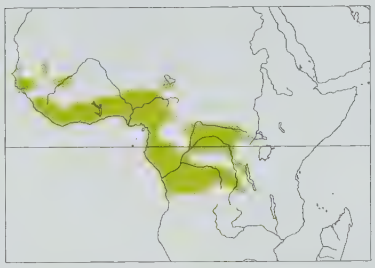


Descriptive notes. 9–10 cm; 6·6–8·5 g (nominate). Male nominate race has head grey, lighter grey on lores, cheek and ear-coverts, upperparts and upperwing brown, rump and uppertail-coverts red, tail black; throat whitish; breast to belly yellowish-buff, washed olive-grey on sides, centre of belly washed brighter yellowish-buff, some feathers tipped pink or red, undertail-coverts buffy white; iris red to reddish-brown, eyering grey; bill red; legs dusky brown. Female is very like male, but top of head browner, no pink on underparts. Juvenile is like adult, but crown brown, underparts paler, bill black. Race *ochrogaster* has upperparts more yellowish than nominate, crown slightly greyer than back, lores and cheeks tinged yellow, chin to breast and belly golden-buff, belly with some pink; *roseicrissa* differs from nominate in having top of head concolorous with back, underparts buff and whitish with no yellow tinge, central belly patch rose-pink, female with pink tinge on belly; *marwitzi* is like previous, but upperparts darker brown, flanks greyer, vent tipped pink; *benguellensis* has head dark grey, back and wings brown, breast to belly buff, flanks washed grey, centre of belly washed yellow, lower flanks and vent tipped pink or red; *ruthae* is paler above, face greyish-white, throat to undertail-coverts white. Voice. Contact calls chattering, "wilit" (*benguellensis*) or "tjip", "jzi", "krr-jee" and a downslurred "sieu" (*ochrogaster*). Song (*ochrogaster*) a rhythmic "tek tek tek teketri teketri teketri" and variations, in rhythm similar to song of *E. melpoda*, but tone more hard and ringing.
Habitat. Tall grass, open damp grassy areas in woodland, along streams and rivers, grassy clearings in forest, forest edge, edge of cultivation; often in flocks in tall grass. In Ethiopia at 1200–2100 m, in Uganda mainly below 1500 m, in E DRCongo (Kivu) to 1900 m.
Food and Feeding. Small seeds of grasses; also some insects. Seeds taken from stem and from the ground. Forages in pairs and in small groups, also in larger flocks of 30 or more individuals; associates with congeners.
Breeding. Breeds in rains, in Jul–Aug in Sudan, mainly Feb–May in Uganda, and Nov–Feb and Apr in Zambia. Courtship behaviour not described in detail, male holds grass stem in bill, bobs up and down; similar to that of *E. melpoda*. Nest a ball, with short downward-sloping entrance tunnel at side, often a "cock's nest" on top, made from grass, unlined, well concealed on ground or 10 cm above it at base of coarse grass. Clutch 4–6 eggs; incubation 12–13 days; nestling pink, lacks down, gape has swollen arc of white above corner of mouth, two whitish balls below it, all backed with black, palate pink with ring of five black spots, tongue has black bar and under it two black spots; nestling period 19–21 days; in captivity, young give song and courtship displays at age of 6 months. Nests occasionally parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common in most of range. The commonest waxbill in NE DRCongo from Buta E to L Albert. Uncommon and local in Kenya.
Bibliography. Ash & Atkins (2009), Brickell (1999b), Carswell *et al.* (2005), Chapin (1954), Clement *et al.* (1993), Dean (2000), Dowsett *et al.* (2008), Espley (2009b), Fry & Keith (2004), Goodwin (1982), Immelmann *et al.* (1965), Nicolai *et al.* (2007), Redman *et al.* (2009), Short *et al.* (1990), van Someren & Cunningham-van Someren (1949), Vincent (1949b), Zimmerman *et al.* (1996).

31. Orange-cheeked Waxbill
Estrilda melpoda

French: Astrild à joues orange **German**: Orangebäckchenastrild **Spanish**: Estrilda Carinaranja
Other common names: Rosy-cheeked Waxbill

Taxonomy. *Fringilla melpoda* Vieillot, 1817, Senegal.
Birds from Andali (N Adamawa), in E Nigeria, described as race *tschadensis* and others from Lulua Province, in S DRCongo, as race *fucata*, but neither appears to differ significantly from birds in rest of species' range. Treated as monotypic.
Distribution. Extreme S Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, S Mali, Sierra Leone and Liberia E to Nigeria, Cameroon, S Chad, Central African Republic, Gabon S to N Angola, and DRCongo, W Burundi and N Zambia.
Introduced in Caribbean (Puerto Rico, Guadeloupe and Martinique) and in Hawaiian Is.
Descriptive notes. 10 cm; 6·5–9·6 g. Male has orange face patch from lores to superciliary area and ear-coverts; forehead to nape grey, merging with brown on mantle and back; rump and uppertail-coverts red, tail blackish-brown, with red on basal fringes of some rectrices; throat whitish, side of neck and breast grey, flanks pale brownish-grey, belly whitish with buff tinge, more distinct yellow or pale orange patch in front of vent, undertail-coverts greyish-white; iris brown; bill deep orange to red; legs dusky brown. Female is very like male, but belly patch less intense in colour, yellowish. Juvenile is like adult, but rump reddish-brown, face patch paler, bill black. Voice. Calls weak and lispy, or squeaky, nasal and strident, "zee", a testy "chi-dee-chi". Song a variable medley of short notes, e.g. "de-de-sweea, sweea, sweea" or "tsee-ree-ree, tsee-ree-ree".
Habitat. Grassland, forest clearings, grassy road edges in forest, shrubby grassy woodland, edge of small thickets, coffee plantations, sugar-cane borders, cultivation.
Food and Feeding. Small grass seeds, small arthropods. In Nigeria, adults feed themselves and their young with small seeds of the grasses *Panicum*, *Digitaria*, *Sporobolus*, *Chloris* and *Urochloa*,

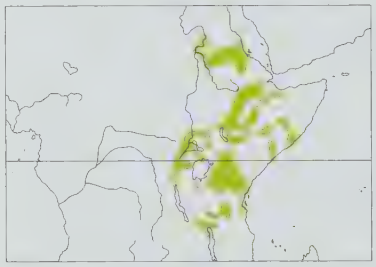


and small insects e.g. termites (Isoptera), caterpillars, Diptera larvae, also spiders (Araneae). Takes seeds while perched on the stems, but more often on ground. Forages in pairs and small groups, outside breeding season also in larger flocks; often associated with other estrildids.
Breeding. Breeds during rains, in Sept and Oct in Gambia, Jul–Aug in Sierra Leone, Apr–Oct (peak in Jul) in SW Nigeria (Ile-Ife), Feb in Angola and Feb–Apr in Zambia. In courtship, male takes slender grass stem, flies to a perch and holds stem in bill, pointed skywards, bobs up and down, sings a shrill song, gradually edging closer to female; copulation usually inside nest. Nest a rounded covered structure with short entrance tube, often a "cock's nest" built on top, made from coarse grass blades, stems and tops, placed low in grass or on ground. Clutch usually 4–6 eggs; incubation 11 days; nestling pink, lacks down, gape has swollen arc of white above corner of mouth, two whitish balls below it, all backed with black, palate pink with ring of five black spots, tongue has black bar and beneath it two black spots; nestling period 20–21 days; young fed by parents for a further 12 days. Nest sometimes parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident; some wandering and local shifts with rains.
Status and Conservation. Not globally threatened. Common to abundant in most of range. Uncommon to rare at S edges of range, e.g. rare in NW Burundi and restricted to shores of L Mweru in Zambia; one record (of small flock) in Rwanda. In SW Nigeria, 33 nests found on college campus of 5065 ha (0·65 nests/km²); density of 4–5 birds/ha in Gabon.
Bibliography. Akinpelu (1994b, 1997), Barlow *et al.* (1997), Bates (1911, 1930), Benson *et al.* (1971), Chapin (1954), Dean (2000), Dowsett *et al.* (2008), Fry & Keith (2004), Goodwin (1982), Harrison (1962a), Immelmann *et al.* (1965), Kunkel (1959), Mayer (1999), McCarthy (2006), Nicolai *et al.* (2007), Payne (2005a).

32. Crimson-rumped Waxbill
Estrilda rhodopyga

French: Astrild à croupion rose **German**: Zügelastrild **Spanish**: Estrilda Culirroja
Other common names: Rosy-rumped/Rosy-winged/Red-rumped/Sundevall's Waxbill

Taxonomy. *Estrilda rhodopyga* Sundevall, 1850, north-eastern Africa = Sennar, Sudan.
Recent studies of mitochondrial phylogeny indicate that this species is sister to *E. rufibarba*. Two subspecies recognized.
Subspecies and Distribution.
E. r. rhodopyga Sundevall, 1850 – E Sudan, W Eritrea, NE Ethiopia and NW Somalia.
E. r. centralis Kothe, 1911 – SE Sudan, Ethiopia (except NE), NE DRCongo, Uganda, Kenya, S Somalia, Tanzania and N Malawi.



Descriptive notes. 10–10·5 cm; 6·6–9·5 g (*centralis*). Male nominate race has red lores and red stripe through eye to above ear-coverts, grey crown, greyish-brown upperparts indistinctly barred on wing-coverts, with red rump, uppertail-coverts and edges of tail feathers; flight-feathers and rest of tail dark brown, red edges on tertials and wing-coverts (forming two red patches on closed wing); face and throat whitish, breast buffy white, belly to undertail-coverts tawny pink, flanks and belly with narrow dusky barring, vent and undertail-coverts barred blackish; iris dark brown, eyering grey; bill black, sometimes red near cutting edge; legs dark grey. Female is like male, but underparts paler. Juvenile is like adult, but lacks red eyestripe, feathers lack barring, bill black. Race *centralis* is darker than nominate, underparts darker, more brown, undertail-coverts crimson. Voice. Contact call a soft "sspt-sspt"; other calls a hard and grating "jup", a "ja-jip", a nasal "jaaa", a rising "tchair". Song described as "tcheker-cherr, tche-chaaer", last note loudest and rising in pitch.
Habitat. Dry bushy grassland, acacia (*Acacia*) savanna, thickets, marshy grassland, and overgrown cultivation.
Food and Feeding. Small grass seeds, also tips of grass shoots; also ant larvae (Formicidae), termites (Isoptera), aphids (Aphidoidea) and spiders (Araneae). Takes seeds while perched on the stem and on the ground; holds grass panicle in foot. Forages in pairs and small groups; sometimes mixes with other estrildids.
Breeding. Breeds Sept and May in Uganda, and Mar, Apr and Jul in Kenya. Courting male holds grass stem in bill, head high, forehead sleeked, fluffs feathers of belly and flanks, bends tail towards female, bobs up and down, at times he turns head towards female, waves the grass from side to side, and gradually moves closer to her; displays same as those of *E. troglodytes*. Nest a large ball with open cock's nest and a side entrance, made from grass leaves and stems, and shreds of leaves, decorated with feathers and clumps of fine roots and flowering grass-heads, placed on ground or, rarely, as high as 9 m above ground. Clutch 4 eggs; incubation 12–14 days; nestling without down, skin pink, darkening to pinkish-grey, above gape a C-shaped white swelling, below it two white papillae with black base (when mouth closed, gape appears as black spot surrounded by white swelling), palate pink with ring of five spots, tongue has black bar; nestling period 17–19 days; young return to sleep in nest for a week after leaving it. Nest sometimes parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident; in arid N Kenya, appears after periods of high rainfall.
Status and Conservation. Not globally threatened. Generally common; uncommon to rare in Somalia. Local in DRCongo, where rare on Lendu Plateau. A single record from extreme NW Mozambique.
Bibliography. Ash & Atkins (2009), Carswell *et al.* (2005), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), McCarthy (2006), Nicolai *et al.* (2007), Payne (2005a), Redman *et al.* (2009), Zimmerman *et al.* (1996).

33. Arabian Waxbill
Estrilda rufibarba

French: Astrild barbe-rousse **German**: Jemenastrild **Spanish**: Estrilda Árabe

Taxonomy. *H.*[*abropyga*] *rufibarba* Cabanis, 1851, Arabia.
Recent studies of mitochondrial phylogeny indicate that this is a close sister-species of *E. rhodopyga*. Was in the past thought to be closest to *E. troglodytes*, on the grounds of plumage similarities; or to *E. rhodopyga*, on the grounds of similarities in habitat choice and plumage; or to be a hybrid. Monotypic.
Distribution. SW Saudi Arabia and W Yemen.



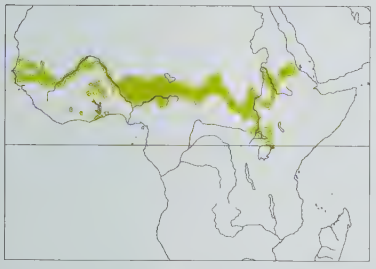
Descriptive notes. 10 cm; one bird 8·5 g. Male has red lores and eyestripe; forehead to nape and upperparts greyish-brown, faintly barred on nape, more barred on mantle, back and upperwing-coverts; rump and uppertail-coverts black; flight-feathers and tail black or blackish, outer tail feathers edged white; face (below eyestripe) to chin and throat white, breast buffy white and becoming pale buff on belly, underparts finely barred; iris dark brown; bill short, black, in breeding season red at base; legs black. Female is like male, but darker buff below, eyestripe nearly black on some. Juvenile resembles adult, but crown and upperparts browner, darker, less barred, eyestripe black, bill darkish grey. Voice. Contact call and flight call a repeated hard buzzing "dzit", "dzeet", "chzit" or "chee"; flocks produce constant "tse-tseee" in noisy buzzing chatter.
Habitat. Wadis and valleys, rocky hillsides with thick scrub or trees, weedy thickets, patches of reeds and tamarisk (*Tamarix*), near cereal cultivation; between 250 m and 2500 m, mostly above 1000 m.
Food and Feeding. Small seeds of sedges (Cyperaceae), rushes (Juncaceae), grasses, including cereals, and herbs; recorded also as taking seeds in riverine scrub (e.g. *Jatropha*), and those of *Chenopodium*, tamarisk and *Aerva javanica* (Amaranthaceae), the last considered a weed by farmers. Strips seeds from grasses and picks them from ground; sometimes two or more individuals land on grass or cereal stem, bending it towards the ground, and the one closest to seeds then feeds on them. Forages in pairs and small groups; in non-breeding season in larger flocks, occasionally with *Amandava subflava*.
Breeding. Recently fledged juveniles seen and a bird carrying nest material in early May in S Yemen (Tarim). No other information.
Movements. Resident; some post-breeding wandering.
Status and Conservation. Not globally threatened. Restricted-range species: present in Southwest Arabian Mountains EBA. Fairly common. Seems to be dependent to a great extent on agriculture; although it often feeds on seeds of cereals, however, it is thought not likely to be a threat to agriculture as it is not overly abundant.
Bibliography. Anon. (2008g), Christensen & Porter (1987), Clement *et al.* (1993), Dunning (2008), Dymond (1996), Goodwin (1982, 1987), Hollom *et al.* (1988), Jennings & Al Salama (1988), Martins *et al.* (1996), Meinertzhagen (1954), Nicolai *et al.* (2007), Porter *et al.* (2004).

34. **Black-rumped Waxbill**

Estrilda troglodytes

French: Astrild cendré **German**: Grauastrild **Spanish**: Estrilda Culinegra
Other common names: Red-eared/Pink-cheeked/Grey Waxbill

Taxonomy. *E.*[*ringilla*] *Troglodytes* M. H. C. Lichtenstein, 1823, Senegambia.
Monotypic.
Distribution. S Mauritania, Senegal, Gambia, Guinea-Bissau, S Mali, Ivory Coast, Burkina Faso, Ghana (to coast in S), Togo, Benin, N Nigeria, S Chad, N Central African Republic, S Sudan, W Ethiopia, W Eritrea, NE DRCongo, Uganda and SW Kenya.
Introduced in Caribbean (Puerto Rico, Guadeloupe, Martinique) and in Hawaiian Is.



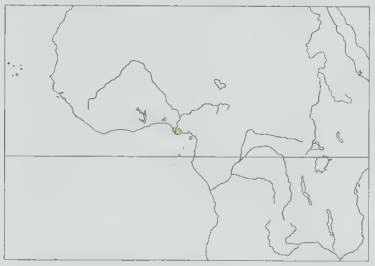
Descriptive notes. 10 cm; 6·9–8·2 g. Male has lores and eyestripe to above ear-coverts red; forehead to back light grey-brown, back finely barred dark grey, rump and uppertail-coverts black, tail black, outer rectrices have white on outer web; flight-feathers dark brown; face (below red eyestripe) whitish, underparts whitish with pink tinge, flanks faintly barred, vent and undertail-coverts white; iris brown, eyering grey; bill red; legs purplish-brown to blackish. Female lacks pink tinge below. Juvenile is similar to adult, but eyestripe black, upperparts paler or duller and unbarred, underparts lack pinkish tinge, bill black. Voice. Calls include harsh "chuur", "chew-tch-tch", nasal downslurred "jeeeu", and drawn-out, rising "chihooee". Song loud and explosive, "tche-tcheeer!" or "chee-eeer!", second note upslurred, and "t'chu-weee", last note downslurred.
Habitat. Grassy woodlands, dense woods and thickets, bases of inselbergs, dry grassland, abandoned cultivation, tall rank grass near water, and edges of swamps.
Food and Feeding. Seeds of grasses and herbs; also small insects, including termites (Isoptera). Takes seeds from fruiting head while perched on a grass stem, and fallen seeds on the ground. Forages in pairs and small groups, sometimes in large flocks; mixes with other estrildids.
Breeding. Season Jul–Dec in Senegal and Gambia, recently fledged young in Oct in Togo, laying in Jul and Aug in Nigeria, Jun–Jul in Sudan and Jun in Kenya. Courting male holds a piece of grass in bill, head held high, grass dangling, forehead sleeked, he fluffs belly and flank feathers, bends tail towards female, and extends and flexes legs as he bobs up and down, at times he turns head towards female, waves grass from side to side, and gradually works his way closer to her (first part of this behaviour may be aggressive or greeting display, rather than courtship). Nest a ball-shaped mass of dry grass-heads, with partly covered extension at one side, placed on ground at foot of clump of long grass or dense bush. Clutch 4–5 eggs; incubation 11–12 days; nestling naked, skin pink, after a few days darkening to pinkish-grey, above gape a C-shaped white swelling and below it two white papillae with black base (when mouth closed, anterior lower papilla fits into arc of upper swelling, and posterior papilla behind upper arc, gape appearing as black spot surrounded by white swelling), palate pink with ring of five spots, tongue with black bar; nestling period 17–20 days; young return to nest to roost at night. Nest sometimes parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident. Possibly a wet-season breeding visitor in Ghana coastal thicket in Mar–Nov and in Chad Sahel in Jul–Oct.
Status and Conservation. Not globally threatened. Locally common to uncommon. Very patchily distributed in W of range, where generally not common, but very common in some places, e.g. parts of Gambia. Reasonably common in Sudan and Ethiopia; uncommon in Kenya.
Bibliography. Barlow *et al.* (1997), Bielfeld (2008), Chcke & Walsh (1996), Fry & Keith (2004), Goodwin (1982), Grimes (1987), Kunkel (1959, 1967b), McCarthy (2006), Morel & Morel (1962, 1990), Nicolai *et al.* (2007), Payne (2005a), Redman *et al.* (2009).

35. **Anambra Waxbill**

Estrilda poliopareia

French: Astrild du Niger **German**: Anambraastrild **Spanish**: Estrilda del Níger

Taxonomy. *Estrilda poliopareia* Reichenow, 1902, south Nigeria.
Recent studies of mitochondrial phylogeny indicate that this is a distinct species, closest to *E. astrild*. In the past was sometimes thought to be a race of latter (both having barred plumage above and below) or of *E. paludicola* (both having red rump and lacking red eyestripe). Monotypic.
Distribution. S Nigeria: Onitsha, Forcados, R Nun, R Niger delta, Badagri.



Descriptive notes. 11–12 cm. Male has forehead to hindneck greyish-brown, upperparts dull olive-yellow, faintly barred, rump and uppertail-coverts plain red, tail dark brown, with red on basal fringes of some rectrices; face below eye tan, throat whitish, breast pale buff, belly to undertail-coverts buff, deeper and browner on flanks; iris cream-coloured, eyering black; bill comparatively deep, bright orange-red; legs grey-brown. Female is slightly paler below than male. Juvenile undescribed. Voice. Little known; "tzzzt" calls described.
Habitat. Tall grasses and sedges (Cyperaceae) on sandy riverbanks, swamps, and sandy shores at estuaries, also long grass within or on fringes of open deciduous forest; seen also in manioc (*Manihot esculenta*) plantations, and frequently found close to human habitations. Often in areas with tall elephant grass (*Pennisetum*), which perhaps important as nesting habitat and for shelter, and manioc plantations likewise useful in providing shelter.
Food and Feeding. Small seeds of sedges and grasses (of genera *Kyllinga*, *Fimbristylis*, *Digitaria* and *Panicum*), seeds and flowers of elephant grass (when other grasses flooded); seeds of chickweed (*Cerastium*), and of weeds in yam (*Dioscorea*) plantations. Climbs on and clings to grass stems; takes seeds from seedheads. Forages in pairs and small groups, sometimes in larger flocks of up to c. 30 individuals; mixes with flocks with *E. melpoda*.
Breeding. Thought to breed after river levels recede following Oct–Nov floods; bird with nest material observed in stand of elephant grass at end of Apr, and female with large developing egg yolk in Jun. No other information.
Movements. Probably resident. Possibly some short-distance movement following flooding in severe rainy seasons, but observations at Tombia in late Oct 2001 suggest that in some areas, at least, this species is sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Lower Niger Valley Secondary Area. Confined to few localities in S Nigeria. Was apparently common at one locality (Onitsha) in 1954. Very few records since 1980, despite considerable dedicated searching; two (possibly five) individuals at Onitsha in 1987, and flock of 40 individuals in grounds of a nursing home at Tombia (S of Yenagoa) in 2002. Also, between March 2001 and April 2002, groups of 1–30 birds observed on nine dates at twelve localities in Niger Delta; on basis of numbers recorded during this period, estimated total population at least 500 individuals. Despite large areas of apparently suitable habitat, population appears still to be very small; as habitat appears not to be at any risk, and no other threats known, paucity of recent records in a heavily inhabited region suggests that a factor as yet unidentified may be acting against this species. Its dependence on weeds associated with disturbance and its tolerance of, or even preference for, areas of human activity suggest that dredging of R Niger or other types of disturbance should not have adverse effects on its population. Proposed conservation measures for this estrildid include the conducting of field surveys to determine its distribution more exactly and to ascertain its habitat requirements; and assessment of any potential threats.
Bibliography. Anon. (2008g, 2009j), Ash (1990), Butchart & Stattersfield (2004), Collar & Stuart (1985), Elgood *et al.* (1994), Fry & Keith (2004), Gerdes (1993b), Goodwin (1982), Heinroth (1907), Roux & Otobotkere (2005), Serle (1957), Stattersfield & Capper (2000).

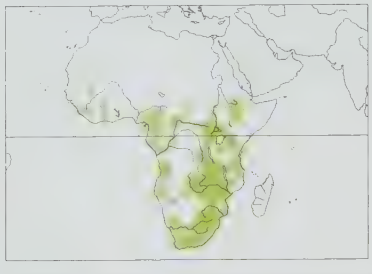
36. **Common Waxbill**

Estrilda astrild

French: Astrild ondulé **German**: Wellenastrild **Spanish**: Estrilda Común
Other common names: Brown/Barred Waxbill, St Helena Waxbill; Black-lored/Black-faced(!)/Kiabo Waxbill (*nigriloris*)

Taxonomy. *Loxia Astrild*, Linnaeus, 1758, "Canaries, America, Africa" = Cape Town, South Africa.
Distinctive black-faced race *nigriloris* sometimes considered a separate species, morphologically distinct from other races and not overlapping them in range; in recent studies of mitochondrial phylogeny, however, *nigriloris* found to be embedded in single clade with all other races, and to be genetically nearly identical to *adesma* and *cavendishi* (which it replaces along R Lualaba), and slightly more different from *rubriventris* and *occidentalis*. Other proposed races include *sousae* (described from São Tomé, where species introduced), treated as synonym of *jagoensis*; *schoutedeni* (from Mbuji-Mayi, capital of Kasai-Oriental, in SC DRCongo), synonymized with *cavendishi*; and *ngamiensis* (from Shorobe, in NW Botswana), synonymized with *niediecki*. Race *adesma* sometimes listed as *nyansae*, but under the ICZN Code this name is permanently invalid, having been replaced due to secondary homonymy prior to 1960. Sixteen subspecies currently recognized.
Subspecies and Distribution.
E. a. kempi Bates, 1930 – W Guinea, Sierra Leone and Liberia.
E. a. occidentalis Jardine & Fraser, 1851 – S Mali, Ivory Coast, Bioko I (Fernando Póo), and Nigeria E to N DRCongo.
E. a. macmillani Ogilvie-Grant, 1907 – S Sudan.
E. a. peasei Shelley, 1903 – Ethiopia.
E. a. rubriventris (Vieillot, 1823) – coastal Gabon S to NW Angola.

E. a. adesma Reichenow, 1916 – E DRCongo, Uganda, Rwanda, Burundi and NW Tanzania.
E. a. massaica Neumann, 1907 – C Kenya S to N Tanzania.
E. a. minor (Cabanis, 1878) – S Somalia, E Kenya, NE Tanzania, and Zanzibar I.
E. a. nigriloris Chapin, 1928 – upper R Lualaba and L Upemba, in SE DRCongo.
E. a. cavendishi Sharpe, 1900 – SE DRCongo (except L Upemba area) and S Tanzania S to Zambia, Zimbabwe and Mozambique.
E. a. jagoensis Alexander, 1898 – coastal W Angola.
E. a. angolensis Reichenow, 1902 – W Angola (except coast).
E. a. niediecki Reichenow, 1916 – C Angola E to SW Zambia, N Botswana and W Zimbabwe.
E. a. damarensis Reichenow, 1902 – Namibia.
E. a. astrild (Linnaeus, 1758) – S Botswana, and W & S South Africa (North West Province S to Western Cape and Free State).
E. a. tenebridorsa Clancey, 1957 – N & E South Africa (Limpopo S to Eastern Cape and KwaZulu-Natal) and W Swaziland.
Introduced (mainly nominate race and *jagoensis*) in many parts of world, including in Europe (Portugal, Spain) and South America (Brazil, Trinidad), and on islands in Atlantic (Cape Verdes, Ascension, St Helena), in Gulf of Guinea (São Tomé and Príncipe), in Indian Ocean (Seychelles Is, Amirantes Is, Mauritius, Reunion, Rodrigues), and in Pacific Ocean (New Caledonia, Tahiti, Hawaii).



Descriptive notes. 9·5–13 cm; 6–11 g. Male nominate race has red stripe from lores back to above ear-coverts; top of head and upperparts pale greyish-brown, finely barred dark brown, flight-feathers and tail dark brown, tail feathers lightly barred; lower face and throat off-white to pale greyish, often tinged pinkish, breast, flanks and side of belly buffy brown, tinged pink and narrowly barred dark brown, centre of belly bright pink, vent and undertail-coverts black; iris dark brown, eyering grey; bill red; legs black. Female differs from male in having underparts less pink, belly patch smaller, vent and undertail-coverts fuscous. Juvenile is like adult, but underparts buffier, pinkish in mid-line, red eyestripe paler and narrower, feather barring less intense, bill black, white swellings at gape. Races differ mainly in plumage tone, amount of pinkish in plumage, and prominence of barring: *tenebridorsa* is slightly darker than nominate, underparts more brown; *damarensi* is paler than nominate, top of head greyer; *jagoensi* is paler and with dark barring less distinct than previous; *niediecki* is slightly darker than *damarensis*, more grey-brown than nominate, and more boldly barred; *cavendishi* has lower face and throat whiter, throat tinged pink, barring above more prominent, broad red or reddish-pink longitudinal stripe on centre of belly; *angolensis* is like previous, but with stronger pink wash on upperparts and flanks; *rubriventris* has strong pink tinge, upperparts darker, tinged red (especially rump and uppertail-coverts), cheek tinged pink, breast to belly and flanks rosy red; *minor* is small, paler than *cavendishi*, red confined to belly patch; *massaica* is larger and darker than last, like *cavendishi* but less pink below, red confined to belly patch; *peasei* resembles previous, but barring below restricted to flanks; *macmillani* is smaller than preceding race, paler above and below, pink of breast and belly less intense; *adesma* is greyer above than last, with more pronounced barring, no distinct belly patch; *occidentalis* is similar to *peasei*, but less barred on breast, no distinct belly patch, underparts less pink; *kempi* differs from last in having upperparts greyer; *nigriloris* is distinctive, has eyestripe black (red on all other races), lower face whitish, breast and belly light pink, centre of belly red patch. Voice. Contact call a sharp "jip"; distance contact call or song 2 or 3 sharp notes followed by rising bubbling sound, "ti-cket please!" or "di-di-di-JEEE".
Habitat. Tall grass, grassy fields, swamps and marshes, sedge (Cyperaceae) marshes, grassy edges of streams and dams, grassy clearings, acacia (*Acacia*) savanna, montane grassland, abandoned cultivation, and grassy areas in towns and gardens.
Food and Feeding. Small grass seeds, also seeds of sedges and of herbs, including stinging nettles (*Laportea*); also small insects, including ants (Formicidae), termites (Isoptera) and moths (Lepidoptera). Takes unripe grass seeds from fruiting head while perching or clinging on stem; also jumps from ground to bring seeding head down to ground, and holds the head under foot as it takes seeds. Also picks fallen seeds on ground. Gregarious, forages generally in small groups; outside breeding season also in larger flocks. Often tame.
Breeding. Breeds at any time of year in Gabon, in Sept–Nov and Mar on Bioko, and May, Jun and Aug–Sept in Ethiopia; in E Africa in second half of rainy season, in Uganda Mar–Jul, with a few records Oct–Jan; Dec–Apr (mainly Jan–Feb) in Zambia and Dec–Apr also in Malawi; in South Africa, Nov–Jun in N, Sept–Oct in SW (near Cape Town) and Nov–Dec in Eastern Cape. In courtship, male takes slender grass stem, flies to perch and holds stem in upward-angled bill, fluffs belly and flank feathers, tilts body away from female to expose underparts, angles tail and head towards her, jerks up and down as he stretches and flexes legs, and after a few jerks he sings; female responds with same display, but does not sing. Nest a large hollow ball with side entrance and sometimes a downspout, and with open "cock's nest" above, made from grass, the ball lined with fine grass and grass-heads and often with bits of fur picked from dung of carnivores (especially cats), built on ground or low in bush; nests with dung odour less likely to suffer predation. Clutch 4–6 eggs; incubation period 12 days; nestling naked, skin pink, after a few days darkening to pinkish-grey, above gape a C-shaped white swelling, below it two white papillae with black base (when mouth closed, anterior lower papilla fits into arc of upper swelling, posterior papilla behind upper arc, and gape appears as black spot surrounded by white swelling), palate pink with ring of five spots, tongue has black bar; nestling period 17–19 days; fledglings fed by both parents, independent at 4–5 weeks. Brood-parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident, with some local movements. Nomadic movements reported in E Africa; in South Africa, near Cape Town, more common in spring and early summer (Sept–Feb) than in rest of year. Recoveries of marked individuals in South Africa at 20 km and 35 km from site of ringing.
Status and Conservation. Not globally threatened. Race *nigriloris*, when treated as a separate species, Data-deficient; also a restricted-range taxon, present in Upemba Plains Secondary Area. This species is widespread and generally common to locally abundant; local and uncommon in Ivory Coast and Sudan. Status in Ghana uncertain; one old record from Tumu (near Burkina Faso border), and species possibly resident locally in NW (near Ivory Coast border). Uncommon in most of S Mozambique (Sul do Save), where population perhaps in excess of 20,000 individuals. Densities of 125 pairs/km² in rural districts and 10 pairs/km² in suburbs in South Africa; 230 birds/km² of acacia savanna in Swaziland. Race *nigriloris* very poorly known, thought to be confined to area of no more than c. 2600 km² around upper R Lualaba and L Upemba, in SE DRCongo, but no definite records since 1950; historical records of small flocks in grassy plains with tall grasses and bushes. Taxonomic status of *nigriloris* disputed, and requires study; also, surveys needed in order to determine its distribution, habitat requirements and population level, assuming that it still survives in the region.

Bibliography. Anon. (2009j), Ash & Atkins (2009), Britton (1980), Brosset & Érard (1986), Butchart & Stattersfield (2004), Carswell *et al.* (2005), Chapin (1928, 1954), Clement *et al.* (1993), Collar & Stuart (1985), Cramp & Perrins (1994), Dean (2000), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Eisentraut (1973), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Kunkel (1959), Leventis & Olmos (2009), Maclean (1993), McCarthy (2006), Nicolai *et al.* (2007), Payne (2005a), Redman *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (2009), Schuetz (2005a, 2005b), Skead (1957), Zimmerman *et al.* (1996).

PLATE 18 ➤



PLATE 18

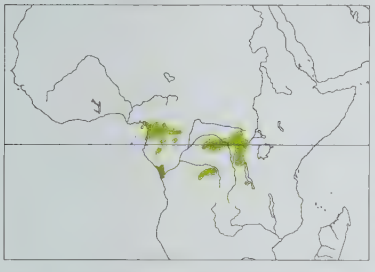
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37. Black-headed Waxbill

Estrilda atricapilla

French: Astrild à tête noire **German**: Kappenastrild **Spanish**: Estrilda Capirotada
Other common names: Grey-breasted Waxbill

Taxonomy. *Estrelda atricapilla* J. Verreaux and É. Verreaux, 1851, Gabon.
Sometimes placed with *E. kandti* and *E. nonnula* in a separate genus, *Krimhilda*. May form a superspecies with *E. kandti*, and formerly considered conspecific. Recent studies of mitochondrial phylogeny indicate that nominate race and race *avakubi* appear as a sister-clade to *E. nonnula* and nominate race of *E. kandti*. Three subspecies recognized.
Subspecies and Distribution.
E. a. atricapilla J. Verreaux & É. Verreaux, 1851 – S Cameroon S to PRCongo, E to NE DRCongo.
E. a. avakubi Traylor, 1964 – NW & NE Angola (Cabinda, N Lunda Norte) and SW & C DRCongo.
E. a. marungensis Prigogine, 1975 – Marungu Mts, in SE DRCongo.



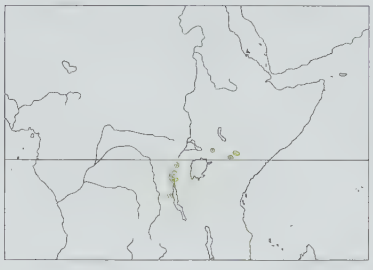
Descriptive notes. 10–10·5 cm; one bird 7·8 g (nominate). Male nominate race has forehead, crown and nape down to lores and eye black; upperparts, including upperwing-coverts, greyish with black bars (dark and light bars nearly equal in width), barring continues onto inner secondaries, where 4–7 pairs of bars in 10 mm; rump and uppertail-coverts red, tail black; face and throat whitish becoming smoky-grey on ear-coverts and neck, dark grey breast and belly, lower belly and undertail-coverts black, large red patch on flanks; iris dark brown, eyering dark grey; bill black, red patch on side of lower mandible near base; legs black. Differs from very similar *E. nonnula* in having larger red flank patch extending lower down on flank. Female is similar to male, but has less red on flanks. Juvenile is brown, with upperparts and underparts diffusely barred, rump dull red, bill black. Race *avakubi* has upperparts paler grey than nominate, barring on back and scapulars more broadly spaced, pale grey bars on secondaries 2–3 times as wide as black bars (4–5 pairs of bars in 10 mm), more extensively whitish on face and throat, breast pale grey, lower belly and undertail-coverts sooty grey; *marungensis* has upperparts like previous race, cheek and throat grey, undertail-coverts reddish. Voice. High thin "psee" and "tsree" calls, and short "psit"; similar to calls of *E. nonnula*.
Habitat. Forest clearings with tall grasses and sedges (Cyperaceae), and grassy patches around villages and roads. Occurs together with *E. nonnula* in E DRCongo.
Food and Feeding. Small grass seeds, ants (Formicidae), winged termites (Isoptera). Takes growing seeds while it clings to stems of tall grass; picks fallen seeds on ground. Forages in small flocks, sometimes in larger flocks; associates with other estrildids, especially *E. nonnula*.
Breeding. Nests in Sept, Nov–Feb, Apr and Jun in Gabon and Jun and Oct in NE DRCongo (Avakubi). In courtship, male holds a piece of grass in bill, fluffs belly and flank feathers, and bobs up and down. Nest an ovoid structure of fine grass stems and flowering heads, with long tube to entrance on side, often a "cock's nest" on top, placed 1–2 m above ground in bush. Clutch 4–5 eggs; incubation 12 days; nestling skin pale pink, nearly naked, gape has white swollen curved arc with black margin and black inner surface above gape, and shorter swollen arc with black lining from gape to below (on hatchling, gape end of arc bluish-white), when closed mouth has upper arc in front of lower arc, palate pinkish-white with ring of five black spots, tongue with two black spots, and lower mouth with black crescent; nestling period 18–20 days.
Movements. Apparently resident.
Status and Conservation. Not globally threatened. Generally common, and locally abundant; uncommon in Angola. Density of 4–8 birds/ha recorded in Gabon.
Bibliography. Bates (1909, 1911), Chapin (1954), Dean (2000), Fry & Keith (2004), Goodwin (1982), Karr (1976), Kleefisch (1996), Kunkel (1967b), Mayer (1997b), McCarthy (2006), Nicolai *et al.* (2007), Prigogine (1975a, 1975b, 1980, 1984a, 1984b), Urlepp (1996), Zimmerman *et al.* (1996).

38. Kandt's Waxbill

Estrilda kandti

French: Astrild de Kandt **German**: Kandtastrild **Spanish**: Estrilda de Kandt
Other common names: Grauer's Waxbill; Kenya Mountain Waxbill (*keniensis*)

Taxonomy. *Estrilda kandti* Reichenow, 1902, Lake Kivu, eastern Africa.
Sometimes placed with *E. atricapilla* and *E. nonnula* in a separate genus, *Krimhilda*. May form a superspecies with *E. atricapilla*, and formerly considered conspecific. Recent studies of mitochondrial phylogeny indicate that nominate race of this species and *E. nonnula* form a sister-clade to nominate race and race *avakubi* of *E. atricapilla*; race *keniensis*, sometimes thought to represent a separate species, appears as sister to all of those. Proposed race *graueri* (described from Mt Sabinjo, in W Kivu volcanoes) is a synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
E. k. kandti Reichenow, 1902 – Albertine Rift region in montane EC DRCongo, Uganda, Rwanda and Burundi.
E. k. keniensis Mearns, 1915 – Kenya (Mt Elgon, Aberdare Mts, Mt Kenya).
Descriptive notes. 10–10·5 cm; 8 g. Male nominate race has forehead, crown and nape down to lores and eye black; upperparts, including upperwing-coverts, brownish-grey, finely and indistinctly barred black, rump and uppertail-coverts red; barring extends to inner secondaries, where 5–7 pairs of dark and light bars in 10 mm; tail black; cheek and ear-coverts whitish, merging with greyish-white on side of neck; chin and throat whitish, breast and upper belly grey, lower belly sooty grey, undertail-coverts black, flanks with large red patch (often concealed by wing); iris dark brown; bill black, red spot on side of lower mandible near base; legs black. Female is duller than male, back and wings with more olive-brown tinge, barring dark grey, breast brownish-grey, belly dark grey, flanks with less red. Juvenile is similar above to female, back greyish-brown and only faintly barred, rump and uppertail-coverts duller red, cheek and chin light grey, breast brown, grading to greyish-brown on belly and sooty grey on lower belly and undertail-coverts. Race



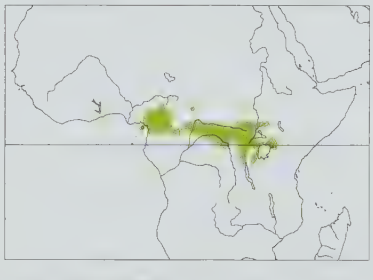
keniensis has back slightly more brown above than nominate, sexes similar, female back slightly less brown than nominate. Voice. Contact call a high, thin "tee-tee-tee"; song (in Kenya) a chippering warble, "chureeecheet cher-wee-wee-ee-wee chi-chit".
Habitat. Montane glades and clearings, edges of forest, bamboo, and areas of bare rock. In DRCongo, from L Kivu (c. 1460 m) up to 3300 m; 2100–2400 m in Bwindi Forest and 1900–3500 on Virunga Volcanoes, in Uganda; 1850–2800 m in Rwanda and 2100–3300 m in Kenya. Separated altitudinally from *E. atricapilla*, which found at lower elevations; the two occur within 16 km of each other near Butembo and Mamboya (N of L Edward), and within 35 km at Mayamomato and Biongo along W-flowing rivers. Mainly at higher altitudes than those at which *E. nonnula* lives, but some overlap in Rwanda (Nyungwe Forest) at c. 1850 m; also in Itombwe Highlands, where present species found at 1900–2500 m and *E. nonnula* at 230–2200 m.
Food and Feeding. Small seeds of grasses and sedges (Cyperaceae). Forages in small flocks; also in mixed-species flocks with *E. nonnula*.
Breeding. Birds in breeding condition in Jun and Jul in Albertine region, and female with large ovary in Mar in Kenya. Nest an ovoid structure with side entrance, made from grass, placed in shrub. One clutch of 4 eggs; nestling undescribed, fledgling (nominate race) has gape swelling light greenish, palate dull yellow with ring of five black spots, tongue with two dark dots. No other information.
Movements. No information.
Status and Conservation. Not assessed. Probably not globally threatened. Locally common. In DRCongo, present in highlands NW of L Edward, and through Kivu to Itombwe Highlands, where common at c. 1900–2500 m (Mt Kandashomwa, Mayamato, Rurambo), and at 2480 m (on Mt Kabobo). In Uganda, common in Bwindi Forest and on Virunga Volcanoes. In Kenya, fairly common on Mt Elgon, Mt Kenya and in Aberdares.
Bibliography. Carswell *et al.* (2005), Chapin (1954), Fry & Keith (2004), Goodwin (1982), Lewis & Pomeroy (1989), Mearns (1915), Prigogine (1975a, 1975b, 1980, 1984a, 1984b), Short *et al.* (1990), van Someren (1922), Zimmerman *et al.* (1996).

39. Black-crowned Waxbill

Estrilda nonnula

French: Astrild nonnette **German**: Nonnenastrild **Spanish**: Estrilda Monjita
Other common names: Blackcap(ped)/White-breasted Waxbill

Taxonomy. *Astrilda nonnula* Hartlaub, 1883, Kudurma, south Sudan.
Sometimes placed with *E. atricapilla* and *E. kandti* in a separate genus, *Krimhilda*. Recent studies of mitochondrial phylogeny indicate that this species and nominate race of *E. kandti* form a sister-clade to nominate race and race *avakubi* of *E. atricapilla*. Three subspecies recognized.
Subspecies and Distribution.
E. n. nonnula Hartlaub, 1883 – SE Nigeria (Mambilla and Obudu Plateaux, Gashaka-Gumti Game Reserve) and Cameroon E to NC & S Central African Republic, SE Sudan, Uganda and W Kenya, S to NW Gabon, N & E DRCongo (S to Itombwe Highlands) and NW Tanzania.
E. n. eisentrauti Wolters, 1964 – Mt Cameroon (W Cameroon).
E. n. elizae Alexander, 1903 – Bioko I (Fernando Póo).



Descriptive notes. 10–10·5 cm; 6·5–8·5 g (nominate). Male nominate race has forehead and crown down to lores and eye black, nape grey; upperparts, including upperwing-coverts, grey with fine black bars (5–7 pairs of bars in 10 mm), rump and uppertail-coverts red, tail and flight-feathers black; face and underparts white, usually with pearl-grey tinge from neck downwards, red patch on flanks, undertail-coverts sometimes with fine barring; iris dark brown, eyering dark grey; bill black, with red band along side of culmen and red triangle at base of lower mandible; legs black. Female is like male, but slightly more brown-tinged on back and wings, with less red on flanks. Juvenile is paler above than adult, lacks barring, rump dull red, flanks pale buff, bill black. Race *eisentrauti* is slightly greyer on breast and flanks than nominate; *elizae* is like previous, but larger. Voice. Contact call a thin, high-pitched buzzy "tseee, sszee", often downslurred "tsssseew"; alarm call "srree-srree"; nest call a soft twittering up and down scale. Song types "speet-speet, p'seet-seet-seet", "speet, speet, speet speet-speet-speet", and "sureeeeaseet seet-seet-seet".
Habitat. Grassy secondary growth, grassy forest edges, neglected cultivation, farms and gardens. In W of range found from coast to 500 m, and up to c. 2900 m, but most common at 1000–2500 m; 230–2800 m in E Africa.
Food and Feeding. Small grass seeds (especially *Setaria*), millet seeds; also flying termites (Isoptera) and possibly ants (Formicidae). Takes seeds from grass-heads and from ground; holds growing grass-heads under foot. Forages generally in small flocks of up to c. 20 individuals, sometimes in much larger aggregations; also in mixed flocks with *E. atricapilla* and *E. kandti* where ranges overlap.
Breeding. Season Sept–Nov in Cameroon, Jul–Nov in NE DRCongo (Ituri), and Mar–Oct (mainly Apr–May) in Uganda. Courting male, with grass stem held in bill, fluffs belly and flank feathers, bends tail towards female, and bobs up and down, occasionally turning head towards female, waving grass from side to side, and gradually coming closer to her; display like that of *E. troglodytes*. Nest a large ovoid structure, entrance hole with short downward-sloping tunnel, outer fabric loosely made with criss-crossed grass stems and grass-heads, lined with soft plant fibres, usually a "cock's nest" (a thin-walled open cup with or without half-dome) on top, placed 1–8 m above ground in shrub or small tree. Clutch 4–5 eggs; incubation period 12–14 days; hatchling nearly naked, skin

On following pages: 40. Lesser Seedcracker (*Pyrenestes minor*); 41. Black-bellied Seedcracker (*Pyrenestes ostrinus*); 42. Crimson Seedcracker (*Pyrenestes sanguineus*); 43. Grant's Bluebill (*Spermophaga poliogenys*); 44. Western Bluebill (*Spermophaga haematina*); 45. Red-headed Bluebill (*Spermophaga ruficapilla*).

pale pink, gape has swollen curved white arc with black margin and black inner surface above, shorter swollen arc with black lining from gape to below, palate pinkish-white with ring of five black spots, tongue with two black spots, lower mouth with black crescent, in appearance much as nestling of *E. atricapilla*; nestling period 17–21 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common in W of range; generally common in E of range; very common to abundant in some places. Record from C Benin in (Bétérou) in Sept 1991 considered probably to have involved an escaped individual.
Bibliography. Bates (1911), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1917, 1954), Fry & Keith (2004), Goodwin (1982), Kunkel (1964), Lewis & Pomeroy (1989), Mayer (1998a), McCarthy (2006), Nicolai *et al.* (2007), Nikolaus (1987), Payne (2005a), Wilkinson (2008), Zimmerman *et al.* (1996).

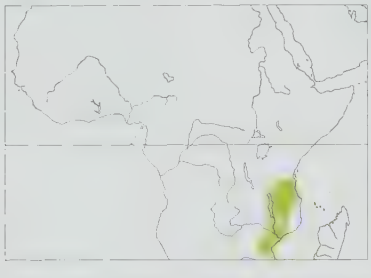
Genus *PYRENESTES* Swainson, 1837

40. Lesser Seedcracker

Pyrenestes minor

French: Petit Pyréneste **German**: Grantastrild **Spanish**: Estrilda Piquigorda Chica
Other common names: Nyasa(land) Seedcracker

Taxonomy. *Pyrenestes minor* Shelley, 1894, Zomba and Milanji Plains, Malawi.
May form a superspecies with *P. ostrinus* and *P. sanguineus*, and the three sometimes treated as conspecific. Thick-billed specimen from N Mozambique (Elephant Bend, c. 100 km WNW of Mocuba) described as a new species, *P. vincenti*, in 1955, and similar one from N Malawi (Kabunduli) was thought to belong to same new species; both individuals, however, now considered to represent size variants of present species. Monotypic.
Distribution. S Tanzania (S from Udzungwa Mts and Uluguru foothills), Malawi, N & C Mozambique and E Zimbabwe.



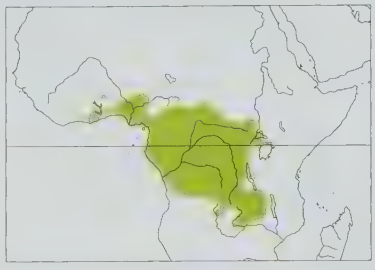
Descriptive notes. 13–14 cm; 14 g. Male has head back to hindcrown and rear ear-coverts and down to upper breast crimson-red, upperparts and lower breast to belly and undertail-coverts brown, uppertail-coverts, central rectrices and outer edges of lateral rectrices red, rest of tail brown; upperwing dark brown, tawny edges of coverts; iris deep red-brown, eyering dark red to pale grey (unlike congeners, broken pale white "eyelid" visible only at close range); bill black; legs brown. Female is similar to male, but red on head restricted to patch from forehead to just behind eye and to chin. Juvenile is plain brown, head tinged tawny, uppertail-coverts and uppertail with dull red wash, bill blackish-horn. Voice. Calls include "tzeet" and repeated explosive "chat-chat-chat" or "qap"; other calls a soft purring and a "chop", male at nest gives clicking alarm. Song a soft trilled chittering.
Habitat. Moist rank growth at edge of montane forest, rank grass along streams, secondary growth near village cultivations, edge of riparian forest, reedbeds, and bracken briar on mountain slopes; at 100–900 m in Tanzania, 500–1700 m in Malawi, and in E Zimbabwe to 1800 m at Vumba and Nyanga.
Food and Feeding. Grass seeds, including large hard seeds of forest bamboo-like grass *Olyra latifolia*. Forages at low levels and in ground; generally in pairs.
Breeding. Season Jan and May, with nest-building in late Dec and Mar, in Malawi; Dec–Mar in Zimbabwe and Apr–May in coastal Mozambique. Nest a covered oval structure, sometimes with entrance tunnel, made from strips of grass, banana leaves and reeds, occasionally on pad of ferns, sometimes with outer layer of dry leaves and grass, unlined, placed 1·5–3 m or higher above ground or over water. Clutch 3 eggs; incubation by both sexes, period 13–15 days; nestling period 20–23 days.
Movements. Resident; evidently a partial migrant in Rusitu–Haroni area of E Zimbabwe, where mainly a summer visitor.
Status and Conservation. Not globally threatened. Local and uncommon. Scarce and very local in Tanzania; in Mozambique, locally common in Manica e Sofala. A shy species, difficult to observe; possibly more common than currently realized.
Bibliography. Benson (1953, 1955a), Benson & Benson (1977), Chapin (1954), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Maclean (1993), Moreau & Moreau (1939), Hockey *et al.* (2005), Stevenson & Fanshawe (2002), Vincent (1936).

41. Black-bellied Seedcracker

Pyrenestes ostrinus

French: Pyréneste ponceau **German**: Purpurastrild **Spanish**: Estrilda Piquigorda Ventrinegra
Other common names: Savanna/Notch-billed Seedcracker; Rothschild's Seedcracker ("*rothschildi*"); Urungu Seedcracker ("*frommi*"); Large-billed Seedcracker ("*maximus*")

Taxonomy. *Loxia ostrina* Vieillot, 1805, India and Africa = southern Gabon coast.
May form a superspecies with *P. minor* and *P. sanguineus*, and the three sometimes treated as conspecific. Several races have been proposed, on basis of differences mainly in general size and in bill size and shape, e.g. relatively small *rothschildi* (described from Niger Delta, in Nigeria), larger and larger-billed *frommi* (from Kitungulu, in SW Tanzania), and still larger and huge-billed *maximus* (from Faradje, in NE DRCongo); individuals of each type, however, can be found together in some geographical areas, and they interbreed (pairing behaviour independent of bill-size morph); in addition, intermediates occur, and nestlings of pairs of each size morph are identical in mouth colour and pattern. Treated as monotypic.
Distribution. Ghana, Togo, Nigeria and W & S Cameroon E to Central African Republic, SW Chad, extreme SE Sudan, Uganda and extreme W Kenya, S to N Angola, Zambia and SW Tanzania.
Descriptive notes. c. 15 cm; male in Cameroon 18·6 g (small morph), 20·9 g (large morph), 29 g (huge morph). Male has head and neck to breast and flanks crimson-red, upperparts, including upperwing, and underparts sooty black, uppertail-coverts, central rectrices and outer edges of lateral



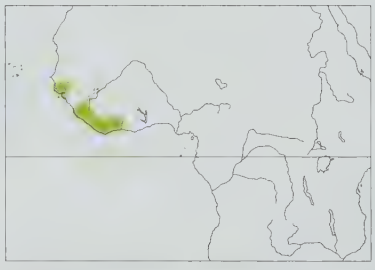
rectrices red, rest of tail sooty brown; iris dark brown, swollen "eyelids" above and below eye white; bill thick, variably small, large or huge, black; legs brown. Female has red restricted to most of head and throat, and from rump to tail, with some variable red feather tips on sides of neck, breast and upper flanks; rest of plumage tawny-brown, wing blackish-brown with tawny edges of coverts. Juvenile is like female, but with head colour tawny-brown (not red), uppertail-coverts and uppertail rufous; bill reaches adult size 2 months after fledging. Voice. Calls include low "peenk", alarm call "terr". Male has up to seven song themes, none shared with other males, a medley of sweet whistles with chuckles, sharp notes, churrs and sibilant trill, e.g. "pep-tiddly-et, o-tslee-tslee", or "dee-oh-la-dee-day". Female song given infrequently.
Habitat. Watercourses in rainforest and closed woodland, edge of moist evergreen and riparian forest, palm savanna, also moist neglected cultivation e.g. manioc (*Manihot esculenta*). Lowland and hills; occurs at 700–1400 m in Uganda and 680–1700 m in Zambia. Morphs differ in habitat and ecology; often small-billed and large-billed forms occur in same area, proportions varying with availability and diversity of sedge (Cyperaceae) seeds; huge-billed individuals occur with those two, but also on their own in forest–savanna ecotone areas. In Cameroon, small-billed birds live in clearings with grass and scrub, patches of weeds near streams, and rice fields, large-billed birds in thickets, and huge-billed birds in gallery forest near streams.
Food and Feeding. Seeds, especially those of sedge, sometimes soft white seeds, others hard-shelled; occasionally bits of green leaves, berries, small spiders (Araneae). Some dietary variation according to bill size; for small-billed and large-billed morphs, this dependent on seed abundance. In Cameroon, both small-billed and large-billed individuals take seeds of small-seeded sedge *Scleria verrucosa* when these abundant; huge-billed individuals take the very hard seeds of *Scleria racemosa*, using the bill to crack them. Forages on or near ground. Generally in pairs and small groups.
Breeding. Season Aug–Nov (mainly Sept–Oct) and Apr–May, during major and minor rains, in Cameroon; in DRCongo during rains, Dec–Jul and Oct in Itombwe and Jul–Dec in Uele; Feb, Apr–Jul and Nov in Uganda, and Feb–Mar in Zambia. Courting male holds long stem in bill, bobs up and down on perch; also has sexual flight display in which he pursues her at great height in a circle 20–35 m in diameter, the two individuals flapping wings, male singing. Nest built by both sexes, a massive ball-shaped structure with side entrance, made from dry broad strips of leaves of rattan and bamboo, grass, dry leaves, ferns, bark strips and creepers, loosely laid or woven together, lined with few grass tops, placed 1–9 m above ground in tree, bush or bamboo clump. Clutch 3–5 eggs; incubation 16 days; nestling gape with three fleshy balls, top one bright yellow, lower ones whiter to pale yellow, and smaller yellow heart-shaped papilla between middle and lower balls, all bordered black, palate pale with five black spots (posterior pair very small), band around tongue and black crescent on mandible; nestling period 24 days; young can fly immediately on leaving nest, fed by parents for as long as one month.
Movements. Resident.
Status and Conservation. Not globally threatened. Considered generally uncommon to locally common. Several reports from Ivory Coast, and single report (of two individuals) from Benin, but status in both countries uncertain and confirmation of presence required. A difficult species to observe; possibly more common and more widespread than currently realized.
Bibliography. Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1917, 1954), Dowsett *et al.* (2008), Frampton (1988), Fry & Keith (2004), Goodwin (1982), Rand *et al.* (1959), Short *et al.* (1990), Slabbekoorn & Smith (2000), Smith, T.B. (1990a, 1990b, 1990c, 1993, 1997).

42. Crimson Seedcracker

Pyrenestes sanguineus

French: Pyréneste gros-bec **German**: Karmesinastrild **Spanish**: Estrilda Piquigorda Escarlata
Other common names: (Brown-backed/Western) Seedcracker

Taxonomy. *Pyrenestes sanguineus* Swainson, 1837, Senegal.
May form a superspecies with *P. minor* and *P. ostrinus*, and the three sometimes treated as conspecific. Occurs in several morphs, varying in body size and bill size, with no geographical pattern; smaller birds with medium-sized bill proposed as a geographical race, *coccineus* (described from Sierra Leone), but such individuals occur alongside larger-billed ones in several other parts of species' range, and considered no more than size variants. Treated as monotypic.
Distribution. Gambia, S Senegal, Guinea-Bissau, Guinea, SW Mali, Sierra Leone, Liberia and Ivory Coast.



Descriptive notes. 14–15 cm; 16·9–26·6 g. Male has head and neck down onto breast and flanks crimson-red, uppertail-coverts, central rectrices and outer edges of lateral rectrices red, rest of plumage brown, undertail-coverts sooty brown; iris dark brown, eyering grey in front of and behind eye, white above and below eye (conspicuous and swollen in breeding condition); bill thick, variably small, large or huge, black; legs brown. Female has red restricted to most of head and throat, and from rump to tail, with variable red flecking on sides of neck and on breast; rest of plumage more tawny-brown, wing blackish-brown with tawny edges of coverts; eyering grey. Juvenile is like female, but has entire head and throat tawny-brown, not red, and long uppertail-coverts rufous. Voice. Contact call during foraging a soft, hollow clicking "tsut...tsut". Courtship song long and melodious, variable, "titi-tsee-chiweeta-toy-ti-tseea", or squeaky song rising in pitch from first to fourth (loudest) note, then tailing off, "tee-ti-ti-teee, ti, tee".
Habitat. Freshwater swamp-forest, tidal creeks, brushy growth along streams, low dense vegetation, scrub near rice fields, ponds in logged forest, and wet sedge (Cyperaceae) in open forest; visits suburban gardens. Lowlands.
Food and Feeding. Seeds of sedges and rice. Feeds on or near ground. Forages in pairs, sometimes in small groups; occasionally associates with *Spermophaga* species.
Breeding. Breeds in Sept, and juveniles seen also in Mar and Jul, in Gambia; in Liberia, nest-building in Jun–Aug, Oct and Nov and fledged young in Sept. Usually solitary nester, but some-

times groups of 8–10 pairs. Courting male displays on perch, holding long stem in bill, hopping up and down; also displays on ground, grass in bill, by turning in a circle, and both male and female hop up and down; in sexual flight, female flies in irregular and undulating circles 50 m in diameter and then back to swamp, male follows her and sings. Nest a ball-shaped structure with side entrance, made from dry fronds of ferns or dead leaves or a pile of dead reeds, lined with soft grassheads, sited 1–3 m above water level or ground, under dense canopy of creepers and leaves. Clutch 3–4 eggs; incubation by both sexes, period 16 days; nestling skin dark blackish-red, sparse down on head and body, gape with three fleshy balls and a smaller papilla between middle and lower balls, top ball yellow, lower ones whiter to pale yellow, all bordered black, palate pale with five black spots (posterior pair small), a band around tongue and a black crescent on lower mandible; nestling period 24 days; young independent 10 days after leaving nest.
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon to locally common. Rare in Gambia, where thought to be threatened by loss of riverbank swamp-forest habitat, which being replaced by farm plots and banana fields. Elsewhere, e.g. Liberia, seems to benefit from logging and small-scale forest loss.
Bibliography. Anon. (2008g), Bannerman (1949), Barlow, Hammick & Seller (2002), Barlow, Wacher & Disley (1997), Berlioz (1954), Brunel (1955), Chapin (1954), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Kleefisch (1999), Nicolai *et al.* (2007), Saarlouis-Fraulautern (1977), Silzer & Silzer (1980), Smith (1990e), Rand (1951), Thiollay (1971, 1985), Traylor & Parelius (1967), Wacher (1993), Wiegand (1999).

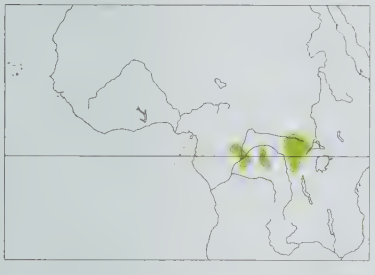
Genus *SPERMOPHAGA* Swainson, 1837

43. Grant's Bluebill

Spermophaga poliogenys

French: Becbleu de Grant **German**: Grantsamenknacker **Spanish**: Estrilda Piquigorda de Grant
Other common names: Grant's Forest Weaver

Taxonomy. *Spermospiza poliogenys* Ogilvie-Grant, 1906, 20 miles [c. 32 km] north of Fort Beni, west Rwenzoris, 3000 feet [c. 915 m], DRCongo.
Monotypic.
Distribution. Extreme SE Cameroon, N PRCongo (Nouabalé-Ndoki National Park), DRCongo and W Uganda (Semliki Forest).



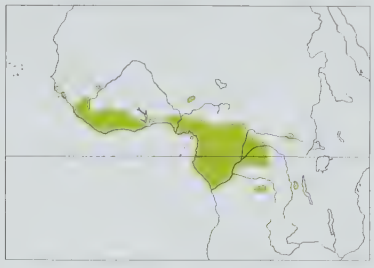
Descriptive notes. 14 cm; 18·7–21·7 g. Male has front of head (back to central crown) and down to breast and flanks red, rump and uppertail-coverts red; rest of plumage glossy black, wing and tail black; iris brown, "eyelids" above and below eye pale blue; bill mostly red, with broad bluish area at base of both mandibles; legs greenish-brown. Female has head and back dark grey, back with bluish sheen, rump and uppertail-coverts red, wing and tail slate-grey, chin to upper breast red, lower breast, belly and undertail-coverts slate-grey with white spots; bare parts as for male. Juvenile is like female, but lacks red on throat and breast and white spotting on underparts, has reddish rump and uppertail-coverts, bluish or bluish-grey bill. Voice. Call a coarse "chip"; female call a soft "thac, thac", and melodious "tyee-dyeeu". Song of downslurred and upslurred whistles, terminal notes progressively higher in pitch, "seeu-sisi-su-swiswiswiswiswisisi".
Habitat. Intact primary forest or secondary forest, swamp-forest, and thick undergrowth of *Phrynium* herbs; lowlands, to 1400 m.
Food and Feeding. Large, hard seeds; also insects, and spiders (Araneae). Forages at low levels, mainly in undergrowth. Forages singly and in pairs, sometimes in small groups.
Breeding. In NE DRCongo (Uele), juveniles in Mar and May–Jun and birds in breeding condition in Dec–Feb, May and Aug–Sept, suggesting protracted season; incubating in Jul in Uganda. One nest described, large, built from dried leaves and twigs, lined with fine grass, sited 2·5 m above ground in fork of small forest tree. Clutch 3 eggs; nestling undescribed, juvenile with regressed gape swellings had palate yellow with three black spots, dark band on tongue and dark crescent on lower mandible under tongue. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Rare in W of range and in extreme E of range; uncommon to locally fairly common elsewhere. Distribution patchy; possibly more widespread than currently known. Only relatively recently discovered in extreme SE Cameroon and N PRCongo.
Bibliography. Carswell *et al.* (2005), Chapin (1917, 1954), Clement *et al.* (1993), Dowsett-Lemaire & Dowsett (1998), Dranzoa & Otim (1993), Fry & Keith (2004), Goodwin (1982), Kunkel & Kunkel (1975), Languy *et al.* (2005), Nicolai *et al.* (2007), Stevenson & Fanshawe (2002).

44. Western Bluebill

Spermophaga haematina

French: Becbleu sanguin **Spanish**: Estrilda Piquigorda Cabecinegra
German: Rotbrust-Samenknacker
Other common names: Red-breasted/Crimson-breasted/Gabon Bluebill, Red-breasted Forest Weaver, Blue-billed Weaver/Waxbill

Taxonomy. *Loxia haematina* Vieillot, 1808, Africa = Ghana.
May form a superspecies with *S. ruficapilla*, and sometimes considered conspecific; ranges of the two meet in NE, E & S DRCongo (Uele, Kivu and Kasai), where specimens are intermediate in plumage, but majority of birds are clearly of one or the other species, indicating that the two are distinct. Races *togoensis* and *pustulata* intergrade in S Cameroon. Three subspecies recognized.
Subspecies and Distribution.
S. h. haematina (Vieillot, 1808) – Gambia, S Senegal, Guinea-Bissau, SW Mali, Guinea, and Sierra Leone E to Ghana.
S. h. togoensis (Neumann, 1910) – Togo E to SW Nigeria.
S. h. pustulata (Voigt, 1831) – SE Nigeria, Cameroon and SW Central African Republic S to NW Angola (Cabinda), E to NE, E & S DRCongo.



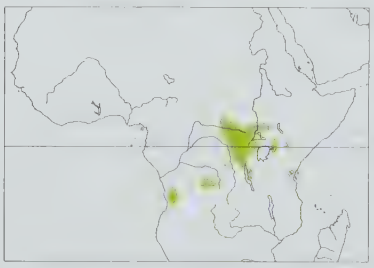
Descriptive notes. 15 cm; 20–26 g (*pustulata*). Male nominate race has head and upperparts glossy black, upperwing and tail black, chin to breast and flanks red, lower breast, belly and undertail-coverts black; iris dark brown or dark red, eyering grey in front of and behind eye, white above and below eye (conspicuous and swollen in breeding condition); bill blue-grey, sometimes quite dark, with red to orange tip often small but sometimes running over cutting edges; legs brownish-olive to blackish. Female has forehead and face dusky maroon, upperparts and wings dark brownish-slate, uppertail-coverts reddish, tail dark brown or blackish; chin and throat red, duller than male, belly to rear flanks and undertail-coverts dark brownish-slate, heavily spotted white; eyering grey. Juvenile male is slaty grey like adult female, reddish uppertail-coverts and flanks, sooty underparts, reddish tinge on side of breast, bill black with tip red and yellow cutting edges, iris dark brown, eyering grey; juvenile female is like juvenile male, but less red, underparts paler and with indistinct whitish barring. Race *togoensis* has face black, uppertail-coverts red; *pustulata* has uppertail-coverts red, face partially red, bill blue with red tip and cutting edges, female less reddish on forehead, face more red than nominate female. Voice. Calls high, thin "sseeeee", contact note a sharp "tsip", alarm "tswink-tswink" and "tac". Song musical, warbled, whistled, starts with series of clicks, then long pure notes upslurred and downslurred, tending to rise near end, "tsuee, tsuee, tsuee-tswee, tswee, tsuee", song lasting c. 6–8 seconds; another version begins as slow "tsip-tsap" and accelerates into harsh trill; songs in Guinea-Bissau, Ghana and Gabon similar to one another. Female sings, less often and less loudly than male.
Habitat. Forest undergrowth, clearings and edges, gallery forest, logged forest roads, forestry plantations, and in Gambia remnant forest thickets and dry coastal palm forest; often near water.
Food and Feeding. Berries, grass seeds, rice, husks of oil palm (*Elaeis guineensis*) fruit; also insects, including termites (Isoptera) and aphids (Aphidoidea), and spiders (Araneae). Uses sharp edges of bill to cut tough foods, and removes these by twisting husk, rather than by crushing. Forages at low levels in undergrowth; occasionally ascends to middle levels. Forages in pairs and singly; sometimes in mixed-species flocks.
Breeding. Season Aug–Dec in Gambia, and nest-building in Jun and Sept–Nov in Liberia; Aug–Oct in Nigeria; in Gabon, nest-building in Dec–Jan and young out of nest Mar–Apr. In courtship, male holds nesting material in bill, sings, bobs up and down, opens wings in "heraldic eagle" posture; when female responds, he drops material, mandibulates, spreads wings, vibrates tail, and tosses back head to display red breast. Nest a large ball-like structure with side entrance, made from moss, ferns, dry leaves and grass, sometimes lined with grass or feathers, hidden 1–2 m above ground in dense bush. Clutch 2–6 eggs; incubation period 14–16 days; nestling skin pale, pale grey down on head and back, gape margin pale yellow with two thick yellow swellings above and one below, upper swellings separated by black spot, two small marks near bill tip, palate yellow with three large rounded black spots, posterior palate with two smaller spots, tongue unmarked yellow or with dusky broken bar, and dark crescent below tongue (adults retain black spots on a red palate); nestling period 21–22 days; young remain with parents for 5–6 weeks after fledging.
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon to locally very common or abundant. Widespread and generally common in W of range, but uncommon in Togo (S from Bismarckburg), and recorded only once in Benin (Noyau Central); one of commonest bird species at lower levels on Mt Cameroon. Densities in Liberia exceeding 25 pairs/km² in secondary forest, and in logged forest higher densities along roads and only 3 pairs/km² in interior of mature forest; abundant in NE Gabon, where 1 pair/2–3 ha.
Bibliography. Anon. (2008e), Barlow *et al.* (1997), Bates (1911), Bielfeld (1995, 1996), Brosset & Erard (1986), Burkard (1962), Chapin (1917, 1954), Chappuis (2000), Eisentraut (1963), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Kunkel & Kunkel (1975), Louette (1988b), Nelf (1978a), Nicolai *et al.* (2007), Serle (1957), Ullrich (2004).

45. Red-headed Bluebill

Spermophaga ruficapilla

French: Becbleu à tête rouge **Spanish**: Estrilda Piquigorda Cabecirroja
German: Rotkopf-Samenknacker
Other common names: Red-billed Bluebill, Red-headed Blue-billed Weaver, Red-headed Forest Weaver, Forest Seedcracker; Usambara Bluebill (*cana*)

Taxonomy. *Spermospiza ruficapilla* Shelley, 1888, Bellima, upper Uele district, DRCongo.
May form a superspecies with *S. haematina*, and sometimes considered conspecific; ranges of the two meet in NE, E & S DRCongo (Uele, Kivu and Kasai), where specimens are intermediate in plumage, but majority of birds are clearly of one or the other species, indicating that the two are distinct. Proposed race *kilgoris* (described from Kilgoris, in SW Kenya) treated as a synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
S. r. ruficapilla (Shelley, 1888) – SE Central African Republic, NE, E & S DRCongo, extreme S Sudan, Uganda, W & C Kenya, Rwanda, Burundi, W Tanzania and N Angola.
S. r. cana (Friedmann, 1927) – Usambara Mts, in NE Tanzania.



Descriptive notes. 15 cm; 21·3–26 g (nominate). Male nominate race has head to breast and flanks red, upperparts glossy black, uppertail-coverts red, upperwing and tail black, lower breast, belly and undertail-coverts black; iris dark brown or dark red, eyering grey in front of and behind eye, white above and below eye (conspicuous and swollen in breeding condition); bill silvery blue to purplish-blue with red tip and cutting edges; legs dark brownish-olive to blackish. Female has head red, nape sometimes with blackish marks, mantle slate-grey, back to rump blackish, uppertail-coverts reddish, tail dark brown or blackish, wing blackish-brown; chin and throat red, duller than male, lower breast to flanks and undertail-coverts black, heavily spotted white;

eyering grey. Juvenile is slaty grey above, including head, with reddish uppertail-coverts, underparts sooty, reddish tinge on side of breast, iris dark brown, bill bluish-black with red tip. Race *cana* male differs from nominate in having upperparts slaty grey, some grey feather bases showing through on head and breast, lower underparts dark grey-brown, red areas paler, female has trace of red on uppertail-coverts, lower underparts dark grey-brown with whitish spots. Voice. Calls "pik", a nasal "tewk", and soft high "seep". Two song types, with separated rambling notes, one a series of long fluting notes ending in trill, or a series of sibilant and rising notes, "si-sisi-su-wii s-sis-swiswiswiswiswiswi"; second type varied, with guttural trills, whistles, rattles, clucks and kissing chirps, fast and then slowing. Voice much as that of *S. haematina*.

Habitat. Forest undergrowth, damp areas in thickets, near streams, clearings and edge, also gallery forest, swamp-forest, coffee plantations; in Uganda, from lowlands to 2100 m.

Food and Feeding. Seeds, including those of legumes (of genus *Indigofera*), morning glories (*Ipomoea*) and speargrass (*Imperata cylindrica*); also insects, including small beetles (Coleoptera) and termites (Isoptera). Strips seeds from tall grass by perching on stem and bending fruiting head to ground; de-husks seeds in bill. Breaks apart clumps of earth or termite nest with downward blows of bill; lifts and moves dead leaves. Forages mainly in pairs and family groups; joins mixed-species feeding flocks.

Breeding. Season Feb–May in Angola, and Oct–Mar and May in E DRCongo (Itombwe); in Uganda most breeding records Apr–Jul and Oct–Nov. Courting male displays with feathers of belly, flanks and back fluffed, feathers of head and neck sleeked, he angles tail towards female, holds a leaf or piece of grass in bill and bows to one side towards her, bill pointed downwards, then throws back head until nearly vertical (angle of bill shifting from 45° below horizontal to 70° above), and twists head, leaf and tail towards mate; pair copulates in the open. Nest a large loosely constructed ball with side entrance, made from dry leaves, ferns and coarse grass-tops, lined with fine grass, hidden among leaves or palm fronds. Clutch 2–3 eggs; incubation period 17–18 days; nestling skin pale yellowish-flesh, sparse down on head and back, gape with three small yellow wattles or ball-like swellings, palate yellow with three large black spots, two small black marks near bill tip, tongue with narrow dark bar, and a sublingual mark; nestling period 20 days; fledglings tended by both parents.

Movements. Resident.

Status and Conservation. Not globally threatened. Locally common to uncommon. Common in DRCongo, especially in NE (as far S as Itombwe); fairly common in S Sudan, and generally common in Uganda; in Kenya, considered fairly common in W but uncommon in C (Meru); locally common in Angola.

Bibliography. Carswell *et al.* (2005), Chapin (1954), Chappuis (2000), Cunningham-van Someren & Schifter (1981), Dean (2000), Ellis (1977), Friedmann (1978), Friedmann & Williams (1969), Fry & Keith (2004), Gichuki & Schifter (1990), Goodwin (1982), Kunkel (1967a), Louette (1988b), Nicolai *et al.* (2007), Steinbacher (1969), Stevenson & Fanshawe (2002).

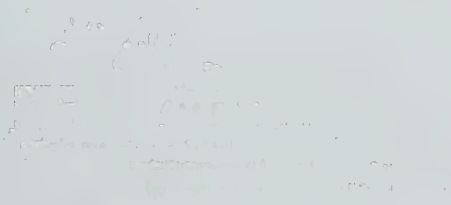


PLATE 19 ➤



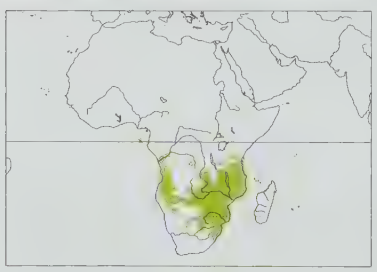
Genus *URAEGINTHUS* Cabanis, 1851

46. Blue Waxbill

Uraeginthus angolensis

French: Cordonbleu d'Angola **German**: Blauastrild **Spanish**: Azulito Angoleño
Other common names: Southern Blue Waxbill, Blue-breasted Waxbill, Southern/Blue-cheeked/Blue-breasted/Angola Cordon-bleu

Taxonomy. *Fringilla angolensis* Linnaeus, 1758, Angola.
Occasionally hybridizes with *U. bengalus* in S Tanzania (Songea, Mikindani), where a few males have red patch on the ear-coverts. Males with red on ear-coverts occur rarely in S Zambia and N South Africa (in areas remote from *U. bengalus*) and one record in NW Zambia (near range of latter), but the two species are broadly sympatric in N & C Tanzania and in SE DRCongo (Kasai and Katanga), where little evidence of interbreeding. Proposed race *natalensis* (described from KwaZulu-Natal, in E South Africa) treated as a synonym of *niassensis*. Three subspecies recognized.
Subspecies and Distribution.
U. a. angolensis (Linnaeus, 1758) – São Tomé, NW Angola (including Cabinda), SW DRCongo and NW Zambia.
U. a. cyanopleurus Wolters, 1963 – S Angola, W Zambia (W of Kafue National Park), W & NW Zimbabwe, N Namibia, N Botswana and N South Africa (S to North West Province and Free State).
U. a. niassensis Reichenow, 1911 – Tanzania, S & SE DRCongo, Zambia (E of Kafue National Park), Malawi, Mozambique and Zimbabwe (except W) S to NE South Africa (N Limpopo S to KwaZulu-Natal and Eastern Cape) and Swaziland.



Descriptive notes. 12–13 cm; 6·3–13 g. Male nominate race has crown to back and upperwing grey-brown, primary P9 broad near tip, rump, uppertail-coverts and long pointed tail blue; face, throat and breast to flanks light turquoise to light cerulean blue, centre of belly to vent and undertail-coverts buffy white; iris dark brown, eyering pale blue; bill pale grey to pale violet-blue, blackish cutting edges and tip; legs greyish-pink. Female is similar to male, but blue colour paler, blue below also less extensive, confined to face and chin to centre of breast. Juvenile is similar to female, but blue paler and less extensive on breast, young male with more blue than female, both with bill black. Race *niassensis* has upperparts darker brown and underparts brighter, darker blue, than nominate, female extensively blue on breast and flanks (much as male); *cyanopleurus* is intermediate in plumage between previous and nominate.
Voice. Close contact call a brief, soft "swip swip"; distance contact call and flight call 1–3 loud, sibilant, high-pitched (6–7 kHz) rising whistles, "chee-chee-chee"; alarm a rapid chatter (18–20 notes per second). Song a series of short slurred whistles and sibilant and harsh notes, varies regionally and individually: in N South Africa described as "chreu chreu chittywoo weeoo wee…"; in Zambia, song at Lochinvar National Park introduced by short "tik" note (like begging note of

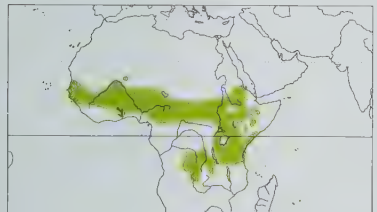
nestling) and low buzzy whistle, followed by short rising or falling whistles, sometimes ending with distance contact call "chee", song at Lusaka begins with single harsh note, followed by 4 short notes, and ends with long upslurred whistle, "zhweep...pu-ti-tee-tiwooooy". Songs similar to those of *U. bengalus*. Female song, given when partners separated, is shorter, variable, with emphasis on repeated low two-tone whistle, and ending in chatter.
Habitat. Acacia (*Acacia*) woodland and thickets, rank growth, overgrown cultivation, around rural settlements and gardens, near surface water. In Zambia at 330–1800 m, once to 2150 m on Nyika Plateau; in Malawi 40–1700 m, in Zimbabwe rarely to 1400 m.
Food and Feeding. Mostly small grass seeds, also some insects and spiders (Araneae). Foods in N South Africa mainly seeds of *Panicum*, *Urochloa*, *Digitaria*, *Sporobolus* and *Eragrostis*, in Zambia seeds of *Echinochloa*, *Setaria*, *Urochloa* and *Panicum*; in austral winter in South Africa takes seeds of prostate herbs and small fleshy fruits. Takes small grass seeds from ground, on bare soil and in dry leaves, by pecking and sweeping with the bill; also takes growing seeds on inflorescences as it flies to grass-head and forces it to ground, and perches on upright grass and takes seeds from heads. Removes husks by rolling seed between edges of bill with tongue. Takes termites (Isoptera) on ground when exposed or concealed under surface, caterpillars on ground under camelthorn trees (*Acacia eriloba*). Forages usually in pairs and in family parties, sometimes in groups or larger flocks; often associates with other estrildids.
Breeding. Season Feb–May in Tanzania, Feb–Jun in DRCongo (Katanga), Dec–Jun (mainly Jan–Apr) in Zambia, Dec–May in Malawi, mainly Dec–Apr (but Aug–Nov in W) in Zimbabwe; in N South Africa (former Transvaal) Jan–Jun, locally from 2 months after first rains (when grass has sprouted, seed developed on grass-heads and termites abundant). Courting male faces female, raises head, holding tip of feather in bill, the bill and feather pointing upwards, jerks head up and down, waving feather over head, after this "feather-flagging" he perches, with plumage sleeked, near female, angles tail and head towards her, and bounces up and down, stretching and flexing legs (legs may leave perch, and tap on contact with perch). Nest a ball with side entrance, made from grass-heads and stems, lined with fine grass or feathers, built 1–4 m above ground in thorn bush or tree; often built near active wasp (Hymenoptera) nest (wasps may signal absence of arboreal ants); sometimes uses old covered nest of other bird, adding feathers to lining. Clutch usually 3–5 eggs; incubation period 13–14 days; hatchling has skin light pink with light yellowish-brown to grey down, gape with inconspicuous oval blue-black swelling on upper mandible and black border inside mouth, gape corner with narrow greyish-white band, and black bill edge with slight swelling on lower mandible, white palate grading to pinkish in front and pale bluish behind, whitish area has three black spots, inner bill tip has two large black spots, inner mouth black, tongue pale pink with black ring and bluish-grey tip, lining of lower mouth whitish with black crescent (by time when contour feathers erupt, skin is blackish, and by fledging the edge of gape is paler, upper swelling more blue than black, lateral palate and inner mouth black, tongue tip pale grey); nestling period 17–19 days. Nest occasionally parasitized by Shaft-tailed Whydah (*Vidua regia*).
Movements. Resident; some local movements.
Status and Conservation. Not globally threatened. Common to fairly common in most of range. In South Africa, density c. 0·25–0·75 pairs/ha in open *Acacia–Dichrostachys* brush on Nyl floodplain (Limpopo); densities of 70, 278, 389 and 754 birds/km² in acacia savannas in Swaziland. Common in São Tomé, where possibly introduced.
Bibliography. Barnard & Markus (1990), Dean (2000), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), van Eerd (1989), Fry & Keith (2004), Goodwin (1965, 1982), Harrison *et al.* (1997), Hockey *et al.* (2005), Irwin (1981), Kelsey & Barnard (1988), Leventis & Olmos (2009), Meise (1937), Nicolai *et al.* (2007), Payne (2005a), Payne & Payne (2002), Skead, D.M. (1975).

47. **Red-cheeked Cordon-bleu**

Uraeginthus bengalus

French: Cordonbleu à joues rouges **German**: Schmetterlingsastrild **Spanish**: Azulito Carirrojo
Other common names: Crimson-cheeked/Red-cheeked Blue Waxbill, Cordon-bleu

Taxonomy. *Fringilla bengalus* Linnaeus, 1766, Senegal.
Occasionally hybridizes with *U. angolensis* in S Tanzania (Songea, Mikindani). Proposed race *littoralis* (described from Mombasa, in Kenya) treated as a synonym of *brunneigularis*. Four subspecies recognized.
Subspecies and Distribution.
U. b. bengalus (Linnaeus, 1766) – S Mauritania, Senegal, Gambia, Guinea-Bissau, Guinea, Mali, Burkina Faso, Ivory Coast and Ghana E to S Sudan, Eritrea and Ethiopia, S to W Cameroon, Central African Republic, NE DRCongo, Rwanda and Kenya (W of Rift Valley, S to L Victoria).
U. b. brunneigularis Mearns, 1911 – S Somalia and Kenya (from L Baringo E to coast) S to NE Tanzania (S to North Pare Mts and Tanga).
U. b. ugogensis Reichenow, 1911 – S Kenya (Mara) and Tanzania (from Serengeti and Mt Kilimanjaro S to Rukwa, Usanga Flats and Iringa).
U. b. katangae Vincent, 1934 – S & SE DRCongo (S Kasai, Katanga), NE Angola and N Zambia. Introduced in Hawaiian Is.



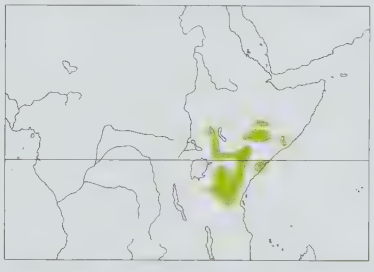
Descriptive notes. 12–13 cm; 8·9–11 g (nominate). Male nominate race has crown to back and upperwing light grey-brown to mid-brown, primary P9 narrow near tip on inner web, rump, uppertail-coverts and long pointed tail blue; red patch on ear-coverts, rest of face and breast to flanks light turquoise to bright cobalt-blue (meeting blue of rump), centre of belly to vent and undertail-coverts buffy white; iris dark brown, eyering pale blue-grey; bill pale grey to pale violet-pink, blackish cutting edges and tip; legs greyish-pink. Female resembles male, but blue colour paler, blue below less extensive and reaching only to centre of breast and upper flanks, and no red ear patch. Juvenile is like female, but paler blue on breast, young male with trace of blue on flanks, this lacking on young female, both sexes with bill black; acquires adult plumage in 3–4 months. Race *brunneigularis* male has upperparts a greyer brown than nominate, female has side of head to throat grey-brown, breast and flanks blue; *ugogensis* male is paler above than previous, female brown on side of neck to below ear-coverts; *katangae* male has upperparts dull and dark, female upperparts darker or duller brown, side of head blue and underparts buffy grey-brown. Voice. Distance contact call, given when separated from mate, when disturbed and when in flight, a thin rising whistled "tseek" or a series as "tsee-tsee-tsee" at 6–8 kHz; nest call of brooding bird, given when mate approaches nest, a soft "pwe-pwe-pwe"; alarm call a slow chatter, 8–13 notes per second. Song a series of short, thin notes and longer sweet whistles, "see-syooo-siwee, see-see-suwee"; each male has two song themes with minor variations (distinct from songs of other males), loud undirected song with sharp introductory notes, buzzy middle notes and upslurred whistles near end, "chuckle-jur-jiwee-see-see", similar to song of *U. angolensis*, soft song ends with "pwe-pwe" (like nest call). Female song shorter and less complex, with sibilant whistles and sometimes a chirping buzz or trill.
Habitat. Thornbush, bushy grassland and sahelian and N guinean woodlands; often found in village areas with millet and manioc (*Manihot esculenta*). Sea-level to (rarely) 2300 m.
Food and Feeding. Small grass seeds, also termites (Isoptera), moth larvae (Lepidoptera). Feeds on the ground in cultivation, edges of thickets and grassy woodland. Forages mostly in pairs and in small flocks; sometimes associates with other estrildids. Often tame.
Breeding. Breeds in late rains and early dry season (mainly Sept–Dec) in Senegal, Apr–Jan (mainly Jul–Oct, May and Jul–Sept) in Gambia, in Jul–Oct rains in Nigeria, in Apr–Dec in Ethiopia, in Dec–Apr in Zambia, and in Aug–Nov in NE DRCongo (Uele); breeds in time with regional rains in E Africa. Courting male faces female, raises head, holding tip of feather in upward-pointing bill, jerks head up and down, then perches, with plumage sleeked, close to female, turns tail and head towards her, and bounces up and down; courtship behaviour like that of *U. angolensis*. Nest ball-shaped with low side entrance, made from stems and heads of fine grasses, sometimes with outer layer of roots or bits of yellowish dry grass, lined with feathers or soft grasses, placed 1–4 m above ground in tree or shrub; sometimes takes over old nest of another species (and does not add fresh lining), and pairs use neighbouring old nests of colonial weavers (*Ploceus*). Clutch 3–5 eggs; incubation period 13–14 days; hatchling has pink skin, long and light yellowish-brown to grey down, gape-flange on upper mandible has oval blue papilla with black border inside mouth, gape corner a thin greyish-white band, below it a slight swelling on lower mandible with black band across outer ridge, whitish palate grading to pinkish in front and sky-blue behind, whitish area with three black spots, roof of mouth behind palate black, inner bill tip with two large black spots, tongue pink with black ring and bluish-grey tip, lower mouth whitish with black crescent near tip, and black crescent under tongue (by time of fledging, gape papilla paler blue, gape and inner mouth paler); nestling period 16–19 days. Apparently, on basis of song mimicry in Kenya, nest parasitized occasionally by Steel-blue Whydah (*Vidua hypocherina*), and females of that species seen to visit nests of present species. Estimated annual adult survival 0·54.
Movements. Resident.
Status and Conservation. Not globally threatened. Common to very common in most of range, and locally abundant. Generally widespread. Very widely kept in captivity.
Bibliography. Ash & Atkins (2009), Bielfeld (1996, 2008), Chapin (1917), Dowsett *et al.* (2008), Fry & Keith (2004), Gahr & Güttinger (1986), Goodwin (1965, 1971, 1982), Grimes (1987), McCarthy (2006), McGregor *et al.* (2007), Meise (1937), Nicolai *et al.* (2007), Payne (2005a), Redman *et al.* (2009), van Someren (1956), Vieillot (1805–1808, 1979).

48. **Blue-capped Cordon-bleu**

Uraeginthus cyanocephalus

French: Cordonbleu cyanocéphale **German**: Blaukopfastrild **Spanish**: Azulito Coroniazul
Other common names: Blue-capped Waxbill, Blue-headed Cordonbleu

Taxonomy. *Estrilda cyanocephala* Richmond, 1897, Useri River, near Mount Kilimanjaro, Tanzania. Monotypic.
Distribution. SE Sudan (Kapoeta), S Ethiopia, Kenya, S Somalia and N Tanzania.



Descriptive notes. 13–13·5 cm; 8·5–10·8 g. Male has head to upper breast and flanks azure-blue, mantle, back and upperwing tawny-brown, primary P9 broad near tip, rump and uppertail-coverts blue, long graduated tail blue (central feathers narrow at tip); centre of lower breast, belly and undertail-coverts pale greyish to buffy-fawn, rearmost belly whitish; iris red to brown, eyering pale grey-blue; bill pinkish to crimson, often blackish at tip; legs dull flesh to orange- or pinkish-flesh. Female is paler than male, has crown bluish-grey to brownish, lower forehead and face (to above eye) to upper breast and flanks blue, rest of underparts light buffish-brown, centre of belly to vent white. Juvenile is similar to female, with face pale blue (variable), breast and flanks pale blue, juvenile male slightly bluer than juvenile female, both with bill black. Voice. Contact call a thin "tseee", harsher than that of *U. angolensis*; alarm a sharp "tchek", singly or in short series, or repeated rapidly (8–10 notes per second) in dry rattle of rising notes; also a more rapid chatter (12 notes per second), each note rising and falling; nest call a high-pitched "chee-chee-chee". Song a series of short and long whistles (sometimes with overtones) and jumbled notes, pitch of early notes usually low and later ones high, with long rising slurred note near end, "teu, skukrr! tsee-ee-wee-see-see, skurr, teh-teh, sweeeeee"; individual male gives variations on a theme, and songs vary among males. Female song short, often ends with dry "tseee", also a trill and a series of whistles. Whistles longer (to 0·3–0·8 seconds), stronger and purer in tone, less lispy than those of congeners.
Habitat. Arid and semi-arid acacia savanna with thickets, thornbush scrub (*Acacia*, *Commiphora*, *Chrysopogon*); in Kenya mainly in areas with annual rainfall 250–1000 mm. Lowlands to 1300 m.
Food and Feeding. Small seeds of annual grasses; also insects, mainly termites (Isoptera). Feeds on ground; takes termites by pecking through earth-covered tunnels on ground and stems of trees. Forages in pairs and small groups.
Breeding. Season May–Jun in Somalia, during rains and into early dry season in Kenya, and Nov–Jun in Tanzania. Courting male faces female, raises head, holding tip of feather in bill, bill and feather pointing upwards, jerks head up and down and, with plumage sleeked, perches near female, turns tail and head towards her, and bounces up and down; courtship behaviour much as for *U. angolensis*. Nest a dense ball of fine grasses, entrance hole low on side, lined with feathers or soft flowering heads of grasses and fine stems, placed in thorny tree or acacia, or sometimes on telegraph pole, often near active nest of wasps (Hymenoptera); will take over old nest of *Ploceus*

On following page: 49. Violet-eared Waxbill (*Granatina granatina*); 50. Purple Grenadier (*Granatina ianthinogaster*).

weaver or of buffalo-weaver (*Bubalornis*). Clutch 4–6 eggs, incubation period 13–14 days; hatchling has pink skin with three broad black stripes on throat, long, dense pale buff to grey down, mouth has small blackish oval swelling above gape (swelling bordered bluish-white at corner of mouth), gape with greyish-white band, and a smaller black swelling on outer edge of lower bill (basal and distal edges whitish), whitish palate grading to sky-blue to violet at rear, whitish area with three black spots, inner bill tip blackish, inner buccal cavity pink, tongue pink with black ring and bluish-white tip, lower mouth lining pale pink with black crescent near bill tip (little change with nestling age); nestling period 17–19 days; fledged young begin to feed themselves after 7 days, and independent by 14 days. In Kenya, song mimicry suggests possible parasitism by Long-tailed Paradise-whydah (*Vidua paradisaea*), and in Sudan–Kenya border region distribution suggests that present species is a host of Straw-tailed Whydah (*Vidua fischeri*); in captivity, breeding adults foster-rear Village Indigobird (*Vidua chalybeata*), *Lagonosticta senegala* and *Amandava subflava*.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally fairly common; nowhere numerous. Fairly widespread in Kenya and Tanzania; more localized in Sudan, Ethiopia and Somalia.
Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), David & Gosselin (2002a), Fry & Keith (2004), Goodwin (1971, 1982), Lewis & Pomeroy (1989), McCarthy (2006), Nicolai *et al.* (2007), Nikolaus (1987, 1989), Payne (1997b, 2005a), Payne *et al.* (2001), Redman *et al.* (2009), Stevenson & Fanshawe (2002).

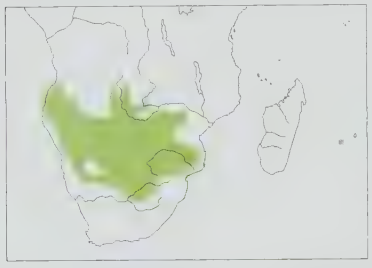
Genus *GRANATINA* Sharpe, 1890

49. Violet-eared Waxbill

Granatina granatina

French: Cordonbleu grenadin **German**: Granatastrild **Spanish**: Granadero Meridional
Other common names: Common Grenadier

Taxonomy. *Fringilla granatina* Linnaeus, 1766, Brazil; error = Angola.
Genus sometimes subsumed in *Uraeginthus*. May form a superspecies with *G. ianthinogaster*. Birds from near Okahandja, in C Namibia, described as race *siccata*, and others from near Panda, in Inhambane district of Mozambique, as race *retusa*, appear to differ little from those elsewhere in species' range. Treated as monotypic.
Distribution. S Angola, SW Zambia and Zimbabwe S to Namibia, Botswana, N South Africa (S to N Northern Cape, Free State and Mpumalanga) and S Mozambique.



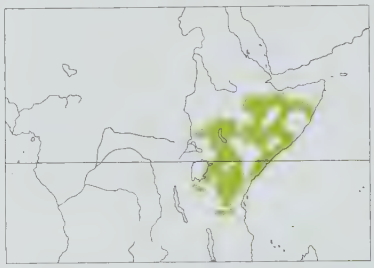
Descriptive notes. 14 cm; 9·5–13·9 g. Male has forehead to superciliary region deep blue, crown rich chestnut, grading to paler rufous-brown on back and upperwing-coverts; rump and uppertail-coverts deep blue, long graduated tail black, most rectrices with basal two-thirds edged pale blue, flight-feathers brown; side of face (from below eye) to throat violet, lores brownish-black, chin to centre of throat black, rest of throat and underparts rich chestnut, lower belly and undertail-coverts brownish-black to black; iris reddish-orange to red-brown, broad eyering orange-red; bill red; legs brown-grey to dark grey. Female has anterior forehead and superciliary area pale blue, crown rufous-brown to brown, back grey-brown, rump to tail paler blue than on male, cheek, ear-coverts and side of face violet, lores dark grey, chin and throat buffy white, breast deep fawn, belly and flanks paler, lower belly to undertail-coverts pale cream; iris brown to reddish, eyering pale orange-red. Juvenile is similar to female, but blue on rump and tail paler, no blue on head, bill reddish-black, eyering blackish, iris brown; blue appears on forehead, black on lores and violet on cheeks before independence. Voice. Contact call "tsek"; excitement or threat call "chay chay chay"; nest call by male on nest (to attract female) 8 soft notes per second, changing in pitch within a series. Song begins with harsh "chay chay" trill, each note rising and then falling, then fluting whistles, "tiu-woo-wee" or "chick-weeoo-weeyi" or "chi-tweeyo-tweeya-chwip", and ends with buzz and slurred whistle, "tiu-woo-wee". Male has several song themes and varies them within a song bout; female has shorter song, and pair sometimes countersings.
Habitat. Acacia (*Acacia*) savanna and thorn thickets, *Terminalia* woodland, *Bauhinia* scrub, thickets in regenerating Rhodesian teak (*Baikiaea plurijuga*) forest, also thickets at base of inselbergs in Zimbabwe, and edge of *Cryptosepalum* forest in Zambia; cultivation.
Food and Feeding. Small seeds of grasses and of the forb common purslane (*Portulaca olearacea*), fruits of small trees, nectar of aloes (*Aloe*); grass flowers also taken; also insects, including termites (Isoptera), small caterpillars, ants (Formicidae), beetles (Coleoptera). Nestlings fed with green grass seeds and termites. Grasses exploited in N South Africa include *Panicum*, *Urochloa*, *Digitaria*, *Aristida*, *Sporobolus*, *Eragrostis* and *Tricholaena*. Feeds on the ground; also takes growing grass stem in bill and holds under foot before removing seeds from inflorescence, flies on to grass stem and bears it to the ground before taking seeds, and jumps from ground to take seeds from seedheads. De-husks seeds in the bill, one at a time; 34 small seeds of *Tricholaena monachne* taken in one minute. Uses bill to break open crust of termite galleries. Forages in pairs, sometimes in small groups; associates with *Estrilda* and *Uraeginthus* species.
Breeding. Breeding records, from a few weeks after first rains into dry season: in Botswana Dec–Jul (mainly Feb–Apr), in Zambia Dec–Apr, in Zimbabwe Oct–May (most records Jan–Mar), and in N South Africa Dec–May. In courtship, male holds a grass or feather in bill, erects feathers on face and flanks, and bows and bobs to female, brightly coloured face patches showing in sideways head movements. Territorial. Nest a loosely constructed ball with side entrance, made from dry grass stems, lined with feathers, placed from low down to 3 m above ground in thornbush; both sexes bring feathers to nest during egg and chick stages. Clutch 2–5 eggs; incubation period 14 days; hatchling skin blackish with long sparse greyish-white down, gape papillae white, upper pair larger, palate orange with 3–5 black spots, inner mouth black, tongue black (at hatching, becoming orange or yellow with black spots by fledging), sublingual band forming black chevron; nestling period 16–18 days; fledged young begin to develop blue face, violet cheek patch and black or blue lores between 24 and 35 days of age (remainder of juvenile plumage replaced weeks later), young males begin to sing by 30–32 days after leaving nest. Nests parasitized by Shaft-tailed Whydah (*Vidua regia*), nestlings of which mimic mouth pattern and colours of present species' nestling.
Movements. Resident, with local movements. In South Africa (North West Province and Free State), ringed individuals remain all year, with seasonal influxes of additional birds; in Zambia, a few records in dry years and cold winters outside usual range.
Status and Conservation. Not globally threatened. Locally common; nowhere very numerous. Estimated population in excess of 5000 individuals in S Mozambique (in inland Sul do Save). In N South Africa, densities of 2 pairs/km² in open bushy habitat (North West Province) and 2–6 pairs/km² in Kalahari woodlands (Limpopo).
Bibliography. Dowsett *et al.* (2008), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Hoesch & Niethammer (1940), Immelmann & Immelmann (1967), Irwin (1981), Maclean (1993), McCarthy (2006), Milstein (1975), Nicolai (1964, 1968c), Nicolai *et al.* (2007), Skead, D.M. (1975).

50. Purple Grenadier

Granatina ianthinogaster

French: Cordonbleu violacé **German**: Veilchenastrild **Spanish**: Granadero Oriental
Other common names: Purple(-bellied) Waxbill

Taxonomy. *Uraeginthus ianthinogaster* Reichenow, 1879, Massa, on lower Tana River, Kenya.
Genus sometimes subsumed in *Uraeginthus*. May form a superspecies with *G. granatina*. Birds from Kisumu, in Kenya, described as race *rothschildi*, others from S R Guaso Nyiro, in Sotik district of Kenya, as race *roosevelti*, and birds from Bari, on R Shebelle, in Somalia, as race *hawkeri*, but none appears to exhibit any constant differences from those elsewhere in species' range. Treated as monotypic.
Distribution. S Sudan, Ethiopia, Somalia, NE Uganda, Kenya and Tanzania.



Descriptive notes. 13–14 cm; 12–17·4 g. Male has lores cinnamon, patch around eye to below bill cobalt-blue to purplish-blue, rest of head to neck and throat cinnamon, mantle, back and upperwing dull brown, rump and uppertail-coverts purplish-blue, tail black with some bluish fringes at base; upper chest and sides of breast cinnamon, breast to belly and undertail-coverts purplish-blue with cinnamon to chestnut patches, especially on centre of breast; iris orange-red, eyering orange-red; bill red, sometimes more dusky on culmen; legs brownish-grey to dark grey. Female has lores cinnamon, narrow pale silvery-blue patch above and below eye (extending from base of bill nearly around eye), rest of head to neck and throat light cinnamon, back and wings brown, rump and uppertail-coverts dark blue, underparts light cinnamon with whitish spots and bars, paler buffish on undertail-coverts; bare parts as for male. Juvenile is similar to female in having tawny-cinnamon plumage with blue rump and uppertail-coverts, but without spots or bars and lacking face patch, and bill reddish-brown. Voice. Call a thin "wis" or "wis-wis" (at 4–6 kHz), given when bird near mate or independent young; mate may respond with same call. Contact trill c. 10 notes per second, each note descending (from 6 kHz to 4 kHz), usually introduced by short, more rapid and higher trill (20 notes per second, each falling from 5·8 kHz to 4·6 kHz), latter sometimes itself preceded by higher and faster short soft trill. Alarm call a short hard "tsek", sometimes in series, e.g. by female perched next to a male whydah (*Vidua*); excitement or threat call a loud, harsh rattle, "chay-chay-chay", when chasing another male; nest call, by male to attract female to nest, a series of contact notes or soft notes with contact trill. Loud song, given early and late in day when male has been apart from mate for long time, a series of high, thin rising whistles mixed with short soft notes and ending with long sweet, upward-sliding whistle, "cheerer-cheet-tsee-tsee-sur-chit-cheet-chit-tsereeeet"; another theme, the trill song, after male has fed and preened in morning, and during day with mate, is whispery and buzzy with short trill in middle and high trill or whistle on one pitch at end. Female song similar to male trill song; loud whistle at end may be contact call. Pair often countersings, and male sings in response to fledglings' begging calls. Detail of song of any one male varies, and songs differ among males and also geographically.
Habitat. Dry country and semi-arid thornbush with acacia (*Acacia*) bush and thicket country, and riverine woodland; from near sea-level to 1600 m.
Food and Feeding. Small grass seeds; termites (Isoptera). Forages on ground and in undergrowth and thickets. Forages in pairs and in small parties; occasionally solitary. Often rather secretive.
Breeding. Breeding recorded in Mar–Jul and Nov in Ethiopia and May in Somalia; in E Africa during rains, Feb–Jun in L Victoria basin, Jan–Jul and once Oct in Kenya E from Rift Valley, and in Tanzania Nov–Mar in Serengeti National Park and Feb–May in Iringa. Courting male holds a grass stem or feather in bill, bobs up and down near female, stretches neck with bill upright to 45°–60°, and bows head to one side and the other. Territorial. Nest a loosely built ball with side entrance and sometimes a spout, made from fine grass, lined with feathers, placed in fork of low bush or in tall grass under bush; both sexes bring feathers during laying period and male continues through incubation stage. Clutch 3–5 eggs; incubation period 13–14 days; hatchling has purplish-black skin and light grey or fawn down, gape with blue dorsal swelling and smaller pale blue ventral swelling, dark blue to purplish-black band around gape (open mouth shows two blue swellings on each side), oral surface black, palate centre whitish with three black spots, tip of palate dark grey, medial palate (behind spots) orange and grading to whitish and laterally to pale blue, rest of palate and inner mouth black, tongue white with black bar near rear (tongue changes to black with white edges), inner lower mandible black; nestling period 18–19 days; young lose natal down 1–2 days after leaving nest, feed themselves by 8–9 days later, gape swellings regress and bill turns pink at base, blue or white feathers around eyes begin to grow 24–35 days after hatching; young form pair-bonds when facial plumage grown, young male sings 2 months after fledging. Nests parasitized by Straw-tailed Whydah (*Vidua fischeri*), young of which mimic mouth pattern and colours of present species' nestling; parasitized once by Long-tailed Paradise-whydah (*Vidua paradisaea*), nestlings of which mimic those of *Pytilia melba*.
Movements. Resident.
Status and Conservation. Not globally threatened. Common to fairly common throughout range.
Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Fry & Keith (2004), Goodwin (1982), Immelmann *et al.* (1965), McCarthy (2006), Neunzig (1929a), Nicolai (1964, 1968c, 1969, 1973a), Nicolai *et al.* (2007), Payne (2005a), Payne, Parr & Payne (2003), Payne, Woods *et al.* (2000), Redman *et al.* (2009), Schmidl (1982), Zimmerman *et al.* (1996).

PLATE 20 ➤



PLATE 20

inches 2

cm 5

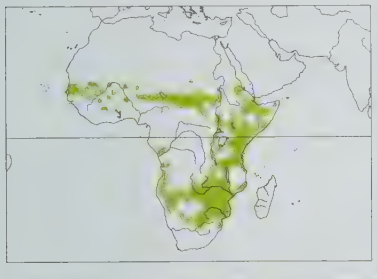
Genus *PYTILIA* Swainson, 1837

51. Melba Finch

Pytilia melba

French: Beaumarquet melba **German**: Buntastrild **Spanish**: Estrilda Melba
Other common names: Green-winged/Yellow-breasted Pytilia, Melba Waxbill

Taxonomy. *Fringilla Melba*, Linnaeus, 1758, China; error = Luanda, Angola.
Was thought possibly to form a superspecies with *P. hypogrammica*, but such a relationship not supported by molecular analysis. Has been suggested that red-lored *citerior* and grey-lored *percivali* represent two different species, but red-lored and grey-lored males intergrade across E Africa, and many intermediates occur. Race *soudanensis* intergrades with *citerior* in S Sudan, with *jessei* in Djibouti and with *grotei* in NE Tanzania. Proposed race *clanceyi* (described from Bahr el Ghazal, in Sudan) treated as a synonym of *citerior*; *damarensis* (from Windhoek, in W Namibia) and *thamnophila* (from Big Bend, on R Great Usutu, in E Swaziland) synonymized with nominate. A population in Djibouti with much yellow in plumage named as race *flavicaudata* (but no museum specimen), and apparently identical birds occur in N South Africa (Northern Cape Province), both possibly variants or additional races; a yellowish bird from Northern Cape appears to be a leucistic individual of nominate race, having mitochondrial sequence identical to that of others of this species in the region; further study required. Eight subspecies recognized.
Subspecies and Distribution.
P. m. citerior Strickland, 1853 – S Mauritania, Senegal, Gambia, Guinea-Bissau, Mali and N Ivory Coast E to N Nigeria, Chad and S Sudan (W of R Nile).
P. m. jessei Shelley, 1903 – NE Sudan, Eritrea, NE Ethiopia, Djibouti and Somalia.
P. m. soudanensis (Sharpe, 1890) – S & SE Sudan, S & E Ethiopia, Djibouti, Uganda, and N & E Kenya S to N Tanzania.
P. m. belli Ogilvie-Grant, 1907 – W Uganda, Rwanda, Burundi, E DRCongo (Kivu) and W Tanzania.
P. m. percivali van Someren, 1919 – C & SW Kenya and N Tanzania.
P. m. hygrophila Irwin & Benson, 1967 – N Zambia and N Malawi.
P. m. grotei Reichenow, 1919 – NE Tanzania S to lower R Zambezi and S Malawi.
P. m. melba (Linnaeus, 1758) – S PRCongo, W & SE DRCongo, Angola, Zambia (except N) and SW Tanzania S to C Namibia, S Botswana, Zimbabwe, S Mozambique, N South Africa and E Swaziland.



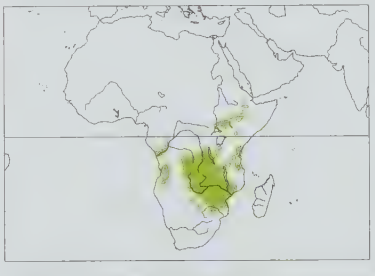
Descriptive notes. 12–14 cm; 12·8–18·4 g. Male nominate race has forehead, cheek, chin and throat red, lores and rest of head grey; upperparts and upperwing yellowish-green, rump and uppertail-coverts red; central pair of rectrices red, other tail feathers dark brown with red outer web; yellowish-green band below throat; some white spots on this band, lower down giving way to bars separated by dark grey, the white progressively dominating towards lower central belly and undertail-coverts; iris red, eyering grey; bill red, sometimes dusky on culmen; legs pinkish-flesh to yellow-brown or grey. Female resembles male, but head all grey (no red), lacks greenish band below throat, barring less distinct, bill red with dusky on culmen and often on tip of lower mandible. Juvenile is like female, but paler, lacks barring, vent and undertail-coverts buff, bill black, iris dark brown. Race *grotei* is darker than nominate, upperparts tinged more golden, red of throat extends onto much of central breast, some males with trace of red on scapulars and upperwing-coverts; *hygrophila* is darker, underparts more heavily barred blackish; *belli* has chin to throat and centre of breast red, upper breast bright yellow, some males with trace of red on scapulars and upperwing-coverts; *percivali* is paler than nominate, lightly barred; *soudanensis* has lores to eye red (not grey), red extending onto throat, face behind eye grey, yellowish breastband, lightly barred below; *jessei* is like previous, but lores grey, forehead and chin to throat paler orange-red, upperparts paler; *citerior* has red extending to lores and behind eye, upperparts normally paler than in nominate, breast much more golden-yellow, and dark bars on underparts paler and thus less contrasting (dark in S part of range). Voice. Contact call a downslurred "tseeoo", alarm call "wik"; other calls "tsit-tsit" or "spit spit". Song varies regionally. In N South Africa, a quiet string of notes lasting up to 16 seconds, starting with sounds like drops falling into water, then ratchet-like "krik krik", then a long trilled whistle (pitch rising and then falling) separated by harsh note, "plink plink krrip pooorrrrrree krip prrreeeeeeoooo..."; in S Zambia, begins with two long, low-pitched whistles followed by "V-shaped" note (in audiospectrogram) with harmonics, a buzzy whistled downslur and then upslur, then a medley of "chip" notes and buzzes, popping notes, low chuckles and low-pitched "woy-woy", sometimes ending in long descending "shrrreeeeeoo", song lasting as long as 10 seconds; songs elsewhere in Zambia lack introductory whistles and harmonic "V", more like song in E Africa, where harsher and composed more of thin hisses, rattles, whistles and low chuckles, but with complex phrases not heard farther W; in Ethiopia described as "loud persistent series of chips, squeals and nasal notes"; song in W Africa simple, without harmonic whistles, lasting c. 2 seconds. Female has short song.
Habitat. Acacia (*Acacia*) thorn savanna and thickets, dry savanna woodland, edge of riparian forest, neglected cultivation and graveyards; lowlands, 100–1500 m.
Food and Feeding. Small grass seeds, also termites (Isoptera) and pseudoscorpions (Pseudoscorpiones). In N South Africa exploits the grasses *Panicum maximum*, *Urochloa mosambicensis*, *Rhynchelytrum repens*, *Sporobolus*; in Zambia grasses *Panicum*, *Echinochloa colonum*, *Urochloa*, *Setaria*, also seeds of *Amaranthus*; visits flowering acacia trees. Rears young on termites. Feeds on ground. Locates termites by digging with bill through the encrusted tunnels on ground and base of trees, and takes termites on the wing. Forages in pairs and in small flocks. Often inconspicuous.
Breeding. Breeds in nearly all months, mainly Sept–Feb, in Senegal; in Aug, Sept and Mar in Nigeria and May and Jun in Ethiopia; breeds with rains in E Africa; in Oct–May (mainly Feb–May) in Zambia and Botswana, Jan–Jun in Malawi, in all months (mainly Jan–May) in Zimbabwe, and Dec–May in N South Africa. In greeting behaviour or courtship, male and female hop around each other on ground, each with tail towards mate; in courtship, male displays on perch, holds a feather or grass in bill, and sings, he bobs up and down, feet leave perch and return with audible click. Territorial; pairs have mutually exclusive breeding territories. Nest a loosely constructed ball with side entrance, made from dry grass, lined with fine grass-heads and feathers, built 0·5–2 m above ground in thorn tree or thicket, concealed in mistletoe (Loranthaceae) or exposed on forked branch. Clutch 3–5 eggs; incubation period 12–13 days; nestling skin black, sparse down pale grey, gape has slightly swollen white flange above and below, continuous across gape, base of flange black, palate white with single black spot in centre, posterior mouth-lining bright pink, sides and lower mouth black, luminous pale blue spot on each side of black palate, tongue pink at base, with wide dark band and whitish tip; nestling period 21 days; young independent 14 days after leaving nest. Nests parasitized in E & S Africa by Long-tailed Paradise-whydah (*Vidua paradisaea*), young of which mimic skin colour and mouth pattern of host's nestling; in W Africa by Sahel Paradise-whydah (*Vidua orientalis*). In ringing studies in Malawi, maximum recorded longevity 8 years.
Movements. Resident; some local seasonal movements, as indicated by changes in numbers in NE Nigeria and in Botswana. In Malawi, some individuals recaptured as much as 21 km from site of ringing.
Status and Conservation. Not globally threatened. Uncommon to locally common. Mostly uncommon in NW of range (W of Nigeria), and uncommon in extreme NE; scarce to uncommon and local in much of E range from Uganda and Kenya S to Tanzania; commoner in S parts of range, e.g. Angola and South Africa, but uncommon in Namibia. Estimated population in S Mozambique (Sul do Save) 200,000 individuals. Densities in mixed *Acacia–Dichrostachys* thornbush savanna in N South Africa 0·25–1·25 breeding pairs/ha (i.e. 1 pair/0·8–4 ha), or 0·39–0·79 pairs/ha (1 pair/1·3–2·6 ha); densities of 12, 32, 69 and 97 birds/km² in *Acacia* savannas in Swaziland. Popular cagebird, large numbers of which are captured and exported; mortality during shipment high. During 1992–1993 drought in S, this species declined dramatically in SE Botswana (reported that bird-export companies failed to take their "usually sustainable quotas").
Bibliography. Ash & Atkins (2009), Barlow *et al.* (1997), Barnard & Markus (1990), Benson & Irwin (1967), Brickell (1999a), Chappuis (2000), Christidis (1983), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Elgood *et al.* (1973), van den Elzen & König (1983), Fleming *et al.* (2006), Fry & Keith (2004), Goodwin (1982), Güttinger & Nicolai (1973), Hand (1998), Harrison *et al.* (1997), Hockey *et al.* (2005), Immelmann *et al.* (1965), Klein & Payne (1998), Maclean (1993), McCarthy (2006), Nicolai (1964, 1965b, 1969, 1991), Nicolai *et al.* (2007), Payne (1973b, 1980b, 1989, 2005a), Redman *et al.* (2009), Skead, D.M. (1975), Welch *et al.* (1986), Welch & Welch (1988, 1998), Wolters (1963, 1977).

52. Orange-winged Pytilia

Pytilia afra

French: Beaumarquet à dos jaune **German**: Wienerastrild **Spanish**: Estrilda Alinaranja
Other common names: Golden-backed/Yellow-backed Pytilia, Yellow-winged Pytilia(!), Red-faced Finch

Taxonomy. *Fringilla afra* J. F. Gmelin, 1789, Angola.
Has been thought to form a superspecies with *P. phoenicoptera* and *P. lineata*, but such a relationship not supported by molecular analysis. Monotypic.
Distribution. Ethiopia, S Sudan, N Uganda, C & SE Kenya, SE PRCongo (lower Congo Valley), SW, S & SE DRCongo, E Rwanda, S Burundi, Tanzania, Angola, Zambia and Malawi S to extreme NE Namibia (Caprivi), N & E Botswana, N South Africa (Limpopo) and SC Mozambique.



Descriptive notes. 11 cm; 15–18 g. Male has face from forehead to ear-coverts, chin and upper throat red, rest of head grey, mantle and back golden-olive, edges of upperwing-coverts and outer flight-feathers golden-orange, rump and uppertail-coverts red; central pair of rectrices, other tail feathers dark brown with red outer webs; lower throat and upper breast grey, lower breast olive, belly to undertail-coverts dusky olive-grey with whitish barring; iris red to reddish-brown; bill red; legs pinkish-grey to flesh-coloured. Female has red of head replaced by grey, tinged olive on forecrown, chin whitish, throat to breast barred olive-grey and whitish. Juvenile is grey above, rump dull reddish, whitish underparts indistinctly barred, bill black, iris dark brown. Voice. Alarm or excitement call short, 0·04 seconds, sound energy peaks at 3 kHz with overtone 4·5 kHz, given in pairs and sometimes repeated in a rattle; contact call a rising note and then a longer falling note run together, "seeee", most energy at 4 kHz; peeping "tyooyu", lower-pitched than equivalent calls of *P. phoenicoptera* and *P. hypogrammica*; buzzy whistling croak characteristic of the species, 1 second long, a rapid modulation at 36–40 peaks per second, held on pitch 3–4 kHz with peak energy at 3·4 kHz, the elements in phrase drop in pitch, this note used also as nest call; distance contact call a whistled "tyew" or "tyooyu", beginning at 5 kHz and dropping to 4·8 kHz, or lower (dropping from 4 kHz to 2·8 kHz), lasting 0·15–0·5 seconds, note given singly, in pairs or in a series. Song a standard combination of these phrases, a rattle, a buzzy croak and a short whistle.
Habitat. Open wooded and bush country, tall grass savanna, tangled thickets, cultivated areas; generally below 1800 m.
Food and Feeding. Feeds on small grass seeds, and also termites (Isoptera). Forages mostly on ground. Generally occurs in family parties and small flocks; sometimes larger flocks outside breeding season.
Breeding. Season Apr–Jun in Tanzania, Jan–May and Aug in Zambia, Mar–Jul in Malawi and Feb–Apr in Zimbabwe. In courtship display, male holds feather in bill, sings, jumps up and down and throws head over back; he quivers tail, and between jumps he turns to one side or other. Nest a ball with side entrance, made from grass, lined with a few feathers, sited 2–2·5 m above ground in thicket, in undergrowth or on fork of branch in small tree. Clutch 3–5 eggs; incubation period 12–14 days; nestling skin blackish on head and pink on back, down pale grey, gape-flange whitish-grey (less swollen than that of *P. melba*), palate white with no central spot, bill tip black, posterior

On following page: 53. Yellow-winged Pytilia (*Pytilia hypogrammica*); 54. Red-winged Pytilia (*Pytilia phoenicoptera*); 55. Ethiopian Pytilia (*Pytilia lineata*); 56. Dybowski's Twinspot (*Euschistospiza dybowskii*); 57. Dusky Twinspot (*Euschistospiza cinereovinacea*); 58. Pink-throated Twinspot (*Hypargos margaritatus*); 59. Peters's Twinspot (*Hypargos niveoguttatus*); 60. Brown Twinspot (*Clytospiza monteiri*).

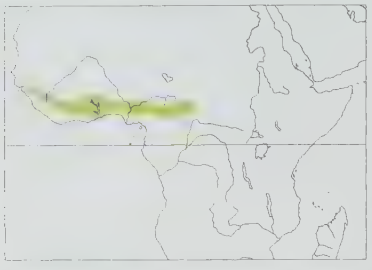
surface bright pink, side of upper mouth reddish-pink with oval violet spot, tongue unmarked pink, and lower mouth pink with black chevron at tip; nestling period 21 days. Nests sometimes parasitized by Broad-tailed Paradise-whydah (*Vidua obtusa*), nestlings of which mimic the host's nestling.
Movements. Resident; seasonal movements and nomadic in dry areas.
Status and Conservation. Not globally threatened. Uncommon or rare in much of range; locally more common. Rare especially at N & S extremes of range, i.e. Sudan, Ethiopia and South Africa. In Sudan last reported 1918; in Ethiopia three records since 1970; in Kenya few recent records near S coast. Locally common in Angola.
Bibliography. Ash & Atkins (2009), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Elgood *et al.* (1994), Fry & Keith (2004), Goodwin (1982), Güttinger & Nicolai (1973), Hockey *et al.* (2005), Immelmann *et al.* (1965), Klein & Payne (1998), Lewis & Pomeroy (1989), Markus (1970), McCarthy (2006), Nicolai (1964, 1969), Nicolai *et al.* (2007), Nikolaus (1987), Payne (2005a), Vincent (1949b).

53. Yellow-winged Pytilia

Pytilia hypogrammica

French: Beaumarquet à ailes jaunes **German**: Rotmaskenastrild **Spanish**: Estrilda Aliamarilla
Other common names: Red-faced Pytilia, (Red-faced) Aurora Finch

Taxonomy. *Pytelia hypogrammica* Sharpe, 1870, Fantee, Ghana.
Probably forms a superspecies with *P. phoenicoptera* and *P. lineata*; was previously thought to form a superspecies with *P. melba*, but such a relationship not supported by results of molecular-genetic studies. Male having red wings, as well as red face, described as *P. lopezi* (type from near Bunda, in Central African Republic), but considered a morph or, possibly, a race of present species; further study required. Monotypic.
Distribution. Guinea-Bissau and W Guinea E to S Chad and W Central African Republic (on R Shari), S to coastal Ghana and Togo.



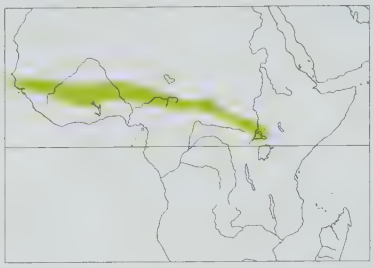
Descriptive notes. 12·5 cm; 14·3–15 g. Male has face from forehead to ear-coverts and down to cheek and throat red, lores grey; crown to back grey, rump and uppertail-coverts red; central pair of rectrices reddish, other tail feathers dark brown with red outer webs; upperwing grey-brown, coverts and outer flight-feathers edged golden-yellow; breast to belly medium olive-grey with fine black and white bars, undertail-coverts grey with whitish bars; iris deep brown-red, eyering grey; bill mostly blackish, paler grey on base of lower mandible; legs pinkish-grey. Female lacks red on head, has head to breast grey tinged brownish, underparts slightly paler than male, white bars and grey bars of equal width. Juvenile is brownish-grey above, rump and tail reddish, wing brownish-grey with rufous edgings, underparts grey with trace of bars, iris dark brown. Voice. Alarm call notes rise from 1 kHz to 2·4 kHz (most energy at 2·6 kHz and an overtone at 3·4 kHz), some descend at end, while others rise and then change into a loud descending whistle at 3 kHz, often in rapid excitement chatter of double notes rising to a peak and dropping rapidly near end; contact call "seeee", like that of *P. afra*; croaking call a buzzy whistle similar to that of *P. afra*, modulated at 40 peaks per second and held on constant pitch with an overtone (two bands of energy centred at 2·4 kHz and 3·6 kHz), other variants are (a) short notes, lower in pitch, rising from 1·8 kHz to 2·8 kHz in a phrase of 20 per second, and (b) short notes rising and falling between 2 kHz and 3 kHz modulated at 24 peaks per second ("wi-wi-wi" or "vee-vee-vee"), all variants given at constant pitch. Song of two themes: one an alarm note and a croak, and after a slowly modulated croak, with no pause, a slurred whistle; the other theme a series of soft alarm notes and then an excitement chatter and a rapid croak, the effect a slow chatter and rapid buzz.
Habitat. Mature S guinean woodland and derived bushland, edges of riverine forest, coastal thickets, woods around base of inselbergs, and abandoned cultivation. Occurs in moister habitats than those occupied by *P. phoenicoptera*; the two are mainly parapatric in distribution.
Food and Feeding. Small grass seeds; also insects, mainly termites (Isoptera) and ants (Formicidae). In examination of contents of 19 stomachs, seeds found in 16 and insects in three. Feeds mainly on ground, occasionally in trees. Singly and in pairs, sometimes in small parties; associates from time to time with other small seed-eating species.
Breeding. Season Oct–Jan in Nigeria. Courting male bows to female, tail angled toward her, and calls; in another display, male holds feather in bill and jumps up and down on perch, tossing head up with each jump, releases hold on perch on vigorous upward bobs. Nest a loosely constructed covered ball with hole on one side, outer layer of broad grass strips, middle layer of grass stems, and lining soft grass-heads and feathers, sited 0·5–4 m above ground in bush or tree. Clutch 3–4 eggs; incubation period 12–14 days; nestling skin dark grey on head and pink on body, turning blackish with age, down pale grey, gape-flange white, two bluish-white lobes with black spot on oral surface, palate yellowish-white with no central spot, posterior surface bright pink, with red lines behind palate and along choana, side of upper mouth pinkish-red with oval violet spot, tongue pink with no black marks and dorsal surface with red band, ventral mouth pink with black chevron, all as *P. phoenicoptera*; nestling period 20–22 days. Suspected brood parasitism by Togo Paradise-whydah (*Vidua togoensis*) in W Africa E to Togo, and by Exclamatory Paradise-whydah (*Vidua interjecta*) in Nigeria and Cameroon.
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common; uncommon to rare in several parts of range. Rare in Liberia, and uncommon to rare in Burkina Faso and Benin; uncommon to rare, and local, in Ghana. Somewhat more numerous in Cameroon, especially on Adamawa Plateau.
Bibliography. Alexander (1906), Burkard (1964), Cheke & Walsh (1996), Dodman *et al.* (2004), Dowsett-Lemaire & Dowsett (2008b), Dunning (2008), Eckl (1974), Fry & Keith (2004), Goodwin (1982), Güttinger (1976), Klein & Payne (1998), Mayer (1993c), Nicolai (1968b, 1977), Nicolai *et al.* (2007), Payne (2005a), Serle (1957).

54. Red-winged Pytilia

Pytilia phoenicoptera

French: Beaumarquet aurore **German**: Auroraastrild **Spanish**: Estrilda Alirroja
Other common names: Crimson-winged Pytilia, Aurora Finch/Waxbill/Pytilia

Taxonomy. *Pytilia phoenicoptera* Swainson, 1837, West Africa = Gambia.
Probably forms a superspecies with *P. hypogrammica* and *P. lineata*, and has been considered conspecific with latter; previously thought to be close to *P. afra*, but such a relationship not supported by results of molecular-genetic studies. Two subspecies recognized.
Subspecies and Distribution.
P. p. phoenicoptera Swainson, 1837 – Gambia, Senegal, Guinea-Bissau, Guinea, S Mali and N Ivory Coast E to SE Burkina Faso, Benin and N Nigeria.
P. p. emini E. J. O. Hartert, 1899 – Cameroon, S Chad, Central African Republic, S Sudan, NE DRCongo and N Uganda.



Descriptive notes. 12·5–13 cm; 13·7–16·1 g. Male nominate race has head and upperparts grey, rump and uppertail-coverts red, central pair of rectrices reddish, other tail feathers dark brown with outer red webs red; upperwing grey, upperwing-coverts and edges of primaries and outer secondaries red; throat greyish-whitish, underparts barred grey and white, the white bars becoming broader posteriorly (white bars widest on undertail-coverts); iris dark brown to red, eyering grey; bill black; legs pinkish-grey. Differs from *P. lineata* in having black, not red, bill. Female has grey areas above tinged brownish, underparts paler than male, white bars broader than grey bars. Juvenile is brownish-grey above, rump and tail reddish, wing brownish-grey with rufous edgings, underparts grey with trace of bars, iris dark brown. Race *emini* slightly greyer, with white barring of underparts narrower and starting on lower breast, female darker below than nominate, with more diffuse barring. Voice. Alarm or excitement call a rising whistle, often becoming a double-note chatter, like that of *P. hypogrammica*; contact call, "seeee", like that of *P. afra*; croak call a buzzy whistle, a soft "geegeegeegee", rising in pitch from c. 2 kHz to 2·8 kHz, intervals between notes increasing (becoming slower, from 30 notes per second at beginning down to 24 at end of phrase), the notes rise, and frequency envelope of phrase elements c. 0·7 kHz at any time; a clear whistle "too-wee-oo" at 2·4–2·8 kHz, on one pitch, with beginning and end slightly lower. Song a series of alarm notes (sometimes followed by short faint whistle), then a rising buzzy whistle, then a descending whistle (like end of clear whistle "too-wee-oo"); song also described as a repeated series of rattling notes followed by double note, of which second part is drawn out into croaky whistle.
Habitat. Dry woodlands with large trees and bushy thickets, around villages and burnt sites.
Food and Feeding. Small grass seeds; also termites (Isoptera). Forages mostly on ground. Takes termites by probing into crust over termite trails on ground and in trees. Forages singly and in pairs; associates occasionally with other seed-eaters.
Breeding. Season Aug and Sept in Gambia and Sept–Feb in Nigeria. In courtship, male hops around female, holds grass or feather in bill, also bobs up and down on perch, sometimes jumping up from perch, as with *P. hypogrammica*, male also flies to nest with loud wing-whirr during laying period. Nest a ball with side entrance, made from grass stems and seeding heads, lined with a few feathers and dry blades of grass, sited within 2 m of ground in bush. Clutch usually 3–4 eggs; incubation period 14 days; nestling skin dark grey on head and pink on body, turning blackish with age, down pale grey, gape-flange white, two bluish-white lobes with black spot on oral surface, palate yellowish-white with no central spot, posterior surface bright pink with red lines behind palate and around choana, sides of upper mouth pinkish-red with oval violet spot, tongue pink with no black marks and dorsal surface with red band, ventral mouth pink with black chevron (brightness of rosy palate varies with nestling condition, paler on nestlings with mite ectoparasites, and fades rapidly after death); nestling period 19–21 days. Nests parasitized by Exclamatory Paradise-whydah (*Vidua interjecta*); in captivity, adults reared chicks of Broad-tailed Paradise-whydah (*Vidua obtusa*).
Movements. Resident; perhaps seasonal migrant near Zaria, in Nigeria, and in NE DRCongo (Uele).
Status and Conservation. Not globally threatened. Uncommon to locally fairly common. Has apparently been recorded in Sierra Leone, but status there uncertain.
Bibliography. Barlow *et al.* (1997), Blasdale (1979), Buckley & Calvin (1992), Chapin (1917, 1954), Christidis (1983), Dodman *et al.* (2004), Dowsett-Lemaire & Dowsett (2008b), Elgood *et al.* (1973), Fry & Keith (2004), Goodwin (1982), Güttinger & Nicolai (1973), Immelmann, Nicolai *et al.* (1977), Immelmann, Steinbacher & Wolters (1965), Klein & Payne (1998), Nicolai (1964, 1968b), Nicolai *et al.* (2007), Payne (1997b, 2005a), Röder (1983, 1984), Trollope (1994).

55. Ethiopian Pytilia

Pytilia lineata

French: Beaumarquet à bec rouge **German**: Streifenastrild **Spanish**: Estrilda Etíope
Other common names: Lineated/Ethiopian Pytilia, (Ethiopian) Aurora Finch, Red-billed Aurora/Pytilia

Taxonomy. *Pytelia lineata* Heuglin, 1863, Dembea, Ethiopia.
Probably forms a superspecies with *P. hypogrammica* and *P. phoenicoptera*, and has been considered conspecific with latter; previously thought to be close to *P. afra*, but such a relationship not supported by results of molecular-genetic studies. Monotypic.
Distribution. N & C Ethiopia.



Descriptive notes. 12·5–13 cm; 11–16·8 g. Male has head and upperparts grey, rump and uppertail-coverts red, central pair of rectrices red, other tail feathers dark brown with red outer webs; upperwing grey, upperwing-coverts and edges of primaries and outer secondaries red; throat whitish-grey, underparts barred grey and white, the grey bars becoming broader from upper breast to belly, the white bars broadest on undertail-coverts; iris dark brown to red, eyering grey; bill red; legs pinkish-grey. Differs from *P. phoenicoptera* in having red, not black, bill. Female has grey areas of plumage tinged brownish, underparts paler, white bars broader than grey bars. Juvenile is mostly brownish-grey above, rump and tail reddish, wing brownish-grey with rufous edgings, underparts grey with trace of bars, iris dark brown, bill greyish or brown, turning first pinkish and then red. Voice. Alarm and flight call "chwick"; songs a few squeaky notes followed by sharp rattle, "tititititititititt".

Habitat. Open wooded grassland and bush, and *Combretum–Terminalia* woodland; at 750–1800 m.
Food and Feeding. Little information. In captivity, small seeds and insects.
Breeding. Nesting recorded in May. Courting male hops around female, holds grass or feather in bill, and bobs up and down on perch. No other information available.
Movements. Resident, with some local movements; occasionally appears in areas where not generally seen.
Status and Conservation. Not globally threatened. Common to abundant in W of range and in C Ethiopian Highlands, where presence confirmed at c. 30 localities, and up to 26 individuals seen in one day; rare in NW. Formerly occurred in E Sudan, where several old records from close to Ethiopian border, but none since 1910.
Bibliography. Ash & Atkins (2009), Fry & Keith (2004), Goodwin (1982), Immelmann *et al.* (1965), Nicolai (1968b), Nicolai *et al.* (2007), Nikolaus (1987), Redman *et al.* (2009), Sclater & Mackworth-Praed (1918).

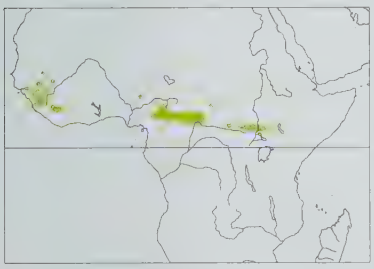
Genus *EUSCHISTOSPIZA* Wolters, 1943

56. Dybowski's Twinspot

Euschistospiza dybowskii

French: Sénégali à ventre noir **German**: Dybowskiastrild **Spanish**: Estrilda de Dybowski
Other common names: (Dybowski's) Dusky Twinspot(!)

Taxonomy. *Lagonosticta Dybowskii* Oustalet, 1892, Post of the Mission of Haut-Kemo, upper Kemo River, Central African Republic.
Forms a superspecies with *E. cinereovinacea*. Monotypic.
Distribution. SE Senegal, Guinea-Bissau, S Mali, Guinea, Sierra Leone, W Ivory Coast, C & E Nigeria, NC Cameroon, Central African Republic, NE DRCongo, S Sudan and N Uganda.



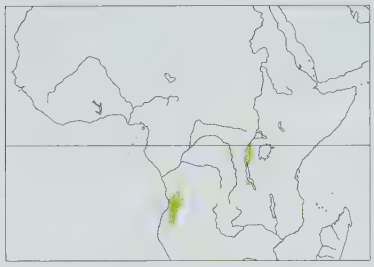
Descriptive notes. 12 cm; 12–14·6 g. Male has head to neck and breast dark grey, upperparts, including rump and uppertail-coverts, crimson, tail feathers blackish-brown, edged greyish-red, upperwing brownish-black; lower breast to undertail-coverts black, flanks with white spots; iris dark brown to reddish-brown, eyering reddish-pink; bill black; legs blackish. Female is paler below than male, chin to breast paler grey, lower underparts and flanks grey, undertail-coverts sooty grey. Juvenile is dark brownish-grey above, rump and uppertail-coverts reddish-grey, iris dark reddish-brown, eyering pink and narrower than adult's. Voice. Close contact call "kek"; distance call a metallic "tsit", in a series louder and run together in excitement or alarm. Song a series of loud, rich bubbling trills, churrs and whistles, some fluty notes. Female has softer song.
Habitat. Grassy areas in woodland, thickets around base of granite hills, weedy cultivation, and grassy montane plateaux.
Food and Feeding. Small grass seeds and insects, taken on the ground. Feeds in cultivated fields of acha "hungry rice" (*Digitaria exilis*) at harvest time, and in annual grasses around latrines and rubbish dumps. Forages in pairs and in small groups; joins mixed flocks with *Lagonosticta*.
Breeding. Breeds in Sept in Sierra Leone, Mar in Cameroon, perhaps Sept–Oct in NE DRCongo (Uele), and Oct in Sudan. Male courts female on ground or on a perch, holds a stem or feather in bill, hops around her with head held upward, belly feathers raised, bobs up and down, sings, sometimes moves head from side to side; on ground, tail is spread and touches ground. Nest a loosely constructed ball of dry grass and plant fibres, lined with feathers, built on ground (then having entrance tube) or to 3 m above ground in fern or shrub (no entrance tube). Clutch usually 4–6 eggs; incubation period 13–14 days; nestling skin purplish-black with sparse grey down, gape with two large white swellings on each side (upper swelling initially blue), each swelling with base light blue and inside mouth black, corner has yellow pad between the white swellings, palate yellow with three black spots and two small mediolateral spots, bill tip blackish, tongue pinkish with two black spots and a yellow tip, inner and lower mouth pink, with black sublingual crescent; nestling period 18–20 days; fledglings fed by both parents, independent in 31 days. Nests in Guinea and Sierra Leone may be parasitized by Cameroon Indigobird (*Vidua camerunensis*), which mimics song of present species.
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon to scarce in much of range; rare in Senegal and rare in Sudan. Locally common in Guinea.
Bibliography. Barlow *et al.* (1997), Bobo *et al.* (2006), Carswell *et al.* (2005), Chapin (1954), Clewing (1988), Dodman *et al.* (2004), Dowsett & Dowsett-Lemaire (2005), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (2005), Fry & Keith (2004), Gatter (1997), Goodwin (1982), Hofmann & Mettke-Hofmann (2001), Kujawa (1965), Nicolai *et al.* (2007), Nikolaus (1987), Payne (2005a), Payne & Payne (1995, 2002), Payne *et al.* (2005), Pensold (1974), Wilkinson *et al.* (1987).

57. Dusky Twinspot

Euschistospiza cinereovinacea

French: Sénégali sombre **German**: Schieferastrild **Spanish**: Estrilda Sombría
Other common names: Dusky Firefinch

Taxonomy. *Lagonosticta cinereo-vinacea* Sousa, 1889, Quindumbo, Angola.
Forms a superspecies with *E. dybowskii*. Two subspecies recognized.
Subspecies and Distribution.
E. c. cinereovinacea (Sousa, 1889) – W Angola.
E. c. graueri (Rothschild, 1909) – mountains of Albertine Rift in DRCongo, SW Uganda, Rwanda and Burundi.
Descriptive notes. 11·5 cm; 9–14 g. Male nominate race has head to back and down to breast dusky grey, rump and uppertail-coverts crimson, tail blackish-brown, upperwing greyish-brown; belly and undertail-coverts black, sides of breast and belly crimson with fine double white dots; iris dark brown or reddish, eyering pink, grey or pale blue; bill black; legs blackish. Female is similar to male, but nape and back paler, underparts blacker. Juvenile is brownish-grey above, lower rump and uppertail-coverts greyish-red, throat and underpart brownish-grey, flanks washed reddish but without white spots, eyering whitish, iris brown. Race *graueri* is darker below than nominate. Voice. Close contact call "tsyip-tsyip", distance contact call and alarm "tsvilip". Song in courtship a series of rather insignificant notes.



Habitat. Tall rank grass and thickets in miombo (*Brachystegia*) woodland in Angola; long grass along lower montane forest, riparian forest, grassy mountain gulleys, and tall grass along streams in Albertine Rift mountains. In DRCongo (Itombwe) occurs at 1300–2000 m; 1800–2300 m in Uganda (Kigezi).
Food and Feeding. Small grass seeds; also small insects. Feeds on ground. Forages usually in pairs or singly.
Breeding. Breeds in Jul–Aug in Angola. Most information from observation of captives. Courting male holds a stem or feather in bill, displays on ground, hops around female, tail spread in contact with ground, and sings. In captivity, nest a ball with side entrance, made with twigs and reeds. Clutch 3 eggs; incubation period 13 days; nestling gape-flange has two large white swellings on each side with base of pale blue and with black inside mouth, corner has yellow pad between white swellings, palate has five black spots; nestling period 21 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common in Angola, where found from Cuanza Sul and S Malanje S to Huíla. Uncommon in DRCongo. Scarce in Uganda, and uncommon in Rwanda and Burundi.
Bibliography. Baars (1967), Burkard (1968), Carswell *et al.* (2005), Dean (2000), Dunning (2008), Fry & Keith (2004), Goodwin (1982), Mills (2009), Nicolai *et al.* (2007), Prigogine (1971), Steiner (1960), Wolters (1965).

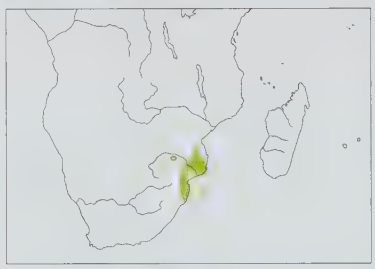
Genus *HYPARGOS* Reichenbach, 1863

58. Pink-throated Twinspot

Hypargos margaritatus

French: Sénégali de Verreaux **German**: Perlastrild **Spanish**: Estrilda Golirrosa
Other common names: Rosy/Verreaux's Twinspot

Taxonomy. *Spermophaga margaritata* Strickland, 1844, Madagascar; error = Coguno, Inhambane district, Mozambique.
Forms a superspecies with *H. niveoguttatus*. Monotypic.
Distribution. S Mozambique (S of R Save), NE South Africa (E Limpopo S to N KwaZulu-Natal) and E Swaziland.



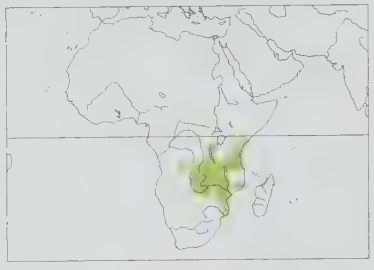
Descriptive notes. 12–13·5 cm; 13 g. Male has crown to back brown, rump and uppertail-coverts dull reddish-pink, tail dark brown, edged pinkish, wing brown; face and sides of neck to upper breast pink, lower breast to undertail-coverts black, sides of breast and belly with large pinkish spots and white spots; iris dark brown, eyering pale pinkish-blue; bill blue-grey; legs grey. Female differs from male in having face to breast grey, centre of belly to undertail-coverts pale grey, sides of breast and belly black with large pinkish-white spots; eyering slightly duller. Juvenile is like female, but underparts entirely pale grey, bill black. Voice. Close contact call a soft rising "seesee" or "sisi"; distance call or alarm a short "zirr" or "rrrrreeee" or a long high "tseeeerrr". Song a trill ending with a buzzy phrase.
Habitat. Dry woodland with dense undergrowth and thickets, sand forest, palm scrub, thorny cover along edge of riverine forest, and dense thorn-scrub.
Food and Feeding. Small grass seeds; insects. Forages on ground. Generally in pairs or in small family groups; often with other waxbills. Inconspicuous.
Breeding. Breeds in Jan in South Africa (KwaZulu-Natal). No information on courtship behaviour. Nest an ovoid structure with side entrance, made from leaf ribs, leaves, flowers and spider webs, lined with plant fibres or feathers, hidden near ground in dense vegetation and leaf litter. Clutch 3–5 eggs; incubation period 12–14 days; nestling skin pinkish, long greyish down on head, gape with white papillae, two on each side and lined with black (gape swellings change to blue-green on inner surface a few days after hatching, and to blue after fledging), palate yellow with three black spots, rest of mouth and tongue reddish; nestling period 20–21 days. Probable brood parasitism of this species in South Africa by Green Indigobird (*Vidua codringtoni*) suggested by latter's song mimicry.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in South-east African Coast EBA. In South Africa, considered "near-threatened" owing to small range. Uncommon to locally fairly common. Estimated population in Mozambique probably in excess of 80,000 individuals; up to 2000 exported annually from this country for cagebird trade. Found in large areas of protected habitat in South Africa.
Bibliography. Allan (1988), Anon. (1979), Brickell & Koen (1996), Burkard (1968), Chaplin (1935), Clancey (1964, 1971), Edmonds (1984), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Immelmann *et al.* (1977), Maclean (1993), Mayer (1997a), Nicolai *et al.* (2007), Roberts (1936), Zietsman (1987).

59. Peters's Twinspot

Hypargos niveoguttatus

French: Sénégali enflammé **German**: Tropfenastrild **Spanish**: Estrilda Golirroja
Other common names: Red-throated Twinspot

Taxonomy. *Spermophaga niveoguttata* W. K. H. Peters, 1868, Inhambane, Mozambique.
Forms a superspecies with *H. margaritatus*. Races differ minimally, and species sometimes regarded as monotypic. Proposed races *idius* (described from R Kihambwe, c. 29 km N of Kibondo, in NW Tanzania) and *interior* (from Sanyati I, on L Kariba, in NW Zimbabwe) are treated as synonyms of *macrospilotus*, as also is *baddeleyi* (described from Nacala, in NE Mozambique). Two subspecies tentatively recognized.
Subspecies and Distribution.
H. n. macrospilotus Mearns, 1913 – NE Angola, SE DRCongo, Rwanda, Burundi, SE Kenya and S Somalia S to N Zimbabwe and N & C Mozambique (to S of R Zambezi).
H. n. niveoguttatus (W. K. H. Peters, 1868) – E Zimbabwe and S Mozambique.



Descriptive notes. 12–13 cm; 12·4–16·9 g (*macrospilotus*). Male nominate race has forehead and crown grey, back and wing brown, lower rump and uppertail-coverts wine-red, tail black with reddish feather edges; face to neck, throat and upper breast intense crimson-red, lower breast and belly black, breast and flanks with large white spots, vent and undertail coverts unspotted black; iris dark red-brown, eyering pale blue; upper mandible blackish with diffuse greyish-blue lateral triangle near base, lower mandible greyish-blue with broad blackish tip; legs slate-grey. Female is mostly olive-brown above, face grey, chin yellowish, throat buff, upper breast reddish-buff, lower breast to belly and undertail-coverts olive-grey, sides of breast and flanks somewhat darker and with large white spots; bare parts as for male. Juvenile is like female, but breast olive-grey, rest of underparts sooty grey without distinct white spots. Race *macrospilotus* is very like nominate, but red of face slightly richer, female with red below extending to throat, underparts darker, more sooty grey, flanks blacker. Voice. Close contact call a soft rising "tseet" or "tsee-et", distance contact call louder and emphatic "tseeet"; alarm a harsh "tschee". Song a series of high-pitched notes and trills, often with bouncing-ball rhythm, accelerating near end, "tsit, tsit, tsit-tsit-tsit-tsisitsitsitsi"; also a "chip" followed by rattling trill, "spit cheeeeeeeeeeeee", a series of sharp notes followed by fluty whistle and trill, "sip tooo tssrrrrr", or a complex mix of very high, sibilant trills, mournful downslurred notes and single extended notes. Female has a short song.
Habitat. Lowland evergreen thickets, riparian forest, forest edge, *Cryptosepalum* forest and *Marquesia* thickets, thickets on termitaria, coastal bush, long grass, along trails. Usually lowlands, to 2000 m in E Africa and 1500 m in Zambia and E Zimbabwe; mainly 500–1300 m in Malawi.
Food and Feeding. Small grass seeds, e.g. those of *Olyra latifolia*; also small insects, including ants (Formicidae). Feeds on ground. Forages in pairs and in small groups.
Breeding. Season Jan–May in Zambia and Malawi and Jan–Apr in Zimbabwe. Courting male displays on ground, with or without a feather or grass in bill, hops around female; in a bob display, body low to ground, head raised at 70°, he bows 30° below horizontal, then throws head upwards and hops off ground, bobs once per second as he sings. Nest a ball with side entrance, sometimes with tunnel, made from fine maidenhair-fern fronds, roots, small leaf skeletons and dry moss, with decomposing leaves, lined with feathers, fine grass or fine moss, built on ground or low in bush, palm or tree-fern. Clutch 3–6 eggs; incubation period 13–14 days; nestling skin pink with sparse grey down, gape with two large white swellings on each side constricted by a white gape corner, lower swelling develops lateral spot that turns yellow by day 5 and orange by day 18, swellings lack black oral surface, palate yellow with three black spots, tongue and inner and lower mouth unmarked pink; nestling period 21 days; young cared for by both parents for a further 10–12 days. On evidence of song mimicry in Zambia, Malawi and Zimbabwe, nests parasitized by Green Indigobird (*Vidua codringtoni*).
Movements. Resident.
Status and Conservation. Not globally threatened. Generally rather common, but often local. Perhaps commoner in S of range, e.g. locally abundant in Mozambique (Manica e Sofala). In Zimbabwe, density in Dichwe Forest 50 pairs/10 ha; has suffered much habitat loss in Mana Pools National Park owing to extremely high concentrations of large herbivores. In S Mozambique (Sul do Save), was formerly fairly common on coast S to lower R Incomati, but population greatly reduced, to probably fewer than 500 individuals, as a result of habitat destruction; now considered threatened in the region.
Bibliography. Ash & Miskell (1998), Benson (1953), Dean (2000), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Harrison & Dormer (1962), Hockey *et al.* (2005), Irwin (1981), Lewis & Pomeroy (1989), Maclean (1993), Nicolai *et al.* (2007), Payne (2005a), Payne *et al.* (1992), Redman *et al.* (2009), Stjernstedt (1993), Zimmerman *et al.* (1996).

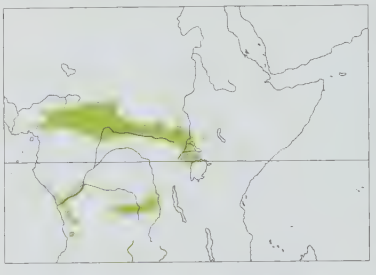
Genus *CLYTOSPIZA* Shelley, 1896

60. Brown Twinspot

Clytospiza monteiri

French: Sénégali brun **German**: Monteiroastrild **Spanish**: Estrilda Parda
Other common names: Monteiro's Twinspot

Taxonomy. *Pytelia monteiri* Hartlaub, 1860, Bembe, Zaire, Angola.
Monotypic.
Distribution. SE Nigeria and Cameroon E to S Sudan, Uganda and extreme W Kenya, also S Gabon, S PRCongo, NW & NE Angola (Cabinda S to Cuanza Sul; NE Lunda Norte), and SW & S DRCongo.



Descriptive notes. 12 cm; 13·5–16 g. Male has grey head, dull brown back and upperwing, red rump and uppertail-coverts; tail broad, dusky; centre of throat red, underparts cinnamon with profuse white spots; iris red-brown or dark red, eyering pale blue; bill blackish, with some light blue areas at base, broader on lower mandible; legs brown. Female differs from male in being slightly paler overall, and in having chin and centre of throat white. Juvenile is like female, but rump orange-red, underparts brown and unspotted; bill black, white cutting edges just anterior to white gape swelling, and white streak on base of lower mandible. Voice. Call a sharp "vay, vay, vay", also "cht" or "chk". Song has long whistles that rise sharply and fall slowly, with rich overtones, and other phrases in hard-sounding medley of chatters, trills and chuckles. Female has song, but few details available.
Habitat. Shrubby and rank grassland, moist thickets, tangled vegetation, and overgrown cultivation. Lowlands, below 1200 m in DRCongo and 1000 m in Uganda; 1000–1500 m in Kenya.
Food and Feeding. Seeds, small insects e.g. termites (Isoptera), also spiders (Araneae). Feeds on ground; digs with bill in crusty wet soil in manioc (*Manihot esculenta*) plantations. Forages in pairs and, less often, singly; also in small flocks, presumed family parties.
Breeding. Breeds in Oct–Nov in Cameroon, Apr in Gabon, Aug–Dec in NE DRCongo, and Dec and May–Jun in Uganda. In courtship display on ground, male holds a feather or grass in bill, hops in a circle around female or goes half-way and then back, spreads tail and angles it towards her, lifts head and points it upwards c. 70°, and then bows to c. 30° below horizontal, head initially held high, slowly lowered and then tossed up quickly as he jumps upwards, and sings; female sometimes performs same movements together with him, without grass in bill and without song; behaviour much as that of *Hypargos niveoguttatus*, but less graceful and more jerky. In the wild, uses old nests of other bird, e.g. coucal (*Centropus*), *Pyrenestes* or *Spermestes cucullata*, adds to lining old snakeskin and matted hair from carnivore droppings; nest built in captivity an ovoid shell with side entrance, made from grass, male brings material and female arranges it. Clutch 4–6 eggs; incubation period 13 days; nestling skin dark, whitish down on head and body, gape has two thick white swellings on each side, constricted at corner, white outside and yellow inside with black spot on each swelling, palate white with five black spots, pink tongue unbanded or with dark band, lower mouth pinkish, black crescent under tongue; nestling period 19–21 days. In Nigeria, song mimicry indicates brood parasitism by Cameroon Indigobird (*Vidua camerunensis*).
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common; rather local. Common in parts of Cameroon, Central African Republic and NE & S DRCongo.
Bibliography. Carswell *et al.* (2005), Chapin (1917, 1954), Fry & Keith (2004), Goodwin (1982), Harrison & Dormer (1962), Lewis & Pomeroy (1989), Neff (1975, 1977), Nicolai *et al.* (2007), Payne & Payne (1994), Payne *et al.* (2005), Short *et al.* (1990), Steiner (1960), Zimmerman *et al.* (1996).

PLATE 21 ➤



PLATE 21

inches 3
cm 8

Genus *LAGONOSTICTA* Cabanis, 1851

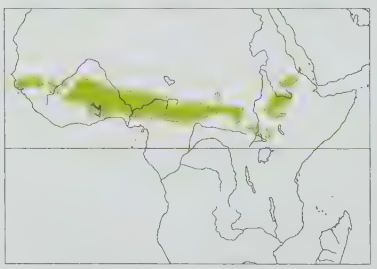
61. **Black-faced Firefinch**

Lagonosticta larvata

French: Amarante masqué **German**: Larvenamarant **Spanish**: Amaranta Carinegra
Other common names: Black-throated/Masked/Dusky Firefinch; Grey (Black-faced) Firefinch (*vinacea*, *nigricollis*); Vinaceous Firefinch/Waxbill (*vinacea*)

Taxonomy. *Amadina larvata* Rüppell, 1840, Simien, northern Ethiopia.
Races *vinacea* and *nigricollis* sometimes treated together as forming a separate species, differing from nominate in the amount of red, pink and grey in plumage; in preliminary mitochondrial phylogeny, however, nominate race (from Ethiopia) and *nigricollis* (from Cameroon) appear closer to each other than to *vinacea* (from Senegal and Gambia) and share a more recent common ancestor; no apparent differences among races in vocalizations. Proposed race *togoensis* (described from Kete Kratschi, in Togo) is treated as a synonym of *nigricollis*. Three subspecies recognized.

Subspecies and Distribution.
L. l. vinacea (Hartlaub, 1857) – Senegal and Gambia E to Guinea and W Mali (to Mandinga Mts).
L. l. nigricollis Heuglin, 1863 – S Mali E to W & S Sudan, NE DRCongo (Uele) and Uganda.
L. l. larvata (Rüppell, 1840) – extreme E Sudan (Gallabat) and Ethiopia.



Descriptive notes. 10–11 cm; 8–12·4 g (nominate). Male nominate race has forehead and crown sooty brownish-grey, indistinct reddish collar from nape to breast; upperparts darkish slate-grey, becoming browner when worn, rump and tail deep red, inner webs of outer tail feathers blackish, upperwing dark brown; face and throat black, upper breast wine-red, lower breast dark grey, a few small white spots on side of breast; belly and undertail-coverts black; iris brown to red, eyering pale blue; bill bluish-grey to slate; legs fleshy to slate. Female has top of head and back dark grey brown, cheek and lores dark grey, throat greyish-buff, pink tinge on breast, becoming drabber on flanks and buffier on belly, undertail-coverts buffy grey to slate. Juvenile is like

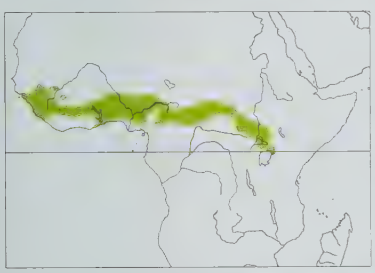
female, but without pink wash, has rump pale red, underparts paler brown and unspotted, bill black, eyering grey, iris brown. Race *nigricollis* male has forehead and crown mouse-grey, back grey, underparts lavender-grey, small spots on side of breast, female slightly paler brown above and below, undertail-coverts buff; *vinacea* male has forehead and crown pale grey, back pinkish-brown, underparts pink, female head pale grey, back pinkish-brown, underparts pink, centre of belly and undertail-coverts buff. Voice. Contact call a shrill "seesee", louder (distance call) when partners separated; in alarm or excitement "pitpitpit", a series of sharp notes rising in pitch at rate of 8–14 per second, often in staccato chatter, "dwit-it-it...". Song consists of phrases of 2–4 plaintive whistles e.g. "beri-beri-beri, wip-chiwoy-chiwee" at 3–5 kHz, either rising in pitch or dropping and then rising, lasting 0·3–0·4 seconds; also a plaintive "whee-hew, whee-hew" and variations, lasting 0·3 seconds, and a slow trill, "weeweeweewee".
Habitat. Grassy areas with trees, *Combretum–Terminalia* woodland, savanna woodland, bamboo thickets, rocky ridges on shallow soil with thorny plants; also tall grass, *Raphia* palm thickets, areas along streams and rank growth near water, thicket base of rocky outcrops. Often in more wooded areas than those in which congeners found.
Food and Feeding. Small grass seeds (diameter 1–2 mm); also termites (Isoptera). Feeds on ground, favouring burnt sites. Forages singly and in pairs or small groups, sometimes with other estrildids.
Breeding. Recorded in Jan in Ivory Coast, Jul in Togo, Jul–Oct in N Nigeria, after Jul in NE DRCongo (Uele), Nov in Ethiopia and Jun in Uganda. In courtship, male often on ground, hops around female, with or without feather in bill, sometimes gives soft note or soft song, performs upward head movements (making black throat conspicuous), bobs up and down and bows towards female. Nest a ball of fine grass, lined with soft grass stems, grass-heads and feathers, built in tall grass or within 1 m of ground in small bush or pile of brushwood, or in old nest of weaver (Ploceidae). Clutch 3–4 eggs; incubation period 11–12 days; nestling (races *vinacea* and *nigricollis*) has skin pale brownish, down sparse and white, gape has two white papillae at base of upper and lower mandibles, base of papillae blue, a dark violet-blue papilla between them on lower gape, the papillae connected blue-black at base, palate yellow with five black spots (the two mediolateral ones smaller), tongue pale pink with two black spots, lower mouth pale pink with black sublingual crescent; nestling period 17–19 days; fledglings fed by parents for a further 8–14 days. Brood-parasitized by Barka Indigobird (*Vidua larvaticola*), young of which mimic mouth colours and pattern of host's nestling; dependent fledglings in mixed-species family groups in Nigeria, and song mimicry by the parasite recorded in Nigeria and Cameroon.
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common. Common in N guinean woodlands.
Bibliography. Ash & Atkins (2009), Barlow, Hammick & Seller (2002), Barlow, Wacher & Disley (1997), Borrow & Demey (2001), Burkard (1968), Carswell *et al.* (2005), Chappuis (2000), Cotterell (1964), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (2005), Fry & Keith (2004), Goodwin (1982), Harrison (1962a), Immelmann *et al.* (1965), Lamarche (1981), Nicolai (1965b), Nicolai *et al.* (2007), Payne (1973a, 1982, 1996, 2005a), Payne & Payne (1994), Sorenson *et al.* (2003), Steiner (1960).

62. **Black-bellied Firefinch**

Lagonosticta rara

French: Amarante à ventre noir **German**: Schwarzbauchamarant **Spanish**: Amaranta Ventrinegra
Other common names: Black-bellied Waxbill, Black-bibbed Firefinch

Taxonomy. *Habropyga rara* Antinori, 1864, between White Nile and Bahr el Ghazal, Sudan.
Two subspecies recognized.
Subspecies and Distribution.
L. r. forbesi Neumann, 1908 – SE Senegal, SW Mali, Guinea-Bissau, Guinea and N Sierra Leone E to Ivory Coast, Ghana, Togo, Benin and Nigeria.
L. r. rara (Antinori, 1864) – Cameroon E to S Sudan, NE DRCongo, Uganda and extreme W Kenya.



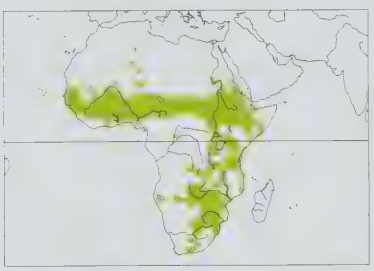
Descriptive notes. 10–11 cm; 10 g. Male nominate race has head and upperparts to uppertail-coverts red, red fringes to lesser and median upperwing-coverts, flight-feathers brown, tail black with some red near base; breast and flanks red, centre of lower breast to belly and undertail-coverts black; iris dark brown or grey, eyering pink; bill black, large purplish-pink patch on side at base of lower mandible; legs dark grey. Female has crown brownish-grey, mantle, back and wing-coverts greyish-brown with red wash, rump and uppertail-coverts red; lores red, throat grey, breast and flanks buffy to greyish-pink, centre of lower belly to undertail-coverts dark grey; eyering grey. Juvenile is similar to female, but lores grey, bill black. Race *forbesi* is brighter than nominate, male body bright crimson-red, female deeper pinkish-red. Voice. Contact call a loud nasal "keeyh" or "mew", sometimes in series and calls then increasing in loudness and becoming loud "squeer"; alarm call a sharp "chek", singly or repeated at 8 per second (but not run together), another call a soft "chet". Song a series of whistles, "tew-tew-tew...", low in pitch (2·2 kHz), plaintive and musical, on one pitch, each note (also intervals between notes) 0·2–0·3 seconds, some notes buzzy in tone; other songs include one or more flat whistles at lower pitch (1·8 kHz) with notes and intervals 0·35 seconds, also a series of descending whistles with pitch higher (3·8–3·2 kHz) or lower (2·2–1·8 kHz), the low whistles in range of race *forbesi* (not recorded for nominate).
Habitat. Grassy N guinean savanna, base of rocks with water seepage, grass and thickets, common around fields of *Digitaria exilis* in Fouta Djalon (Guinea). In Nigeria and Cameroon found in coastal thicket, grassy savanna farmland and edge of gallery forest, grass around weedy yam farms and bush; in E Africa in tall, moist grassland and overgrown cultivation. In Nigeria (as far E as Serti) and Cameroon (E from Banyo), reportedly absent in montane forest and grassland on Obudu and Mambilla Plateaux.
Food and Feeding. Small grass seeds; small ants (Formicidae) and termites (Isoptera). Feeds on the ground. Forages in pairs and in small groups, often together with other members of genus.
Breeding. Recorded in Oct–Nov in Mali, May–Sept in Ghana, Jul–Nov in Nigeria, Oct in Cameroon and Sept–Nov in DRCongo. Male displays on ground, feather or stem in bill, hops around female, head tilted upwards, tail spread and dragging. Nest a loosely constructed ball with outer layer of loosely thatched grass, leaves, stems and grass-heads, inner layer of rootlets and fine grass fibres, built near ground in clump of grass, or in shrub or low tree or in thatch of building. Clutch 3–4 eggs; incubation period 13–14 days; hatchling (race *forbesi*) skin black on above and reddish-black below, light grey down on head and back, gape has two small pale blue papillae, one above and one below corner of mouth, each with basal blue-black ring, corner of gape a ruby-red expanded flange between the blue papillae and extended to inner side of mouth, palate whitish with three black spots and two behind them (ring of five spots), upper mandible has black bar near tip, inner mouth pink, tongue pink with two black spots joined by a band below, tongue tip pale blue, lower mouth pale with black crescent (in side or frontal view, closed mouth has blue papillae and red gape); nestling nominate race has skin pinkish-grey, down light grey, gape papillae white with no trace of blue, gape pink to light red at base of papillae, in corners and into side of mouth; nestling period 18–20 days. On evidence of song mimicry, species is parasitized in Guinea, Ghana and Cameroon by Cameroon Indigobird (*Vidua camerunensis*); in Cameroon, indigobird young mimic mouth colours and pattern of host's young.
Movements. Resident.
Status and Conservation. Not globally threatened. Fairly common in much of range; rare in Senegal and N Liberia, and rather uncommon in E of range.
Bibliography. Balakrishnan, Sefc & Sorenson (2009), Barlow *et al.* (1997), Burkard (1968), Chapin (1917, 1954), Clement *et al.* (1993), Dodman *et al.* (2004), Dowsett (1989), Dowsett & Dowsett-Lemaire (2005), Dowsett-Lemaire & Dowsett (2005), Elgood *et al.* (1994), Fry & Keith (2004), Goodwin (1982), Harrison (1956), Nicolai (1972), Nicolai *et al.* (2007), Payne (1982, 1996, 2005a), Payne *et al.* (2005), Serle (1938, 1957), Sorenson *et al.* (2003).

63. **Red-billed Firefinch**

Lagonosticta senegala

French: Amarante du Sénégal **German**: Senegalamarant **Spanish**: Amaranta Senegalesa
Other common names: Senegal/Crimson/Rosy Firefinch, Little Ruddy Waxbill

Taxonomy. *Fringilla Senegala* Linnaeus, 1766, Senegal.
Race *brunneiceps* intergrades with *somaliensis* and *ruberrima* in S Somalia and N Kenya. Proposed races *guineensis* (described from N'Zerekore, in SE Guinea) is synonymized with nominate, *kikuyuensis* (from Nairobi, in Kenya) is treated as synonym of *ruberrima*, and *pallidicrissa* (from Humpata, in Angola) and *confidens* (from near Bloemfontein, in Free State, in South Africa) are synonymized with *rendalli*. Six subspecies recognized.
Subspecies and Distribution.
L. s. senegala (Linnaeus, 1766) – S Mauritania, Senegal, Gambia, Mali, Guinea-Bissau, Guinea, Sierra Leone and N Liberia E to Nigeria; also mesic oases in S Algeria and N Niger.
L. s. rhodopsis (Heuglin, 1863) – E Nigeria, S Chad, N & C Cameroon, Central African Republic, W Sudan, and lowlands of W Eritrea and Ethiopia.
L. s. brunneiceps Sharpe, 1890 – Eritrea and Ethiopia above 1000 m, E Sudan N down R Nile, S Somalia and N Kenya.
L. s. somaliensis Salvadori, 1894 – SE Ethiopia and Somalia.
L. s. ruberrima Reichenow, 1903 – N, E & SE DRCongo, Uganda and Kenya S to NE Angola, NE Zambia and N Malawi.
L. s. rendalli E. J. O. Hartert, 1898 – S Angola, Zambia, Malawi and Mozambique S to N Namibia, N & E Botswana, Zimbabwe, much of South Africa and Swaziland.



Descriptive notes. 9–10 cm; 7–12 g. Male nominate race has head to breast red, some brown on crown and nape, small white spots on side of breast; upperparts red-washed brown, rump and uppertail-coverts red, tail black with red outer margins of feathers; upperwing-coverts with variable red fringes, flight-feathers brown; belly buff-brown, undertail-coverts buff-brown to drab greyish, sometimes with pale fringes; iris dark brown, eyering yellow (greenish in non-breeding season); bill light red or pink, upper and lower ridges and inner cutting edges black; legs grey-brown. Female is brown above, with lores bright red, cheeks light brown to pale pink, throat whitish, underparts light grey-brown, breast sometimes washed pink, side of breast and flanks with fine white spots. Juvenile is like female, but lores grey, underparts without spots, bill black, eyering grey, legs pinkish-grey. Race *rhodopsis* is slightly paler than nominate, male forehead red, crown brown, back buff to yellowish-buff without red wash, cheek to nape red, underside red with pink cast, female underparts paler than nominate; *brunneiceps* male has upperparts brighter red than previous, crown brown with reddish sides, female usually greyer than previous; *somaliensis* male has crown reddish-brown, back pale brown with pink wash, underparts cerise-pink; *ruberrima* has duller and darker brown on wings, with crown and back showing much pinkish-red to carmine, becoming browner when worn, cheeks, rump and underparts deep red to purplish-red, female cheeks with reddish wash; *rendalli* is paler brown above, with red restricted to forehead, lores, upperwing-coverts, rump and uppertail-coverts, underparts reddish, paler and pinker than last, lower breast and belly brownish, female paler than last race. Voice. Contact call a fluty whistle, "pea", often rising in pitch; alarm call a sharp "chick"; nest call a churring "wiswiswis", attracts mate into nest; begging call irregular alternations of "wis" and "we" notes, the former developing into alarm call and "we" into contact call. Song a sharp call followed by whistled contact calls, the whistle repeated or varying in pitch and length, "chick-pea-pea-pea"; varies among males, some regional variation.
Habitat. Open grassy woodland with acacia (*Acacia*) thornbush, thicket clumps near open ground, secondary growth and near rubbish dumps, around cultivation and towns and villages; lowands, locally to highlands at 1000–2200 m.
Food and Feeding. Small grass seeds (diameter 1–2 mm), notably of the annuals *Echinochloa* and *Setaria*, and in Ethiopia cultivated tef (*Eragrostis tef*), as well as meal from cultivated crops such as maize (*Zea mays*) and manioc (*Manihot*); also insects, including termites (Isoptera). Seeds taken on the ground; often feeds on grass seeds on bare ground in latrine areas. Forages in pairs and in small groups, often with other estrildids.
Breeding. Season Jul–Apr (mainly Oct–Dec) in Senegal, all year except height of dry season (mainly May–Oct) in Nigeria, Mar–Apr and Sept–Dec in Ethiopia; in all months (mainly in Mar–Jun long rains) in Kenya, Jan–Sept (mainly Jan–Apr) in Zambia, all year (mainly Mar–May) in Malawi, peak Dec–Mar in Zimbabwe, and in South Africa Dec–Apr in N (former Transvaal) and Jan–Mar

On following page: 64. Bar-breasted Firefinch (*Lagonosticta rufopicta*).

in E (KwaZulu-Natal). Breeding pairs usually well apart; sometimes several pairs in a grass roof. Male holds a feather in bill, flies with a loud whirring of wings to female, perches upright with head thrown back and feather-flagging, jerks body upwards in bobbing action by extending and flexing feet, last bob followed by deep bow to female. Nest a loosely thatched ball of grass with side entrance, built over a small flat cup, lined with feathers, placed in bush or tree, in thatch roof, or on ground. Clutch 3–5 eggs; incubation period 11–12 days from last egg; nestling skin at hatching pink with grey down, gape has two white papillae on each side separated by narrow blue band (which turns black by fledging), palate yellow with usually three (sometimes five) spots, gullet pink, tongue yellow and unmarked, lower mouth-lining pink with black tip, the mark divided transversely in older nestlings, posterior part to form a sublingual crescent (black palate spots enlarge and spread in older juveniles, and coalesce into black mouth-lining in adults); nestling period 18–19 days; fledglings fed with regurgitated seeds by both parents for a further 10 days. Nests parasitized throughout range by Village Indigobird (*Vidua chalybeata*), adult males of which mimic host's songs and calls and young of which mimic host nestling's mouth colours and pattern. First breeds from as young as 4 months of age. Estimated annual adult survival in Senegal 0·72.

Movements. Resident, with local movements. Local disappearance at time of lowered body fat in late dry season in NE Nigeria suggests seasonal movements; elsewhere in N Nigeria (Zaria), no seasonal change in numbers, fat or body mass. In Zambia, marked birds moved 14 km between breeding season and dry season, and 2–8 km between breeding seasons.

Status and Conservation. Not globally threatened. Common in most of range, and locally abundant: uncommon in NW & S Somalia, and rare in N Liberia. In Lochinvar National Park, in Zambia, density of 140 birds/km² in 1972–1973; lower in 1997, following progressive degradation of habitat. Decline in numbers recorded at Richard Toll, in N Senegal, in 1960s, when thatched houses (thatch used for nesting) replaced by houses with metal roofs.

Bibliography. Ash & Atkins (2009), Borrow & Demey (2001), Desfayes (1975), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry (1971), Fry & Keith (2004), Goodwin (1982), Hald-Mortensen (1970a), Hockey *et al.* (2005), Hollom *et al.* (1988), Jones & Ward (1977), Kunkel (1959), McCarthy (2006), McGregor *et al.* (2007), Morel (1973), Nicolai (1964, 1987), Nicolai *et al.* (2007), Payne (1973a, 1980a, 1990, 2005a), Payne & Payne (2002), Payne, Barlow *et al.* (2005), Payne, Hustler *et al.* (2002), Payne, Payne & Woods (1998), Payne, Payne, Woods & Sorenson (2000), Payne, Woods & Payne (2001), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefe & Payne (2003).

64. Bar-breasted Firefinch

Lagonosticta rufopicta

French: Amarante pointé **German**: Pünktchenamarant **Spanish**: Amaranta Barrada
Other common names: Speckled Firefinch

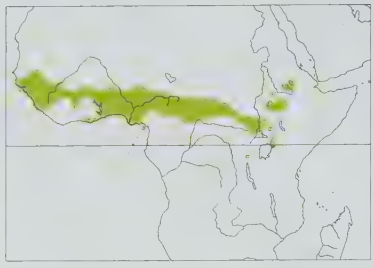
Taxonomy. *Estrilda rufopicta* Fraser, 1843, Cape Coast Castle, Ghana.

Forms a superspecies with *L. nitidula*, and sometimes considered conspecific. Two subspecies recognized.

Subspecies and Distribution.

L. r. rufopicta (Fraser, 1843) – Senegal, Gambia, SW Mali, Guinea-Bissau, Guinea and Sierra Leone E to Nigeria, Cameroon, S Chad and Central African Republic.

L. r. lateritia Heuglin, 1864 – S Sudan, NE DRCongo, W Ethiopia, Uganda and SW Kenya.



Descriptive notes. 9–10 cm; 8·2–11·2 g (nominate). Nominate race has crown to back and upperwing-coverts rather dark, dull earth-brown, rump and uppertail-coverts red, tail black with variable amounts of red near base, flight-feathers brown; forehead and face to throat and breast vinaceous red, breast with fine white double spots or bars, belly pinkish to grey, undertail-coverts buff to grey; iris olive-brown, eyering pinkish; bill purplish-red, upper and lower ridges black; legs brownish-grey. Sexes alike. Juvenile has upperparts brown, rump and uppertail-coverts red, face grey, breast grey with faint pink wash, belly and undertail-coverts pale grey, iris and eyering grey, bill blackish, bill base changing to purplish-pink at independence. Race *lateritia* has crown and back slightly paler and greyer than nominate, face and breast paler pink. Voice. Contact call 1–2 short rising and falling notes, "kewp" or "kewp-kewp"; alarm call a sharp abrupt "tik" or "tik-tik", sometimes in a chatter of 4 notes per 3 seconds. Song a jingling "tsi-tsi-trrrrrwa, tsi-tsi-tirrrrrrrwa" or "chichi-widdler, chichi-widdler", 9–11 short notes per second, lasting up to 4 seconds, pitch fluctuating widely within 4–8 kHz, high notes metallic and low notes nasal in tone, most notes descending in pitch and often with an overtone, the song often with alarm notes and ending in low descending whistle; a second song theme is shorter and without terminal whistle.

Habitat. Grassland and acacia (*Acacia*) savanna, wet marshes, often near villages and along dirt roads.

Food and Feeding. Small grass seeds (diameter 1–2 mm). Feeds on ground. Forages in pairs and in small groups; often associates with other estrildids.

Breeding. Season in second half of rains and into early dry season: May–Sept in S Ghana, Jul–Nov in Nigeria and May in Uganda. Courting male holds a feather in bill, jerks body up and down on perch, stretching and bending legs, directing display to female, and sings during and between bouts; all behaviour like that of *L. senegala*. Nest a covered mass with side entrance, made from coarse grass, lined with soft grass-heads and feathers, built at base of bush or 1–2 m above ground in creepers on wall of building, in tangle of grass, sometimes in old nest of *Ploceus* weaver or *Spermestes cucullata*. Clutch 3–6 eggs; incubation period 13–14 days; nestling skin blackish with grey down, white swollen gape-flange without distinct papillae, oral surface black on upper and lower flange, palate pale pink with three black spots, tongue unmarked pink with black bar, inner mouth pink, floor of mouth pink with black chevron; nestling period 17–19 days; young sing at 3 months of age. Nests parasitized by Wilson's Indigobird (*Vidua wilsoni*), young of which mimic mouth colours and pattern of host's nestling. Estimated annual adult survival in Nigeria 0·75.

Movements. Resident.

Status and Conservation. Not globally threatened. Fairly common to locally common.

Bibliography. Carswell *et al.* (2005), Chapin (1954), Dowsett-Lemaire & Dowsett (2005), Fry & Keith (2004), Goodwin (1982), Harrison (1956), McCarthy (2006), McGregor *et al.* (2007), Nicolai (1972, 1987), Nicolai *et al.* (2007), Payne (1982, 1996, 2005a), Payne & Payne (1994), Senewald (1965), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefe & Payne (2003).

PLATE 22 ➤

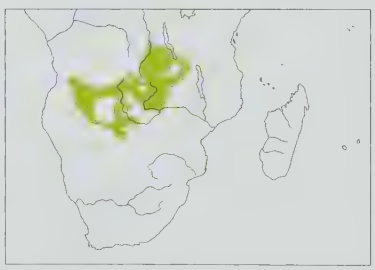


65. Brown Firefinch

Lagonosticta nitidula

French: Amarante nitidule **German**: Braunbürzelamarant **Spanish**: Amaranta Parda

Taxonomy. *Lagonosticta nitidula* Hartlaub, 1886, Mpala, Lake Tanganyika, DRCongo.
Forms a superspecies with *L. rufopicta*, and sometimes considered conspecific. Proposed race *plumbaria* (described from Sepupa, in NW Botswana) on average somewhat greyer than birds elsewhere in species' range, but no constant differences. Monotypic.
Distribution. Angola, SE DRCongo, SW Tanzania, Zambia, NE Namibia (Caprivi), N Botswana and NW Zimbabwe.
Descriptive notes. 9–10 cm; 10–11 g. Male has upperparts brown to grey-brown, crown, nape, rump and uppertail-coverts greyer, flight-feathers darker brown, tail darker greyish-brown to blackish, supercilium, lores and side of face mauve-pink to crimson, chin and throat purplish-red, upper breast mauve-pink to crimson with small white spots or bars, belly grey to light grey-buff, undertail-coverts light grey-buff; iris dark brown to reddish-brown, eyering pale bluish; bill purplish-red, upper and lower ridges black; legs vinous grey or brownish-grey. Female is very similar to male, but eyering bluish-grey, plumage often slightly paler. Juvenile has head, upperparts and throat to breast dark grey, belly warmer grey-brown, bill black with small white gape papillae, eyering grey, iris dark brown, legs black to dark grey; adult bill colour acquired 10–11 weeks after fledging. Voice. Most calls similar to those of *L. rufopicta*, contact call 1–2 short "kewp" notes; when alarmed or disturbed gives sharp chatter, 12–18 notes per second, "trrrittit trrittrit" (not heard from *L. rufopicta*). Song a jingling series of high metallic notes and low nasal notes, often with descending whistle at end; songs identical to those of *L. rufopicta*.



Habitat. Reedbeds (*Phragmites*), papyrus (*Cyperus papyrus*), tall grass and thickets along rivers, swamps and marshes and adjacent thorn-scrub and riparian woodland, also edges of forest; in Zimbabwe in wild date palms (*Phoenix reclinata*). Lowlands, up to nearly 2000 m in Marungu Mts (DRCongo); 880–1750 m in Zambia.
Food and Feeding. Small grass seeds, also small insects. Feeds on the ground; favours damp earth, where it scatters surface food with bill. Forages usually in pairs and in small groups; often in mixed flocks with other granivorous species.
Breeding. Recorded in all months, mainly Feb–Jun and Sept–Oct, in Zambia, and in Oct–Apr (most records Jan–Apr) in Zimbabwe. In advertising display, male holds feather or grass stem in bill, fluffs breast feathers, bounces up and down on perch, turns head side to side, sometimes sings;

in courtship display, he flies with feather in bill to female, lands beside her, bows low, calls or sings, after a few bows he drops feather and pecks her nape. Nest a thatched ball with side entrance, made from grass, lined with feathers, a few grass stems protruding from entrance, built low in thicket or thatched human dwelling; often takes over old nest of weaver (Ploceidae) or sunbird (Nectariniidae), adding lining of grass and a few feathers, sometimes building covered nest inside old nest. Clutch 3–5 eggs; incubation period 13–14 days; nestling skin black, sparse light grey down on head and back, gape has two rounded white swellings (one above and one below on each side of corner of mouth), base of swellings and gape between the papillae bright blue (lower papilla fits in front of upper one when bill closed), palate pinkish-white with three or five black spots, tongue pink without spots, lower mouth pinkish with black crescent, inner edge of mouth dark grey above and below (mouth unlike that of *L. rufopicta* nestling); nestling period 18–19 days; both parents feed regurgitated seeds to young. Nests along R Zambezi above Victoria Falls (on mainland and islands) and in Okavango Delta (N Botswana) parasitized by Village Indigobird (*Vidua chalybeata*), the common brood parasite of *L. senegala*.

Movements. Resident.

Status and Conservation. Not globally threatened. Fairly common; often local. Locally common in marshes along R Zambezi.

Bibliography. Dowsett *et al.* (2008), Ford (2005), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Hustler (1998), Immelmann *et al.* (1965), McCarthy (2006), Neff (1966), Nicolai (1987), Nicolai *et al.* (2007), Payne (1982, 2005a), Payne *et al.* (2002), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003).

66. African Firefinch

Lagonosticta rubricata

French: Amarante foncé **German**: Dunkelamarant **Spanish**: Amaranta Ocre
Other common names: Blue-billed/Brown-backed/Dark/Lilac Firefinch, Ruddy Waxbill; Pale-billed/Landana Firefinch (*landanae*)

Taxonomy. *F.[ringilla] rubricata* M. H. C. Lichtenstein, 1823, "terra Caffrorum" = Uitenhage, Eastern Cape Province, South Africa.

Race *landanae* often treated as a separate species, on basis mainly of reddish bill colour; recent studies of mitochondrial phylogeny indicate that it is closer to nominate (the two share a more recent common ancestor) than to other races, but mouth of *landanae* nestling similar to that of *congica*, and songs and calls appear to be the same; also, adult males in NW Angola (Uíge) have bill varying from violet above and red below to grey-blue above and pale horn-coloured below (both with black tip), with plumage nearly identical. Most other races intergrade with one another, although nominate not known to intergrade with *haematocephala*. Proposed race *neglecta* (described from Guinea-Bissau), named on basis of red cheeks of female, considered untenable; treated as a synonym of *polionota*; *ugandae* (described from Fort Portal, in Uganda) synonymized with *congica*. Five subspecies recognized.

Subspecies and Distribution.

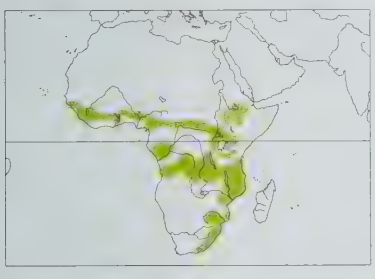
L. r. polionota Shelley, 1873 – S Senegal, SW Mali, Guinea-Bissau, Guinea, Sierra Leone and N Liberia E to Nigeria.

L. r. congica Sharpe, 1890 – Cameroon E to S Sudan, NE DRCongo (Uele, Kivu) and W Uganda, S to Gabon and N & NE Angola.

L. r. haematocephala Neumann, 1907 – E Africa from Sudan E of R Nile, Ethiopia, Uganda, and Kenya Highlands S to Zambia, Malawi, highlands of E Zimbabwe, coastal Tanzania and N & C Mozambique (N of R Save).

L. r. landanae Sharpe, 1890 – NW Angola (Cabinda S to Gabela and upper R Cuanza) and lower R Congo in S PRCongo and SW DRCongo.

L. r. rubricata (M. H. C. Lichtenstein, 1823) – N & E South Africa, Swaziland and S Mozambique (S of R Save).



Descriptive notes. 10–11 cm; 8·6–11·7 g. Male nominate race has crown and side of neck grey, nape and upperparts, including upperwing-coverts, brown, rump and uppertail-coverts red, tail black with red base of outer webs, flight-feathers dark brown (outer primaries notched); lores, face (including superciliary area and anterior ear-coverts), throat, breast and upper belly red, flanks red with white spots, centre of belly sooty grey, undertail-coverts black; iris brown, eyering pink; bill blue-grey, pinkish base of lower mandible; legs grey. Female is less richly coloured than male, more buffish-pink below, often few or no spots on flanks. Juvenile is similar to female, but buffy brown and less red below, belly and undertail-coverts dark rusty brown, lacks spots, outer primaries broad (not notched), bill blackish to bluish-grey, eyering grey to pinkish, iris dark brown. Races differ mainly in tone of plumage: *polionota* is darker and greyer than nominate, grey-brown above, crown and nape with pink wash, red areas of plumage deeper red, bill dark bluish; *congica* male has head and nape pink, back more olive-brown than previous, underparts pinkish-red, female crown and nape pinker than previous, back olive brown; *haematocephala* male has crown tinged red, ear-coverts red, contrasting with brown back, underparts more crimson (less pink) than last, belly and undertail-coverts black, female crown slightly pinkish, no red on ear-coverts, throat pale, belly buffy brown; *landanae* is like *congica* in plumage, bill grey-blue to violet above, violet to pink or red below. Voice. Contact call a plaintive whistled "feeeeeee", and in undirected display at close range both sexes give soft squeezed "whit"; alarm a short sharp "pitpitpitpit" at 10–20 notes per second, also extended into dry rattle or explosive chittering, and when bird frightened a single "pit". Songs of male include variety of liquid trills at different speeds and pitches: thin, rapid "srrrrrrrrrr", a pure "hee-hee-hee-hee-hee-hee" whistle, a slightly buzzy "zee-zee-zee-zee...", those at medium pitch more tuneful, e.g. "hee-wee-wee-wee-wee...", a series of short "too-too-too" whistles, or slightly harsher "chew-chew-chew", or rattle-like "chichichichichichi"; song may include high sweet whistles that rise and fall in pitch, another whistle that begins on one pitch, rises to another and stays there, and a double note of buzz and whistle, "bzz-tu". Little difference in songs among local males and across wide geographical area (W, E & S Africa).

Habitat. Rank vegetation of long grass and bushes, thickets, riverine forest edge, edge of evergreen and deciduous forest, montane bracken briar, hilly woodland, neglected cultivation. Lowlands to 2400 m in Sudan, 1230–2500 m in Ethiopia; mainly 1500–2000 m in highlands with more than 500 mm rainfall in Kenya; humid lowlands to 2200 m and 2500 m on Nyika Plateau in Zambia and Malawi, escarpment areas in E Zimbabwe, and coastal and escarpment areas in South Africa.

Food and Feeding. Small grass seeds (diameter 1–2 mm); also small insects, especially termites (Isoptera). Forages on ground; pecks with closed bill to break hard soil and debris. In pairs and small groups, often in family parties; occasionally mixes with other members of genus.

Breeding. Records in Jun–Jul in coastal Ghana; in Nigeria, Jul in N and Aug–Oct in E; Oct–Nov in Cameroon; Jul–Sept in Uganda, Mar–Jul in Kenya, and Jan (Arusha) and Jun–Jul (Iringa and Mikumi National Park) in Tanzania; Feb–May in S DRCongo, Jan–May in Zambia, Nov–May in Malawi, and Nov–Apr in Zimbabwe and South Africa. Displaying male holds large feather or grass stem in bill tip, flies to perch and takes upright pose, stretching upwards, belly feathers a little fluffed, head and neck feathers sleeked, tail slightly angled towards female, throws back head, points bill and feather up, springs upwards in vigorous jerks, bouncing up and down; repeats display, calling and singing, then bows to female; when pair on ground, male spreads tail and circles around female; at end of courtship display, he drops feather and moves towards her, she crouches and quivers tail, and the two copulate. Nest a loosely constructed ball, entrance hole in side (often covered by leaves or dried grass), made from grass stems and leaves, often brown and decaying ones, lined with fine seeding grasses or feathers, placed in fork of bush or shrub, near ground in pile of brush, tuft of broad-leafed sword grass, debris at base of tree, under bent dried stalk or leaf in old maize (*Zea mays*) field, or in low herb, concealed by tall grass or exposed in thorn bush or thinly leafed shrub. Clutch 3–6 eggs; incubation period 12–14 days; hatchling skin black to grey-black, belly violet-black, down light grey, gape has small pair of rounded white papillae, blue at base, one above and one below corner of mouth, the swelling between papillae dull mauve-pink, palate yellowish-white with five black spots in a ring, the two mediolateral spots smaller, tongue pink with black bar, lower mouth pale pink with black sublingual crescent; nestling period 21 days. In S & E Africa, mixed broods and song mimicry indicate nests parasitized by Dusky Indigobird (*Vidua funerea*); in W Africa, as evidenced by song mimicry, parasitized by Cameroon Indigobird (*Vidua camerunensis*).

Movements. Resident; probably some altitudinal movement in Sudan.

Status and Conservation. Not globally threatened. Common to fairly common; race *landanae* locally common within relatively small range. Densities of nominate race in acacia (*Acacia*) savannas in Swaziland 9, 20 and 69 birds/km². Precise distribution and relative abundance in some parts of range uncertain; some reports of this species from Senegal and Mali possibly referable to *L. virata*, and some records from Benin, Burkina Faso and N Togo may likewise refer to another member of genus; claimed sightings of present species in N Central African Republic may have involved *L. umbrinodorsalis*.

Bibliography. Ash & Atkins (2009), Balakrishnan, Sefc & Sorenson (2009), Benson & Benson (1977), Benson & Irwin (1967), Burkard (1961), Carswell *et al.* (2005), Chapin (1954), Dean (2000), Dowsett & Dowsett-Lemaire (2005), Dowsett & Forbes-Watson (1993), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2005, 2006), Fry & Keith (2004), Goodwin (1964, 1982), Günther & Feiler (1986), Harrison (1962a), Hockey *et al.* (2005), Immelmann *et al.* (1965), McCarthy (2006), Meise (1937), Mills (2009), Nicolai (1969), Nicolai *et al.* (2007), Payne (1973a, 1982, 2005a), Payne & Payne (1994), Payne *et al.* (1993), Puschner (2000a), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003).

67. Mali Firefinch

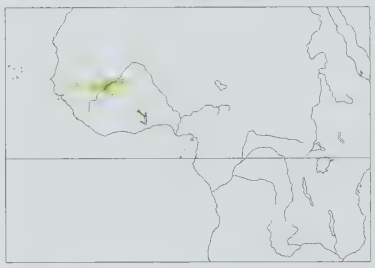
Lagonosticta virata

French: Amarante de Kulikoro **German**: Maliamarant **Spanish**: Amaranta de Mali
Other common names: Kulikoro/Blue-billed/Grey-backed Firefinch

Taxonomy. *Lagonosticta rubricata virata* Bates, 1932, Koulikoro, Mali.

Has been suggested as forming a superspecies with *L. umbrinodorsalis* and *L. rhodopareia*, and the three sometimes treated as conspecific; superspecies treatment, if appropriate, would presumably include also recently described *L. sanguinodorsalis*. Monotypic.

Distribution. E Senegal and S Mali.



Descriptive notes. 10–11 cm; 8·5–10·9 g. Male has crown brownish-grey, mantle and back grey-brown, rump and uppertail-coverts red, tail black, outer margins of rectrices red; upperwing grey-brown, outer primaries broad (not emarginated); lores red, side of face, chin and throat to belly deep pinkish-red, side of breast and upper flanks with small rounded spots, centre of belly grey, lower belly and undertail-coverts black; iris dark brown, pale pinkish-yellow eyering; bill comparatively long, straight and narrow, slate-blue with black tip, upper mandible can be mostly blackish; legs blue-grey to greyish-black or dark brown. Female is similar to male, but slightly paler, lower belly and undertail-coverts sooty grey. Juvenile has crown to back and upperwing-coverts greyish-brown, rump and uppertail-coverts red, tail black, red edges on outer feathers, lores grey, ear-coverts, cheek and underside light greyish-brown, paler on throat, lacks spots. Voice. Male distance contact call a prolonged plaintive whistle, "feeu", descending from 5 kHz to 3·5 kHz and then held for 1 second, variations including low (2·2 kHz) "feeee" on one pitch, and whistles which start low and rise slightly, "doooey", or start high and barely decline; female distance call a prolonged, plaintive "feeeeeeeee", 0·8–1 second; excitement or contact call a low wheeze, "kyah", rising rapidly from 1 kHz to 2·8 kHz, falling slowly, 0·2 seconds; alarm call a distinctive rattling trill in three-part phrase, "churrrrrrrr, churr churr", 20–22 notes per second; female call before copulation a soft "tu-tu-tu-tu-tu". Song a series of trills, one slow with short introductory notes and then upslurred whistles at 0·2-second intervals, "wee-wee-wee-wee-wee...", other trills faster with 18 notes per second, and still others in which whistled notes descend scale.

Habitat. Rocky hillsides, grassy and bushy areas around base of rocky hills, and acacia (*Acacia*) thickets.

Food and Feeding. Small grass seeds, taken on the ground. Forages in pairs and singly, sometimes in small flocks.

Breeding. Breeding records Jul–Dec. In courtship, male holds feather or grass stem by base in bill, bounces up and down on perch; females calls, crouches, vibrates tail, male mounts her; experi-

On following pages: 68. Rock Firefinch (*Lagonosticta sanguinodorsalis*); 69. Chad Firefinch (*Lagonosticta umbrinodorsalis*); 70. Jameson's Firefinch (*Lagonosticta rhodopareia*).

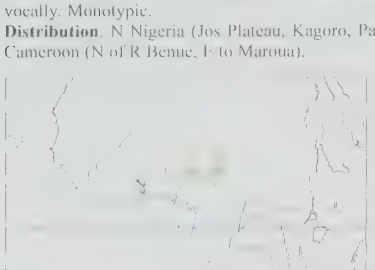
enced, mated pair mates without male display. Nest a hollow ball of grass, with large side entrance, placed near ground in bush or fern. Clutch 3–4 eggs; incubation period c. 11–13 days; nestling skin dark grey to purplish-black, down light grey, corner of gape greyish-pink with two small blue and white papillae on each side in low relief, palate whitish-pink with ring of five black spots, inner mouth on sides bright pink, tongue whitish-pink with or without two black spots; nestling period 19 days; young independent by 32 days after hatching. On evidence of song mimicry, nests parasitized by Barka Indigobird (*Vidua larvaticola*).
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Upper Niger Valley Secondary Area. Uncommon to locally common. In Senegal found only in SE (100 km S of Goudiry). Confirmed at minimum of 100 localities in Mali, where at least some reports of *L. rubricata* are thought probably to refer to present species. Possibly occurs also in N Guinea.
Bibliography. Bates (1934), Fry & Keith (2004), Goodwin (1982), Hinze (2001), Lamarche (1981), Nicolai (1982), Nicolai *et al.* (2007), Paludan (1936), Payne (1997c, 2005a), Payne & Barlow (2004), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003).

68. Rock Firefinch

Lagonosticta sanguinodorsalis

French: Amarante des rochers **German**: Felsenamarant **Spanish**: Amaranta Roquera
Other common names: Rock Finch

Taxonomy. *Lagonosticta sanguinodorsalis* Payne, 1998, Taboru, Jos Plateau, Nigeria.
Presumably part of the possible superspecies formed by *L. virata*, *L. umbrinodorsalis* and *L. rhodopareia*. Differs in plumage from *L. umbrinodorsalis*, but appears to be nearly identical to it vocally. Monotypic.
Distribution. N Nigeria (Jos Plateau, Kagoro, Panshanu, and Mandara Hills) and adjacent NW Cameroon (N of R Benue, E to Maroua).



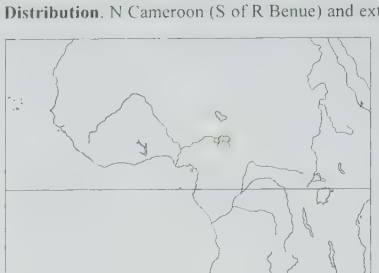
Descriptive notes. 10–11 cm; 11·4 g. Male has crown grey, nape red, upperparts brownish-red, rump and uppertail-coverts red, tail feathers black with red outer webs; upperwing dark brown, outer primaries broad (not emarginated); superciliary area, lores, side of face, chin and throat to upper breast pinkish-red, side of breast and flanks with small white spots, belly pink to vinous red, undertail-coverts black; iris dark brown, eyering pink; bill long, straight and narrow, bluish-grey and slate; legs grey. Female differs from male in having head all brownish-grey except for red loral patch, back and upperwing-coverts reddish-brown, underparts paler reddish than male. Juvenile has crown more greyish-brown than back (and slightly browner than female), back and upperwing-coverts reddish-brown, lores grey, face and underparts light greyish-brown to reddish-brown, paler on throat, flanks unspotted reddish-brown, undertail-coverts black, bill black, base of lower mandible bluish-grey, eyering pale grey. Voice. Call a characteristic rapid descending trill, "treeee", 12–13 notes per second, given by both sexes; very short whistled "chew" of 0·06 seconds, pitch dropping from 4·8 kHz to 3·2 kHz, often a double "peas-chew" or "see-too", sometimes repeated in slow trill (4 notes per second), answered by mate with "chew" trill; short whistled "chwee" rising from 2·5 kHz to 4·2 kHz; distance contact call by female a long "feeew" whistle, rising and then slowly falling, sometimes in two parts, "feeee-eeeee"; close contact call between pair-members a low whistle, "too too too...", repeated in short trill; alarm "pitpitpit".
Habitat. Rocky hillsides and granite outcroppings (inselbergs) with scattered thickets and grass, scrub savanna with long grass, gallery forest along gulleys, streams and rivers, and cultivated lands. Inselberg habitat used in all seasons, and savanna in dry season; tends to occur in gallery forest in dry season.
Food and Feeding. Small grass seeds, including cultivated acha (*Digitaria exilis*), taken on the ground. Forages in pairs. Seasonal activity determined by ringing and radio-tracking: area used by a pair 3·6 ha in wet season, 7·3 ha in dry season; areas of neighbouring pairs often overlap.
Breeding. Breeding season (from dates of juveniles and active nests) Aug–Nov. No information on courtship behaviour. Nest a ball of grass, rough grasses on outside and fine grasses on inside, hidden in tuft of grass between boulders from ground level to 1 m above it, occasionally up to 5 m above ground. Clutch 2–5 eggs; incubation by both male and female, no information on duration; nestling undescribed, fledged young has gape-flange pale grey, palate pale grey with three large blackish spots in front and two smaller spots behind, posterior palate pink; no information on duration of nestling period. Nests presumably parasitized by Jos Plateau Indigobird (*Vidua maryae*), which mimics song of this species. Annual adult survival 0·65.
Movements. Resident. One individual moved 2·5 km.
Status and Conservation. Not globally threatened. Fairly common. Has comparatively small global range, restricted to N Nigeria and NW Cameroon. Occurs in two discrete populations: one on Jos Plateau and nearby hills, and the other farther E, centred on the Mandara Hills (on Nigeria–Cameroon border). Firefinches reported as *L. rubricata* in N Benin (Pendjari National Park) and Burkina Faso (Arli National Park) may, in fact, involve present species.
Bibliography. Brandt & Cresswell (2008, 2009), Chappuis (2000), Dunning (2008), Fry & Keith (2004), McGregor *et al.* (2007), Mills (2010a), Nicolai *et al.* (2007), Payne (1998a), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003), Wright & Jones (2005).

69. Chad Firefinch

Lagonosticta umbrinodorsalis

French: Amarante de Reichenow **German**: Tschadamarant **Spanish**: Amaranta de Chad
Other common names: Reichenow's/Pink-backed Firefinch

Taxonomy. *Lagonosticta umbrinodorsalis* Reichenow, 1910, Sakdje (Sakjé), upper Benue River, Adamawa, Cameroon.
Has been suggested as forming a superspecies with *L. virata* and *L. rhodopareia*, and the three sometimes treated as conspecific; superspecies treatment, if appropriate, would presumably include also recently described *L. sanguinodorsalis*. Previously, present species often treated as a race of *L. rhodopareia*, and subspecific epithet *bruneli* then often used, but latter a junior synonym of present name, which has priority. Monotypic.
Distribution. N Cameroon (S of R Benue) and extreme SW Chad.



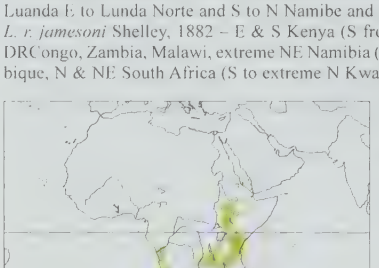
Descriptive notes. 10–11 cm. Male has crown and nape pale grey, mantle, back and upperwing-coverts umber-brown to cinnamon, rump and uppertail-coverts red, tail feathers black with red outer webs; flight-feathers dark brown, outer primaries broad (not emarginated); superciliary area, lores, side of face, chin and throat to upper breast pinkish-red, side of breast and flanks with small white spots, belly pink to vinous red, undertail-coverts black; iris dark brown, eyering pink (brighter in breeding season); bill long, straight and narrow, bluish-grey and slate; legs grey. Female is similar to male, but upperparts brown, side of face grey (lores red), paler reddish below. Juvenile has crown and back brown, underparts ochre, lacks spots, bill black. Voice. Calls include soft "tsit", high-pitched twitter, soft "chew", slow trill; alarm "pitpitpit". Voice nearly identical to that of *L. sanguinodorsalis*.
Habitat. Rocky hillsides and rocky granite outcroppings with scattered thickets, woods and grass, also well-vegetated sites in plains; along streams and rivers in rainy season, and where small pools remain in dry season.
Food and Feeding. Small grass seeds, taken on the ground. Forages in pairs.
Breeding. Breeds apparently in Aug–Nov, in wet season. No other information.
Movements. Resident. In Cameroon (Poli), local altitudinal movement from 400 m to wetter upland sites above 800 m in dry season.
Status and Conservation. Not globally threatened. Generally fairly common, but local. In N Cameroon, apparently known only from type locality (Sakjé), on upper R Benue. In Chad, occurs near border with Central African Republic; found in mountains of Lam, near Dagbao (25 km SE of Baibokoum). Firefinches observed in Manovo-Gounda-Saint Floris National Park, in N Central African Republic, and reported as *L. rubricata*, may be referable to present species; further fieldwork required.
Bibliography. Brunel *et al.* (1980), Chappuis (2000), Érard & Roche (1977), Fry & Keith (2004), Nicolai *et al.* (2007), Payne & Louette (1983), Sorenson *et al.* (2004), Voaden (2008).

70. Jameson's Firefinch

Lagonosticta rhodopareia

French: Amarante de Jameson **German**: Rosenamarant **Spanish**: Amaranta de Jameson
Other common names: Ethiopian/Abyssinian Firefinch (*rhodopareia*)

Taxonomy. *E [strelda] rhodopareia* Heuglin, 1868, Keren, 4000–5000 feet (c. 1220–1525 m), Eritrea.
Has been suggested as forming a superspecies with *L. virata* and *L. umbrinodorsalis*, and the three sometimes treated as conspecific; superspecies treatment, if appropriate, would presumably include also recently described *L. sanguinodorsalis*. Nominate race intergrades with *jamesoni* in NW Kenya and N Uganda, and *ansorgei* intergrades with *jamesoni* in N Namibia. Proposed race *taruensis* (described from Tsavo, in Kenya) synonymized with *jamesoni*. Three subspecies normally recognized.
Subspecies and Distribution.
L. r. rhodopareia (Heuglin, 1868) – NW Eritrea, SW Ethiopia, S Sudan and NE Uganda E to N & W Kenya.
L. r. ansorgei Neumann, 1908 – extreme SW DRCongo (lower R Congo), Angola (Cabinda, and Luanda E to Lunda Norte and S to N Namibe and Moxico) and NW Namibia (R Cunene).
L. r. jamesoni Shelley, 1882 – E & S Kenya (S from lower R Tana and Lamu) S to Tanzania, SE DRCongo, Zambia, Malawi, extreme NE Namibia (Caprivi), N & E Botswana, Zimbabwe, Mozambique, N & NE South Africa (S to extreme N KwaZulu-Natal) and Swaziland.



Descriptive notes. 10–11 cm; 7·5–13 g (*jamesoni*). Male nominate race has forehead to back brown with slight pink tinge, rump and uppertail-coverts red; tail black, basal half of outer webs red; upperwing brown, wing-coverts with reddish edges when fresh, outer primary broad (not emarginated on inner web); lores red, side of face, throat and breast crimson-red, belly and undertail-coverts dull black; iris dark brown, eyering pink; bill blue-grey, tip, culmen and cutting edges blackish, upper mandible usually darker greyish than lower, and can be largely blackish; legs grey. Female is paler than male, above pale brown, greyer on head, lores red, throat peach-buff, underparts warm orange-red, browner on belly, undertail-coverts blackish. Juvenile is brownish above, rump red, plain buff below, bill black. Race *jamesoni* is pinker-looking than nominate, male has forehead to back brownish-pink, area over eye and lores down to chin bright scarlet, rest of face to throat and breast rose-pink, belly and undertail-coverts dull black, female pink-washed brown above, head greyish-pink, underparts dull pink to rosy buff, belly dark grey; *ansorgei* is brighter than others, male has crown brown with pink wash, back ochre-yellow-brown, lores bright red, brighter red below, female paler, upperparts without reddish tinge. Voice. Song consists of trills at varying speeds and pitches, some melodious whistles including upslurred notes, "wee-weepweepwee..."; other themes and contact notes drier, trills of repeated single notes or double notes, e.g. "t'we twe" and "tui, twi...". Alarm call a rapid purr (22–24 notes per second); female distance call a long "feeew"; nest call a rapidly repeated "tititi" or "ti-ti-ti-ti"; begging call of nestlings and fledglings "wiswiswis", like that of *L. rubricata*. Songs and calls nearly uniform throughout range of nominate race and *jamesoni* (not described for *ansorgei*).
Habitat. Semi-arid acacia (*Acacia*) bushland, grassy thickets, undergrowth, maize (*Zea mays*) fields with weeds and grass, edges of riparian forest in dry areas, and rocky hillsides; mainly lowlands, below 1200 m.
Food and Feeding. Small grass seeds (diameter 1–2 mm); also insects, including termites (Isoptera). In Lochinvar National Park, in Zambia, exploits mainly annual grasses *Echinochloa*, *Setaria*, *Urochloa* and *Panicum*. Takes seeds on ground; uncovers termites under tunnels and surface of ground, also catches them in flight during mass emergences. Forages in pairs and in small family groups.
Breeding. Breeds in late rains: Jul in Kenya, Jan–May (once Sept) in Zambia, Feb–Aug (once Nov) in Malawi, in all months (mainly Dec–May) in Zimbabwe, and Dec–Apr in N South Africa.

Courting male perches with body and head held high, breast and head plumage ruffed, holds feather or strip of grass in uptilted bill, moves head up and down; bounces up and down, stretching and flexing legs, flicks head up and back, lands with click sounds, sings as he displays. Nest a thatched ball with side entrance, made from grasses and leaves, lined with feathers and fine grasses with seedheads, placed 0·1–0·3 m above ground, in grass clumps in thornbush area, or in herbs or bush with grass growing through branches. Clutch 3–5 eggs; incubation period 12–13 days; nestling skin blackish-pink, sparse light grey down, gape has two small white papillae, one above and one below on each side (papillae become light blue with age), narrow dark blue band at base and separated by broad pinkish-violet oral flange, palate pink with five black spots, tongue pink with black bar, lower mouth pale pink with black sublingual crescent; nestling period 16–19 days; young independent 14 days after fledging. Nests parasitized by Purple Indigobird (*Vidua purpurascens*), nestlings of which mimic mouth colour and pattern of host's nestlings.

Movements. Resident. In Zambia, local movements of up to 4 km to surface water during and after breeding season; in Botswana, seasonal changes in numbers suggestive of movement; in South Africa, most recoveries within 10 km of ringing site, one at 125 km.

Status and Conservation. Not globally threatened. Common to locally common in most of range; probably most numerous in E & S. In Zambia density at Lochinvar National Park 40/km² in 1972–1973; in following years, with loss of tall grass cover, trampling by cattle and increase in unpalatable herbs, numbers declined, and species scarce by 1997.

Bibliography. Ash & Atkins (2009), Benson & Irwin (1967), Dean (2000), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Goodwin (1982), Hockey *et al.* (2005), Immelmann, Nicolai *et al.* (1977), Immelmann, Steinbacher & Wolters (1965), Marriott (1999), McCarthy (2006), Nicolai (1987, 2001), Nicolai *et al.* (2007), Payne (1973a), Payne & Payne (2002), Payne *et al.* (1993), Redman *et al.* (2009), Sorenson, Balakrishnan & Payne (2004), Sorenson, Sefc & Payne (2003).


71
golden-headed morph
red-headed morph
black-headed morph
♂
♀
inches
3
cm
8
PLATE 23
ssp hyperythra
73
ssp borneensis
ssp brunneiventris
72
74
typical
ssp prasina
yellow morph
76
75
ssp coelica
ssp pealii
ssp regia
78
79
ssp cyaneovirens
77
80
81

Subfamily ERYTHRURINAE

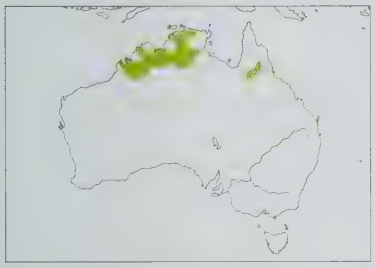
Genus *ERYTHRURA* Swainson, 1837

71. Gouldian Finch

Erythrura gouldiae

French: Diamant de Gould **German**: Gouldpapageiamadine **Spanish**: Diamante de Gould
Other common names: Lady Gouldian Finch, Rainbow/Purple-breasted Finch, Painted Finch(!)

Taxonomy. *Amadina Gouldiae* Gould, 1844, Victoria River, Northern Territory, Australia.
Often separated in a monotypic genus, *Chloebia*; recent studies of mitochondrial phylogeny indicate that this species is basal to the other members of present genus. Monotypic.
Distribution. N Australia N of 20° S: in N Western Australia (Kimberley Division), N Northern Territory, and N Queensland (mainly in base of Cape York Peninsula).



Descriptive notes. 15 cm (including tail of 4 cm); 10·5–16 g. Male of black-headed morph (most common) has forehead, crown and face to upper throat black, black bordered with light blue, which grades into green on nape, green continuing to back and upperwing; rump and uppertail-coverts blue, tail, including long pointed central feathers, black; breast below blue band purple, lower breast yellow, shading to white on lower belly and undertail-coverts; iris dark brown, eyering pale bluish-grey; bill white with red tip in non-breeding season, more extensively dark grey in breeding season; legs pinkish. Male red-headed morph (rare) has forehead, crown and face red, narrowly outlined black in front of the blue border and over base of bill, black chin and upper throat; golden-headed morph (rare) is similar, but face golden-yellow (not red). Domesticated strains vary in face colour (red, black or yellow-orange) and in bill colour (red or yellow), as well as in other parts of plumage, depending on presence or absence of melanins and carotenoids. Female is similar to male in pattern, but duller and paler, with central tail feathers only slightly elongated; bill as in male, but becomes mainly dark grey in breeding condition. Juvenile has head and face grey, back and wings greenish-grey, tail short, breast pinkish-buff, belly yellowish-white, bill black with pale pink base, eyering dark grey. Voice. Close contact call "sit" or "ssit", singly or in series; distance contact call louder, usually in pairs, "ssit-ssit"; male gives nest call, "ssreeit", from nest or at nest-site. Song a complex series of high-pitched, continuous whispering, hissing and low-pitched clicking notes and a long, drawn-out whine.
Habitat. Grassy open forest and woodlands in a mosaic of burnt and unburnt woodland in semi-arid regions, often near spear-grass (*Sorghum*); in wet season in patches of cockatoo grass (*Alloteropsis semialata*), golden beard grass (*Chrysopogon fallax*) and spinifex (*Triodia*); near water. Breeding habitat in Western Australia and Northern Territory characterized by rocky hills with smooth-barked gums (*Eucalyptus brevifolia* or *Eucalyptus tintinnans*) within c. 2–4 km of water (small permanent water-holes or springs).
Food and Feeding. Grass seeds, half-ripe and ripe, especially those of *Sorghum*, other seeds mainly in wet season (when *Sorghum* germinates); occasionally insects, mainly in wet season. Seeds taken both from seeding heads and on the ground. Alights on grass stems and moves up to seedhead; also jumps up and pulls stem to ground, where it holds stem under foot and takes seeds; also perches on branches over tall grasses to take seeds from seedheads. Social; occurs in small or large flocks; active in heat of the day.
Breeding. Recorded in all months except Oct: May–Jun in Western Australia (Kimberley), Dec–Apr (late wet season) in Northern Territory, and Feb–Apr in N Queensland. Often loosely colonial, several pairs nesting in neighbouring trees or same tree. In courtship, birds fly about and give contact calls, or male approaches a perched female and, in horizontal posture with tail raised or in more erect posture, turns towards her and bows from upright posture, then takes upright posture with body drawn back, tarsal joint held below perch, fluffs feathers of face, head, and rump and purple feathers of breast; he lowers tail and angles it towards female, faces her, sings, and bobs up and down, sometimes jumping up from perch. In the field, mates preferentially with partner of same colour morph; offspring of mixed-morph pairs have lower survival (pre-hatching, juvenile, and adult), especially in case of females, owing to underlying genetic incompatibility. Nest a loosely formed open cup of dry grass, lined with softer grass, built in hole in hollow tree or in termitarium; occasionally uses old nest of other bird; in captivity, uses nestbox without lining it, or builds covered nest with entrance hole. Clutch 4–8 eggs; incubation by both sexes during day, by female at night, period 14–15 days; hatchling naked, skin orange to pink, gape with large balls of opalescent blue with black base, one above and one below corner of mouth, a smaller yellow ball or swelling at gape, palate yellowish with ring of five black spots, upper bill tip with black mark on each side, inner mouth pink, tongue pink with two black spots above connected by black band below, and below it a black mouth or sublingual crescent; nestling period 21–22 days; young fed by parents for a further 10–14 days.
Movements. Resident, with short-distance dispersal from breeding areas in early wet season, after germination of *Sorghum* seeds. No evidence of N–S seasonal shifts in range. Radio-tracked individuals in non-breeding season moved 3–10 km during day between feeding areas and water sources.
Status and Conservation. ENDANGERED. Scarce to uncommon, and local. Has suffered substantial decline as a result of habitat modification; decline still continuing, albeit at slower rate. Found mainly from Kimberley region of Western Australia E to N part of Northern Territory; scattered records in Cape York Peninsula through NW Queensland, where regular at only one locality. Global population was estimated at fewer than 2500 mature individuals (at start of breeding season), but now thought to be closer to c. 10,000 mature individuals. Monitoring work near Katherine, in Northern Territory, revealed that population is stable; no evidence of decline during 2004–2007 at Mornington Wildlife Sanctuary, in C Kimberley. Main threats appear to be grazing and altered fire regimes. Grazing by livestock leads to changes in species composition and phenology of grasses, especially reduction in abundance of grass species that set seed earliest in wet season. Cattle, horses and feral pigs graze wet-season grasses that are vital to this estrildid, and cattle and buffalo (*Bubalus*) damage water-holes used by it by trampling and grazing of surrounding vegetation. Adverse effects of large herbivores probably exacerbated by current fire regimes in N Australia, which are dominated by frequent hot wildfires in late dry season over extensive tracts of terrain; fire has adverse impact on seed productivity of key wet-season grasses on which this species relies early in year (a period of food scarcity), and this finch tends to shun burnt tree hollows as nesting sites. Trapping may have had a local effect in the past. For a long time, it was believed that infection with a endo-parasitic mite (*Sternostoma tracheacolum*) was a principal reason for this species' decline, but such infection now thought more likely to indicate that these birds (and other granivorous species) were under stress owing to broader changes at landscape level; recent short-term increases may represent recovery after an epidemic of parasitization. Further, climate change likely to affect timing and quantity of wet-season rainfall, which could lead to increase in frequency or intensity of wildfires, thereby altering abundance of important grass species and changing availability of surface water during dry season. Management actions include implementation of a recovery plan, detailed research on fire, food and the species' movements at Mornington Wildlife Sanctuary (Kimberley), maintenance of a database of sight records, and a review of patterns of distribution, habitats, potential threats and conservation status of granivorous savanna birds. Continued monitoring occurs at four sites. Proposed measures include, among others, studies of response of grasses and birds to a variety of pastoral and fire-management regimes, encouragement for landholders to implement the most beneficial regimes, and control of feral herbivores; collaboration with Jawoyn Aboriginal Corporation in implementing fire regimes and control of feral herbivores; monitoring of populations at key sites throughout range.
Bibliography. Anon. (2008g, 2009j), Beckham (2009), Bielfeld (1997, 2008), Butchart & Stattersfield (2004), Butler (1899), Goodwin (1982), Hall, B.P. (1974), Hall, M.F. (1962), Higgins *et al.* (2006), Immelmann (1962a, 1965a), Kühn (1994), McCarthy (2006), Nicolai & Steinbacher (2001), North (1909), O'Malley (2006), Payne (2005a), Pizzey (1980), Pryke & Griffith (2007, 2009), Puschner (2000b), Schodde & Mason (1999), Stattersfield & Capper (2000), Storr (1977, 1980, 1984b), Tidemann (1990), Tidemann & Woinarski (1994), Tidemann, Calley & Burgoyne (1992), Tidemann, Lawson *et al.* (1999), Tidemann, McOrist *et al.* (1992), Vriends & Heming-Vriends (2002), Woinarski & Tidemann (1992), Ziegler (1963), Ziswiler *et al.* (1972).

72. Pink-billed Parrotfinch

Erythrura kleinschmidti

French: Diamant à bec rose **Spanish**: Diamante Piquirrosado
German: Schwarzstirn-Papageiamadine
Other common names: Black-faced Parrotfinch

Taxonomy. *Amblynura kleinschmidti* Finsch, 1878, Viti Levu, Fiji.
Sometimes separated in a monotypic genus, *Rhamphostruthus*. Monotypic.
Distribution. C & E Viti Levu, in Fiji.



Descriptive notes. 11 cm; one bird 21 g. Has forehead and face black, crown deep blue, ear-coverts to throat pale green; upperparts green, rump and uppertail-coverts red, short tail black; breast to undertail-coverts yellowish-green; iris reddish brown, with eyering black; bill long (1·5 cm), pink, tip sometimes black; legs dull pink. Sexes alike. Juvenile is similar to adult, but plumage duller, less black on head, brownish on side of neck and breast, bill orangey-horn with tip black. Voice. High, thin, penetrating "cheee cheee cheee" call, and a clicking sound.
Habitat. Mature wet forest, mainly below 1000 m; also found in secondary scrub and plantations, and has bred at edge of secondary forest.
Food and Feeding. Primarily insects, also flower buds and fruit; fruit especially figs (*Ficus vitiensis* and *Ficus tinctoria*), also mangosteen (*Garcinia myrtifolia*). Forages at medium height along tree trunks and branches; active, hops and flies from branch to branch, moves up and down trees and vines, clings to bark of vertical trunks. Probes with bill among dead leaves and examines branches for insects. Picks up twigs, pecks at dead leaves and pulls them apart; uses bill to open leaf stems of tree-fern, pecks holes and feeds on ants (Formicidae) and their eggs; probes into rotting tree trunks and takes large grubs, using bill to lever off pieces of bark. Holds fruits under foot, tears open the skin, and swallows seeds and pulp; small fruits plucked, crushed in bill and consumed. Forages in pairs, sometimes singly; also joins mixed-species flocks moving through forest understorey.
Breeding. Nest-building observed in May, Jun and Aug; juveniles seen in Aug–Sept and Jan–Feb. Nest an untidy globular structure with downward-facing entrance hole low on one side, made from dead leaves, twigs, lichens and bamboo leaves, one bird bringing material, the other building; only recent known nest was 6–7 m above ground in fork of small branches in a stand of bamboo, a few metres from edge of forest and an abandoned cocoa plantation. No other information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Fiji EBA. Has small population within very small global range. Population estimated at 2500–10,000 individuals, in area of 2400 km² on island of Viti Levu; numbers declining owing to habitat loss. Although this species has always been considered rare, it may simply be unobtrusive and patchily distributed; all records are from wetter C & E parts of Viti Levu, where recent surveys suggest that it is widespread at low densities, recently estimated at 2·8 birds/km². The species was recorded at eight (62%) of 13 recent survey sites on the island, but sites were restricted to those having densest old-growth forest. Only c. 50% of Viti Levu is still forested, and small-scale logging and clearance for agriculture continues; the most reliable site for the species (Joske's Thumb) was logged in early 1980s, leading to a drastic decline in number of sightings. This estrildid, which is legally protected in Fiji, has been recorded in the protected watershed forest near Suva. Proposed conservation measures include the conducting of forest surveys and threat assessment, and resurvey of all known sites; development of local expertise in survey methodology also needed. Suitable areas for conservation need to be found, and preservation of the watershed forest near Suva ensured.
Bibliography. Anon. (2008g, 2009j), Butchart & Stattersfield (2004), Cichon (2009), Clement *et al.* (1993), Clunie (1973), Clunie & Morse (1984), Clunie & Perks (1972), Goodwin (1982), Masibalavu & Dutson (2006), Mayr

On following pages: 73. Tawny-breasted Parrotfinch (*Erythrura hyperythra*); 74. Pin-tailed Parrotfinch (*Erythrura prasina*); 75. Green-faced Parrotfinch (*Erythrura viridifacies*); 76. Mount Katanglad Parrotfinch (*Erythrura coloria*); 77. Tricoloured Parrotfinch (*Erythrura tricolor*); 78. Red-throated Parrotfinch (*Erythrura psittacea*); 79. Red-headed Parrotfinch (*Erythrura cyaneovirens*); 80. Papuan Parrotfinch (*Erythrura papuana*); 81. Blue-faced Parrotfinch (*Erythrura trichroa*).

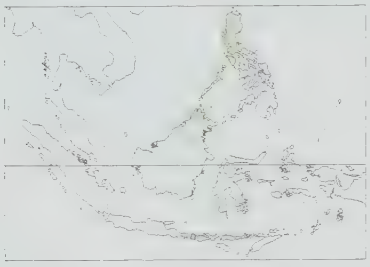
(1931, 1945a), Nicolai & Steinbacher (2001), Pratt *et al.* (1987), Slattersfield & Capper (2000), Tarburton (1992), Tuiwawa (2005), Watling (2001), Ziswiler *et al.* (1972).

73. Tawny-breasted Parrotfinch

Erythrura hyperythra

French: Diamant à queue verte **German**: Bambuspapageiamadine **Spanish**: Diamante Coliverde
Other common names: Bamboo/Green-tailed Parrotfinch, Bamboo Munia

Taxonomy. *Chlorura hyperythra* Reichenbach, 1863, New Guinea; error = Java.
Sometimes separated in a monotypic genus, *Reichenowia*. Proposed race *malayana* (described from Cameron Highlands, in Peninsular Malaysia) is synonymized with *borneensis*, *ernstmayri* (from Wawa Karaeng, Lompobattang, in SW Sulawesi) with *microrhyncha*, and *obscura* (from Sita, in W Flores) with *intermedia*. Five subspecies recognized.
Subspecies and Distribution.
E. h. borneensis (Sharpe, 1889) – Peninsular Malaysia (Cameron Highlands) and N Borneo.
E. h. brunneiventris (Ogilvie-Grant, 1894) – N Philippine Is (Luzon and Mindoro).
E. h. hyperythra (Reichenbach, 1863) – Java.
E. h. microrhyncha (Stresemann, 1931) – Sulawesi.
E. h. intermedia (E. J. O. Hartert, 1896) – W Lesser Sundas (Lombok, Sumbawa, Flores).



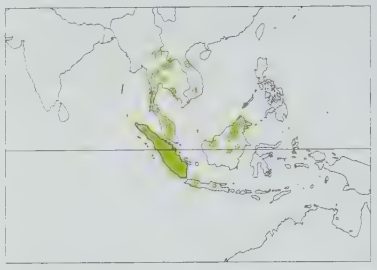
Descriptive notes. 10·4 cm; c. 10–13·2 g. Male has forehead velvety black, forecrown blue, hindcrown and upperparts to back green, rump and uppertail-coverts tawny-orange; tail short and rounded, olive-green; primaries black, edged green; lores, face, throat and underparts tawny-buff, flanks green; iris dark brown, eyering grey; bill black; legs pinkish flesh to red. Female is similar to male, but forehead brown, blue of forecrown duller and less extensive. Juvenile is paler than adult, lacks blue on forehead, bill yellow with tip black. Race *brunneiventris* is shorter-billed than nominate, hindcrown and nape to rump and tail bright green, underparts paler buff, flanks tinged blue; *borneensis* has blue extending from forehead to hindcrown, buff areas mostly paler; *microrhyncha* is paler and duller, with less blue on head, paler and washed green below, bill small; *intermedia* has uppertail-coverts green with orange wash. Voice. Contact call, given in flight, a high-pitched hissing "tzit-tzit" or "tseet-tseet"; generally silent. Song begins with long series of crackling notes, rhythmically in different tempos, and middle of song has a series of bell-like paired notes, "dodo-düdü-dede-didi".
Habitat. In Peninsular Malaysia, occurs in bamboo, edge of broadleaf evergreen forest, montane forest and scrub, at 1100 and 1900 m in Cameron Highlands and Larut Range; 600–3300 m in Borneo. In Philippines (Luzon), occupies primary forest, bamboo, pine (*Pinus*) and forest edge, ranging into adjacent grassland, at 600–2300 m. In Java, montane areas in moist forest and bamboo thickets, foraging out into open grassy areas and neighbouring rice fields. In Lesser Sundas, found in open monsoon forest and forest edges, mostly in hills, at 800–1000 m; 700–2200 m in Sulawesi.
Food and Feeding. Seeds of grasses (*Poa pratensis*, *Puleum pratense*, *Panicum*) and bamboo, also seeds of herbs, e.g. sunflower (*Helianthus annua*), thistles (*Cirsium*) and knotweed (*Polygonum chinense*), pine seeds; also small fruits, especially figs (*Ficus*); also small insects. Forages on ground and in dense undergrowth, and in crown of climbing bamboo, also in bushes and on stems of bamboo. Forages singly and in small groups, especially in bamboo; shy, often difficult to see.
Breeding. Season Feb–Mar in Java and May–Jun on Flores, and juveniles seen in May in Borneo. In courtship, male bundles several pieces of nesting material in bill, flies to female, and sings while making side-to-side head movements, then crouches, lowers head until bill nearly touches perch, hops sideways towards her, stretching his legs and throwing back head at each jump; female responds with her own side-to-side head movements. Nest a grassy ball with side entrance, built 1–12 m (usually 1·5–2·5 m) above ground in tree, among ferns, orchids or moss. Clutch 4–6 eggs; incubation period 13–14 days; nestling naked, skin pink, each side of gape with two large blue reflecting papillae, yellow palate with three spots, tongue with two spots and below it a sublingual crescent; nestling period 21–27 days; young fed by parents for a further 2 weeks.
Movements. Resident. Perhaps some short movements in response to flowering and seeding of bamboo.
Status and Conservation. Not globally threatened. Not well known; probably often overlooked because of its skulking behaviour. Rare in Peninsular Malaysia. Rare in Borneo, where confined to N mountains. Rare and local in Philippines; found only on Luzon, with sight records from Mindoro, and an old record from Panay. Rare in Java, where few recent records and possibly now restricted to W of the island. In Wallacea generally uncommon or rare, but locally moderately common, e.g. at Tentolo-Matinan Mts, in N Sulawesi, and at Poco Ranaka, on Flores.
Bibliography. Albrecht (1990), van Balen (1987), Bregulla (1998), Burkard (1966), Clement *et al.* (1993), Coates & Bishop (1997), Dickinson *et al.* (1991), Goodwin (1982), Kennedy *et al.* (2000), MacKinnon (1988), Mann (2008), Mayr (1931), Medway & Wells (1976), Myers (2009), Nicolai & Steinbacher (2001), Puschner (2001a), Ripley & Rabor (1958), Robson (2000), Smythies & Davison (1999), Stresemann & Heinrich (1940), Verheijen (1964), Wells, D.R. (2007), White & Bruce (1986), Whitehead (1893), Ziswiler *et al.* (1972).

74. Pin-tailed Parrotfinch

Erythrura prasina

French: Diamant quadricolore **German**: Lauchpapageiamadine **Spanish**: Diamante Colifino
Other common names: Nonpareil Finch, Long-tailed Munia

Taxonomy. *Loxia prasina* Sparrman, 1788, Java.
Has been thought to form a superspecies with *E. viridifacies*. Two subspecies recognized.
Subspecies and Distribution.
E. p. prasina (Sparrman, 1788) – Thailand, S Myanmar (Tenasserim), Peninsular Malaysia, S Cambodia, N & C Laos, Vietnam (C & S Annam, N Cochinchina), Sumatra and Java.
E. p. coelica Stuart Baker, 1925 – W Philippine Is (S Palawan) and Borneo.
Descriptive notes. Male 15 cm, female 11·5–12 cm; 14·7 g. Male nominate race has forehead, face and throat blue, lores black; crown and upperparts, including upperwing, green, rump, uppertail-coverts and tail red, the tail long and pointed; breast buff, centre line of belly red, flanks to undertail-coverts buffy tan; iris dark brown, eyering dark grey; bill black, grey base of lower mandible; legs light pinkish to red. Rare yellow morph has red areas of plumage replaced by yellow. Female



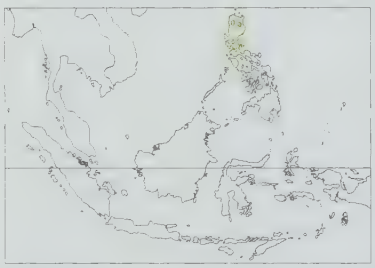
differs from male in having rump, uppertail-coverts and tail dull red, pointed tail shorter, face to upper breast duller blue (intensity variable), underparts buff (lacking red). Juvenile is like female but paler, with head bluish-grey, upperparts pale green, rump to tail dull brown to orange, underparts pale buff, lower mandible mostly yellowish, tip black. Race *coelica* male has blue extending from throat to breast and meeting red of upper belly, female face, throat and upper breast pale blue. Voice. Call a loud, high-pitched "tseet-tseet" or "tsit-tsit", also a sharp "teger-teger". Song includes a series of abrupt notes at 3 kHz and 6 kHz.
Habitat. Forest edge and secondary growth, bamboo; visits rice fields; lowland plains up to 1500 m. In Malay Peninsula mainly in dryland forest, especially in bamboo, but occurs also in secondary scrub far from bamboo jungle and true forest; in Borneo mostly in rice fields, occasionally in scrub at least 50 km from rice cultivation; on Palawan in bamboo, at c. 700 m and above on Mt Mantalingajan.
Food and Feeding. Rice (*Oryza sativa*), and seeds of grass, of bamboo and perhaps of sedges (Cyperaceae). In Borneo, hundreds of specimens examined had taken only rice; in other areas takes rice, and seeds of canary grass (*Phalaris canariensis*), oats (*Avena sativa*) and *Panicum*, as well as bamboo. In Malay Peninsula, takes unripe bamboo seeds on the plant, dangling from end of perch in order to reach a seedhead; sometimes holds items in bill to crush or decorticate for several seconds, before swallowing. Also searches for seeds among fallen leaves. Forages alone or in pairs or small groups; sometimes in larger flocks of hundreds, these arriving and remaining during seeding time of bamboo; large flocks mixed with *Lonchura* munias visit rice fields.
Breeding. Season Feb–Sept in SE Asia and Feb and Nov in Java. Male holds nesting material in bill, hops towards female, bobs up and down, and then raises tail and switches it from side to side as he lifts head high and swings head from side to side. Nest a ball-like structure with side entrance, made from blades of bamboo and rattan, fibres and rootlets, unlined, placed from near ground to 20 m above it in creepers, bush, tree or bamboo in forest edge or thicket. Clutch 4–6 eggs; incubation period 12–14 days; nestling skin pink (anterior head black), naked, gape with large blue reflecting papillae, yellow palate with five spots, tongue with two spots and a sublingual crescent; nestling period 21 days.
Movements. Resident, partially migratory and nomadic. Appears to wander over large range, and moves seasonally with rice harvest and seeding bamboo, e.g. in S Myanmar (Tenasserim) present during rice harvest Nov–Jan. In Borneo, most records from rice fields: in Kelabit Highlands arrives in large numbers in Feb and Mar, and in SW Sarawak all records are in Aug–Oct.
Status and Conservation. Not globally threatened. Scarce to locally fairly common in SE Asia; uncommon to scarce and local in Sumatra and Java; locally common to abundant in Borneo. Status in Philippines uncertain; recorded only from Mt Mantalingajan, in S Palawan, where first discovered as recently as 2007. Regarded as a pest in rice cultivations in several parts of range, e.g. Borneo and Thailand.
Bibliography. Clement *et al.* (1993), Goodwin (1982), Karl (1964), MacKinnon (1988), Mann (2008), van Marle & Voous (1988), Mayer (1995d), McCarthy (2006), Medway & Wells (1976), Myers (2009), Nicolai & Steinbacher (2001), Robson (2000, 2002), Schwanke (2008), Sheldon *et al.* (2001), Smythies (1986), Smythies & Davison (1999), Wells, D.R. (2007), Ziswiler *et al.* (1972).

75. Green-faced Parrotfinch

Erythrura viridifacies

French: Diamant de Luçon **German**: Manilapapageiamadine **Spanish**: Diamante de Luzón
Other common names: Green/Manila Parrotfinch

Taxonomy. *Erythrura viridifacies* Hachisuka and Delacour, 1937, vicinity of Manila, Luzon, Philippines.
Has been thought to form a superspecies with *E. prasina*. Monotypic.
Distribution. Philippines: Luzon, Panay, Negros and Cebu.



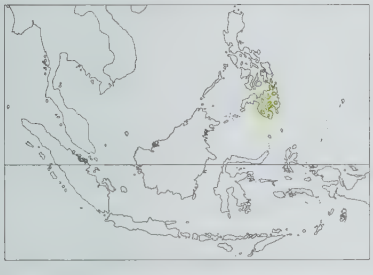
Descriptive notes. 12·5 cm; 12·6 g. Male plumage is almost entirely green, paler below; rump, uppertail-coverts and elongated pointed central tail feathers red, rest of tail dark brownish-grey, with fringes of outer webs olive-green, undertail-coverts buff; iris dark brown, eyering grey; bill black; legs pinkish. Female is similar to male, but paler, the red areas duller, belly and undertail-coverts yellowish buff. Juvenile is like female, but still paler, underparts yellowish-buff. Voice. Calls "tseet tseet" or "tisit tsit"; song a soft "deedeedeedee...", a chattering "day day day...", and ending with harsh "grey-grey-grey-ray-day-lay-grey".
Habitat. Montane forest and forest edge, bamboo, grassland and shrubs near forest; generally above 1000 m, occasional in lowlands. Closely associated with flowering or seeding bamboos, and concentrates in numbers at these temporarily rich food sources.
Food and Feeding. Seeds of bamboo, canary grass, rice, and casuarinas (*Casuarina*), also bamboo flowers. Food items taken from low bushes, on stems and on ground. Forages singly and in pairs, also in small flocks of up to 35 individuals; occasionally, flocks of over 100 individuals at temporary food abundances on Luzon.
Breeding. Season appears to be Mar–Apr. Male displays with reed or grass stem held in bill, bobs up and down, raises tail and head and waves both from side to side; courtship similar to that of *E. prasina*. Nest in captivity shaped like a ball, made from grass and fibres, built in a bush; no observations in the field. In captivity, clutch 3–4 eggs, incubation period 14 days, nestling naked, skin pink, gape with large blue reflecting papillae, yellow palate with five spots, tongue with two spots and under it a crescent. No other information.
Movements. Resident and nomadic; occasionally irruptive, suddenly appearing in an area when food resources unavailable elsewhere.
Status and Conservation. VULNERABLE. Restricted-range species: present in Luzon EBA and Negros and Panay EBA. Rare to locally scarce; decreasing. Confined to Philippines, where recorded on Luzon (several localities), Negros (two sites) and Panay (one site), with one recent report from Cebu. Since 1980, apart from Cebu, recorded at only five localities, four on Luzon and one on Panay. Status difficult to assess, as its nomadic and occasionally irruptive behaviour can make it

appear locally common, e.g. flocks containing more than 100 individuals on Luzon; possible that records on other islands involve immigrants from Luzon. Main threat habitat destruction and degradation, as this species is dependent on a temporally and spatially patchy food resource (bamboo seeds) within forest; initial forest disturbance improves conditions for bamboo, but subsequent clearance removes food sources. In late 1980s, estimated forest cover as low as 24% on Luzon, 4% on Negros and 8% on Panay. In addition, trapping for the cagebird trade probably had serious adverse effect on this species' population in earlier years; in 1935, on Luzon, it was caught in large numbers in many parts of Manila, and many hundreds exported to USA. Although this species is recorded in Northern Sierra Madre Natural Park and Bataan Natural Park/Subic Bay, both on Luzon, its nomadic habits mean that occurrence in protected areas is of limited benefit. Proposed conservation measures include the conducting of regular fieldwork, including mist-netting, in areas where this estrildid may still survive in order to assess its current status and movements; research to determine the distribution and ecology of the bamboos on which it depends; and protection of sites supporting both populations of this parrotfinch and its favoured bamboo species.
Bibliography. Allen (1999), Anon. (2008g, 2009j), Bielfeld (1996), Bregulla (1998), Butchart & Stattersfield (2004), Clement *et al.* (1993), Collar *et al.* (2001), Dickinson *et al.* (1991), Goodwin (1982), Kennedy *et al.* (2000), Mayr (1931), Nicolai & Steinbacher (2001), Rabor *et al.* (1970), Stattersfield & Capper (2000), Ziswiler *et al.* (1972).

76. Mount Katanglad Parrotfinch
Erythrura coloria

French: Diamant de Mindanao **Spanish**: Diamante de Mindanao
German: Buntkopf-Papageiamadine
Other common names: Mindanao/Red-eared/Red-collared Parrotfinch

Taxonomy. *Erythrura coloria* Ripley and Rabor, 1961, Mount Katanglad, Malaybalay, Bukidnon, Mindanao, Philippines.
Sometimes placed with *E. papuana* and *E. trichroa* in a separate genus, *Trichroa*. Has been thought possibly to form a superspecies with *E. tricolor* and *E. trichroa*. Monotypic.
Distribution. Mountains of Mindanao, in S Philippines.



Descriptive notes. 10–10·5 cm; 9·8–12·7 g. Male has forehead and face blue, large red crescent on rearmost ear-coverts and side of neck; rest of head to back and upperwing green, rump, uppertail-coverts and edge of brown tail feathers red; chin, throat and underparts green; iris brown, eyering dark grey; bill black; legs pinkish-brown. Female is very similar to male, but with less blue and less red on on head. Juvenile is green above, rump, uppertail-coverts and tail dull reddish-brown, dull green below, face greenish-blue, bill yellow with black upper ridge. Voice. Calls a sharp, repeated "tik", a short sharp "prrrt", and a "tik-tik-tik-tik" trill.
Habitat. Montane forest and forest edge, secondary growth, shrubs, *Lantana* thickets, palms, dense understorey, and tall grass; at 1000–2250 m.
Food and Feeding. Seeds of grasses (*Poa pratensis*, *Phleum pratense*, *Panicum liliaceum*, *Setaria italica*, canary grass), and seeds of thistles, chicory (*Cichorium intybus*), opium poppy (*Papaver somniferum*) and flax (*Linum usitatissimum*), also fruits; also small insects. Feeds mostly on ground and in low vegetation; occasionally takes seeds in forest canopy. Often feeds in dead blackened branches around base of palms. Forages singly and in small groups.
Breeding. Few data. Birds with active gonads in Jan–Apr. No field observations available, all following details based on observations in captivity: clutch 1–3 eggs; incubation period 14 days; nestling naked, skin pink, each side of gape with two large blue reflecting papillae, yellow palate with five black spots, tongue with black band and a crescent under it; nestling period 21–23 days; young fed by parents for a further 2 weeks, moult completed in 3–4 months.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Mindanao and the Eastern Visayas EBA. Moderately common, but very local; appears to be not uncommon at Mt Katanglad. Easily overlooked owing to its unobtrusive and secretive habits; probably present on every mountain in C Mindanao. Until very recently, its presence had been confirmed at only two or three localities, but now known to be more widespread: Mt Hilong-hilong (at Siwod), Mt Pasian (Bislig), Mt Puting Bato (Davao del Norte), Mt Katanglad (at Malaybalay, at Mt Kaatoan, at Mt Nangkabulos and at Kinubalan), Mt Piapayungan (at Siwagat), Mt Apo, Mt Parker (T'boli), Mt Three Kings, and Mt Busa (on S slope at Binati). No apparent threats within its altitudinal range, but, because its global range is small, it is potentially vulnerable to changes in the future. Population size hardly known, and relatively little known about its breeding ecology and biology. Further research required.
Bibliography. Anon. (2008g, 2009j), Butchart & Stattersfield (2004), Clement *et al.* (1993), Dickinson *et al.* (1991), Fisher & Hicks (2006), Goodwin (1982), Kennedy *et al.* (2000), Kühn (1994), Mayr (1931), Nicolai & Steinbacher (2001), Peterson *et al.* (2008), Pistor (1990), Robiller (2009), Stattersfield & Capper (2000), Ziswiler *et al.* (1972).

77. Tricoloured Parrotfinch
Erythrura tricolor

French: Diamant azuvert **German**: Forbespapageiamadine **Spanish**: Diamante Tricolor
Other common names: Sunda/Tricolour/Three-coloured/Blue-breasted/Timor/Tanimbar/Forbes's Parrotfinch

Taxonomy. *Fringilla tricolor* Vieillot, 1817, Timor.
Has been thought possibly to form a superspecies with *E. coloria* and *E. trichroa*. Monotypic.
Distribution. Timor, Atauro, Wetar, Romang, Damar, Babar and Tanimbar Is (Larat, Yamdena, Lutu), in C & E Lesser Sundas.
Descriptive notes. 10 cm; 11 g. Male has head deep blue, fading on nape to bright green of back and wings, with rump, uppertail-coverts and tail red; sometimes shows strong light blue wash on mantle, scapulars and fringes of upperwing-coverts; throat deep blue normally becoming less intense on breast, belly bright to pale blue, undertail-coverts pale blue; iris dark brown, eyering dark grey; bill black; legs pinkish-grey to fleshy-orange or fleshy-yellow. Female is very similar to male, but slightly paler, face and throat to breast duller and paler blue, flanks greenish-blue, belly light blue. Juvenile has forehead and face grey, crown and back dull green, wings green, rump grey, uppertail-coverts and edge of rectrices dull red, throat pale grey, underparts grey, bill yellowish, upper mandible black. Voice. Call a soft "ti-ti-ti-ti...ti-ti-ti"; also thin, high-pitched sibilant upslurs. Song a shrill high trill.



Habitat. Forest edge and small clearings in monsoon forest, woodland and secondary growth, thickets, bamboo, and cultivated areas; lowland to 1400 m.
Food and Feeding. Seeds of grasses and fruits. Feeds on ground and in low scrub, bamboo and trees. Forages singly, in pairs and in small groups, occasionally in flocks of up to c. 20 individuals; often associates with *Lonchura* species in Tanimbar Is (Yamdena).
Breeding. No information on season. Male bundles nesting material in bill and, with trilling song, flies to female; perched male stretches head and body in her direction, but does not bob or bow towards her; pair engages in sexual pursuit-flight, female in the lead, while male sometimes holds nest material in bill. Nest built in top of palm. Clutch 4–6 eggs; incubation period 13–15 days; nestling naked, skin pink, each side of gape with two large blue reflecting papillae, yellow palate with five black spots, tongue with two small lateral spots, a crescent under tongue; captive-reared young sometimes leave nest at 17 days, independent at 5 weeks, bill black at 7 weeks, bright adult plumage acquired with a third moult.
Movements. No information.
Status and Conservation. Not globally threatened. Restricted-range species: present in Banda Sea Islands EBA and Timor and Wetar EBA. Locally fairly common on Timor and Wetar; moderately common in Tanimbar Is (Yamdena). Formerly quite common on Romang and Babar, but no recent information from those islands.
Bibliography. Clement *et al.* (1993), Coates & Bishop (1997), Goodwin (1982), Keijzer (1993), Mayer (1996a), Mayr (1931, 1944), Nicolai & Steinbacher (2001), Reinwarth (1992), Robiller (2009), Trainor & Soares (2004), White & Bruce (1986), Wyrsch (1992), Ziswiler *et al.* (1972).

78. Red-throated Parrotfinch
Erythrura psittacea

French: Diamant psittaculaire **German**: Rotkopf-Papageiamadine **Spanish**: Diamante Lorito
Other common names: Red-headed Parrotfinch(!)

Taxonomy. *Fringilla psittacea* J. F. Gmelin, 1789, New Caledonia.
Sometimes placed with *E. cyaneovirens* in a separate genus, *Amblynura*. Monotypic.
Distribution. New Caledonia.



Descriptive notes. 12–14 cm; 10·5–11·5g. Male has forecrown, face and throat to centre of upper breast hindcrown to back green, rump and uppertail-coverts red, outer rectrices mostly dark olive-brown, with some red on outer fringes, central tail feathers and edges of other tail feathers red, the tail graduated; sides and lower breast to undertail-coverts green; iris dark brown, eyering grey; bill black; legs pinkish-grey to orange-flesh. Female is very like male, but slightly duller and less extensively red on chin and throat. Juvenile is similar to adult, but rump duller red, red feathers appear on throat within a few days of fledging; bill yellow with black tip, after fledging black above and mostly black below. Voice. Call a high "seet"; song a high-pitched trill, like that of other Melanesian parrotfinches.
Habitat. Forest edge, grassy openings in forest, scrub, edge of cultivation, plantations, mangroves, and paperbark (*Melaleuca*) woodland.
Food and Feeding. Seeds of grasses (canary grass, *Poa pratensis*, *Phleum pratense*, *Panicum liliaceum*, *Setaria italica*, *Andropogon*, *Pennisetum*, *Eragrostis*), fruits of dicotyledons, including *Casuarina* and *Erythrina*, poppies, hemp (*Cannabis sativa*), and figs (*Ficus*); also seeds of sedges (Cyperaceae); also small insects and spiders (Araneae). Feeds mostly on ground, but also in trees and bushes and on grass stems. Forages in pairs and family groups, and in small flocks of up to c. 20 individuals.
Breeding. Breeds in Sept and Mar. Male bundles nesting material in bill, flies to female while giving trilling song, and pair engages in sexual pursuit-flights. Nest a rough ball with side entrance, made from elongate leaves, stems and bark fibres, lined with feathers, built in cavity on cliff, in fig tree or on building, or in grass. Clutch 4–6 eggs; incubation period 13 days; nestling naked, skin pink, each side of gape with two large deep-blue reflecting papillae, yellow palate with five black spots, tongue with two small lateral spots; nestling period 18–22 days; young independent 2 weeks after leaving nest. Usually 3 or 4 young produced in a brood.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Fairly common within small global range. Several records from Vanuatu (in Port Vila, on Efaté) during 1960s and 1970s involved escaped cagebirds, and no recent reports from there.
Bibliography. Bregulla (1992), Charruaud (1909, 1926), Clement *et al.* (1993), Doughty *et al.* (1999), le Flahec (1978), Goodwin (1982), Güttinger (1972), Jacobsen (1975), Kraus (1969), Mayr (1931), McCarthy (2006), Menegazzi (1984), Mills (1987), Nicolai & Steinbacher (2001), Oppenborn (1998b), Payne (2005a), Pearson (1992), Puschner (2000c), Reimann (1986), Restall (1972), Sarasin (1913a, 1913b), Webb (1932), Weston (1989), Ziswiler *et al.* (1972).

79. Red-headed Parrotfinch
Erythrura cyaneovirens

French: Diamant vert-bleu **Spanish**: Diamante Verdiazul
German: Kurzschwanz-Papageiamadine
Other common names: Red-capped Parrotfinch; Royal/Blue-bellied/New Hebrides Parrotfinch (*regia*, *serena*); Fiji/Peale's Parrotfinch (*pealii*)

Taxonomy. *Geospiza cyaneovirens* Peale, 1848, Upolu, Samoa.
Sometimes placed with *E. psittacea* in a separate genus, *Amblynura*. Race *pealii* often considered a separate species, and *regia* and *serena* often regarded as forming a further species, differing in

extent of blue in plumage and in ecology; variation in amount of blue plumage, however, nearly as great within an island group (Samoan group; Vanuatu) as between island groups (Samoa, Vanuatu and Fiji). Race *gaughrani* described from a single adult and a series of young birds; validity perhaps requires confirmation. Proposed race *efatensis* (described from Efaté, in S Vanatu) considered a synonym of *serena*. Five subspecies recognized.

Subspecies and Distribution.

E. c. regia (P. L. Sclater, 1881) – N Vanuatu, including Banks Is.

E. c. serena (P. L. Sclater, 1881) – Efaté and Anatom (Aneitym), in S Vanuatu.

E. c. pealii Hartlaub, 1852 – Fiji.

E. c. gaughrani duPont, 1972 – Savai'i, in Samoa.

E. c. cyaneovirens (Peale, 1848) – Upolu, in Samoa.



Descriptive notes. 10 cm; male mean 13·1 g and female 13·3 g (*regia*), male 10·5 g and female 10·7 g (*pealii*), and male 10·5 g and female 11·5 g (nominate). Male nominate race has forehead, crown and entire face red, upperparts bluish-green, upperwing green with variable blue tinge, rump and uppertail-coverts red, central tail feathers and edges of others dull red, rest of tail feathers brown; chin, throat and breast deep blue, rest of abdomen more sea-green (lower belly and Banks blue on some individuals); iris dark brown, eyering grey to blue; bill black; legs pinkish-grey. Female is very like male, sometimes paler. Juvenile is similar to adult, but face blue to green, bill yellow with black tip; shortly after fledging (when tail still short), crown develops red feathers, upper mandible becomes black and lower mandible black at base. Race *gaughrani* is like nominate, but has underparts wholly green; *pealii* has upperparts green, throat to breast blue, lower breast to undertail-coverts green; *regia* has upperparts deep blue, mixed with green on lower back and wings, deep blue on throat to belly, undertail-coverts blue-green; *serena* resembles previous, but blue on upperparts restricted to band around neck and fringes of wing-coverts. Voice. Call a high, thin "seep"; song a high-pitched trill.

Habitat. Forest; at all elevations, from sea-level to mountains. In Samoa (nominate race and *gaughrani*), restricted to forest, and usually found in closed-canopy or degraded forest, but also in native forest trees. In Vanuatu (*regia* and *serena*), usually confined to closed-canopy and broken forest with large fig trees (*Ficus*); on larger islands, more restricted to closed-canopy forest in hills. In Fiji (*pealii*), common in forest edge and occurs also in gardens and suburbs; uncommon in closed-canopy forest.

Food and Feeding. Wild figs and fruits of casuarina (*Casuarina*); also rice, seeds of other grasses and herbs; also insects and spiders (Araneae); nectar also taken. In one study, half of the food items recorded consisted of grass seeds and other half fruits of herbs. Nestlings fed with fig seeds, weed seeds and small caterpillars. Feeds in treetops on fruits; feeds on ground on rice, seeds of other grass and herbs, insects and spiders. In Samoa forages in canopy of large fig trees in forest, also in middle and upper storeys of various native forest trees; in Fiji, enters suburban areas and gardens and forages on lawns near shrubs and other woody cover. Removes fig seeds from fleshy fruits, which it opens on the stem or carries to a branch, where it secures fruit with feet and tears it open with curved lower mandible; deposits uneaten fruit on a branch. Usually seen singly, in pairs or in family groups; occasionally as many as 30 individuals in a fruiting tree. Often in small flocks outside breeding season in Fiji.

Breeding. Observed in Jan–Apr, Jul and Aug. Male bundles nesting material in bill, flies to female while giving trilling song, and pair engages in sexual pursuit-flights. Nest elliptical or ball-like, with narrow entrance opening to side or downwards, made from stems and fibres, placed in tree, often in epiphytes and figs, in Samoa 3–8 m above ground. Clutch 3–4 eggs; incubation period 13–14 days; nestling naked, skin pink, each side of gape has two large deep-blue reflecting papillae, yellow palate has five black spots, a crescent under tongue; nestling period 18–21 days; young independent 2 weeks after leaving nest.

Movements. No information. Suspected that race *regia* is nomadic in its search for figs.

Status and Conservation. Not assessed. Probably not globally threatened. Races *regia* and *serena* (often treated as constituting a separate species) VULNERABLE. Restricted-range species: present in Vanuatu and Temotu I BA, Fiji EBA and Samoan Islands EBA. Generally decreasing. Widespread but uncommon in Samoa, where always inconspicuous; population vulnerable to meteorological events, e.g. suffered great losses in the 1990–1991 cyclones. Common in Fiji, where found on four largest islands (Viti Levu, Vanua Levu, Taveuni and Kadavu) and also, rather surprisingly, on some islands in Yasawa Is and Mamanuca Is (in W Fiji); has adapted well to man-modified habitats, and benefits from the planting of lawns with carpet grass (*Axonopus compressus*), seeds of which are among this species' favoured foods; in some areas, it is considered a serious pest in rice fields. In Vanuatu, small population threatened, and declining through forest loss and degradation; still common on small islands of Tongoa and Emaé, but difficult to detect and perhaps often overlooked; only population estimate is of 200–300 individuals (of race *regia*) in upland of Tongoa. Has been recorded on most islands in Vanuatu, but not seen for many years on several of them (e.g. Anatom), and may be locally extinct; recent records on Gaua, Espiritu Santo, Efaté and Epi, but larger numbers only on Tongoa and Emaé (has been suggested that an increased number of fruiting figs has allowed high numbers to survive on these islands). Lowland and middle-altitude forest in the archipelago is under considerable threat from commercial logging, and extensive forest clearance for gardens has already taken place on small islands with high human populations, such as Tongoa; reports of small-scale and irregular trapping of this parrotfinch (a highly valued species) for domestic and international trade give cause for concern; on most islands people use catapults to kill small birds for fun, but whether this unobtrusive species is affected by this is not known. On Tongoa, local islanders have in the past prevented people from catching the species for trade, in the hope that its presence will attract ecotourists; encouragement and promotion of such ecotourism initiatives would be beneficial. This parrotfinch occurs in proposed Lake Letas Reserve, on Gaua.

Bibliography. Anon. (2008g, 2009j), Birchenough *et al.* (2003), Bregulla (1992), Butchart & Stattersfield (2004), Clunie (1972), Doughty *et al.* (1999), Goodfellow (1934), Goodwin (1982), Kratter *et al.* (2006), Mayr (1931), Neff (1995), Nicolai & Steinbacher (2001), Payne (2005a), duPont (1972), Pratt *et al.* (1987), Stattersfield & Capper (2000), Tarburton (1992), Watling (2001), Ziswiler *et al.* (1972).

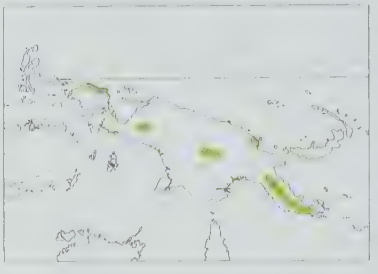
80. Papuan Parrotfinch

Erythrura papuana

French: Diamant de Nouvelle-Guinée **German**: Papuapapageiamadine **Spanish**: Diamante Papú
Other common names: Large-billed/Large-tailed Parrotfinch

Taxonomy. *Erythrura trichroa papuana* E. J. O. Hartert, 1900, Arfak Mountains, New Guinea. Sometimes placed with *E. coloria* and *E. trichroa* in a separate genus, *Trichroa*. Monotypic.

Distribution. Mountains of New Guinea: N Vogelkop, Wissel Lakes area, Victor Emanuel Range (Telefomin), upper R Sepik and Adelbert Mts E to Aseki (Morobe Province), Eastern Highlands (Okapa) and Owen Stanley Range.



Descriptive notes. 15 cm; 17–24 g. Male has most of crown and face deep blue, lores duskier, hindcrown to back and upperwing green, rump, uppertail-coverts and slightly pointed tail red, outer tail feathers blackish-brown with carmine or yellow-olive fringes on outer webs; chin blue to green, throat to undertail-coverts green; iris dark brown, eyering black; bill robust, black; legs flesh coloured. Differs from very similar *E. trichroa* in larger size and more massive bill. Female is very like male, but blue of head paler and less extensive, rump to tail duller red, chin and throat green, underparts green with buff wash. Juvenile has head and foreparts greyish-green, bill yellow, upper surface of upper mandible and base of lower mandible black. Voice. Contact call a thin, high-pitched "tsit tsit"; song a high-pitched trill.

Habitat. Inhabits evergreen forest and forest edge, also secondary forest, usually at 1200–2600 m, but rarely down to 500 m; where present species occurs, the more common *E. trichroa* is often found.

Food and Feeding. Seeds of grasses, fruits of herbs including opium poppy (*Papaver somniferum*), field mustard (*Brassica rapa*) and hemp (*Cannabis sativa*), also figs (*Ficus*); also insects; possibly also nectar, as it visits flowering trees. Frequents forest middle stage and canopy of fruiting trees, especially figs and evergreen oak (*Castanopsis*). Forages singly and in pairs.

Breeding. Nestling described as having skin pink, no down, each side of gape with two large deep-blue reflecting papillae, yellow palate with five black spots, tongue with two lateral black spots and a crescent under tongue. No other information available.

Movements. No information; presumed resident.

Status and Conservation. Not globally threatened. Not well known. Scarce to uncommon; very patchily distributed. Easily overlooked as a consequence of its unobtrusive behaviour.

Bibliography. Beehler *et al.* (1986), Coates (1990, 2001), Diamond (1972), Güttinger (1972), Mayr (1930, 1931), Mayr & Rand (1937), Mettke-Hofmann & Hofmann (2001), Neff (1970), Nicolai & Steinbacher (2001), Payne (2005a), Ripley (1964), Vriends & Heming-Vriends (2002), Ziswiler *et al.* (1972).

81. Blue-faced Parrotfinch

Erythrura trichroa

French: Diamant de Kittlitz **German**: Dreifarben-Papageiamadine **Spanish**: Diamante Cariazul
Other common names: Blue-faced/Australian Green-backed Finch, Blue-headed Parrotfinch

Taxonomy. *Fringilla trichroa* Kittlitz, 1833, Kosrae, Caroline Islands.

Sometimes placed with *E. coloria* and *E. papuana* in a separate genus, *Trichroa*. Has been thought possibly to form a superspecies with *E. coloria* and *E. tricolor*. Subspecific epithet *cyanofrons* sometimes spelt as "*cyanifrons*" or "*cyaneifrons*", but present spelling has priority. Proposed race *macgillivrayi*, described from NE Australia (Lloyd I, off NE Queensland), apparently indistinguishable in plumage or size from birds of this species in New Guinea; treated as synonymous with *sigillifera*. Ten subspecies recognized.

Subspecies and Distribution.

E. t. sanfordi Stresemann, 1931 – NC & SC Sulawesi.

E. t. modesta Wallace, 1862 – N Moluccas (Halmahera, Ternate, Tidore, Bacan).

E. t. pinaiae Stresemann, 1914 – S Moluccas (Buru, Seram).

E. t. pelewensis Nagamichi Kuroda, 1922 – Palau Is.

E. t. clara Takatsukasa & Yamashina, 1931 – Chuuk Is and Pohnpei Is, in E Caroline Is.

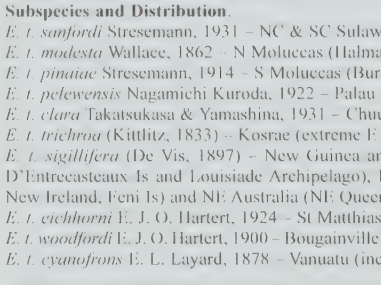
E. t. trichroa (Kittlitz, 1833) – Kosrae (extreme E Carolines).

E. t. sigillifera (De Vis, 1897) – New Guinea and some offshore islands (Manam I, Karkar I, D'Entrecasteaux Is and Louisiade Archipelago), Bismarck Archipelago (Umboi I, New Britain, New Ireland, Feni Is) and NE Australia (NE Queensland).

E. t. eichhorni E. J. O. Hartert, 1924 – St Matthias Is (in N Bismarck Archipelago).

E. t. woodfordi E. J. O. Hartert, 1900 – Bougainville I and Solomon Is (Kolombangara, Guadalcanal).

E. t. cyanofrons E. L. Layard, 1878 – Vanuatu (including Banks Is) and Loyalty Is.



Descriptive notes. 12 cm; 12–16 g (*sigillifera*). Male nominate race has most of crown and face deep blue, hindcrown to back and upperwing green with golden gloss, uppertail-coverts and slightly pointed tail red, outer tail feathers olive-brown; below, entirely green from chin to undertail-coverts; iris dark brown, eyering black; bill black; legs flesh-coloured. Female is very like male, but duller, blue of head paler and less extensive, rump to tail duller red. Juvenile is dull green above, rump to tail dull red, lacks blue on forehead and face, has breast light green, belly buff, bill yellow, black on upper ridge and at base of lower mandible. Races differ mainly in minor details of plumage, mainly relative brightness, also in size: *sigillifera* is sightly less yellow-tinged above than nominate, sometimes a slight bluish tinge below; *eichhorni* is smaller than previous, more extensively blue on forehead; *woodfordi* is larger than nominate, green areas paler and more yellow, slightly less blue on forehead, blue of face tinged mauve; *cyanofrons* is smallest race, brighter green, blue on head more extensive, blue of face tinged purple, bill blunt; *modesta* is larger and paler than nominate, has mauve-blue tinge on face, bill comparatively small; *sanfordi* is larger, with bill thicker than last, paler below, rump tinged orange; *pinaiae* has upperparts tinged bluish, wings dull green, edges of secondaries greyish-blue; *pelewensis* has bill large and thick at base, underparts tinged pale blue; *clara* resembles nominate, but brighter green, glossed golden above, blue on crown more extensive, rump slightly more orange. Voice. Call a thin, high-pitched "tsit-tsit", given in flight, described also as a short, thin, high-pitched descending "ti-tu, ti-tu-tu" or "t t t t". Song in New Guinea a high metallic trill followed by a whistle that falls and then rises at end.

Habitat. Hill forest and montane forest and forest edge, rainforest, and dense secondary growth; usually near grassy areas and fruiting bamboo, and in Vanuatu occasionally lawns under casuarina trees (*Casuarina*) on Efaté. From mangrove fringes to hills and montane sites, at 1500–2300 m on Sulawesi, 1500 m on Buru and 600–2300 m on Seram; in New Guinea mainly 1000–3000 m, also in lower foothills and nearby lowlands; breeding records at 900 m in NE Australia (Queensland), and down to sea-level on smaller islands.

Food and Feeding. Mainly grass seeds, also seeds of bamboo, figs (*Ficus*) and casuarina (*Casuarina*), and small berries; also small insects, including termites (Isoptera). In Queensland, takes seeds of introduced grass *Brachiaria decumbens* while perched along edge of rainforest. Active, at ground level to forest canopy. Forages singly, in pairs and in small groups, sometimes in larger flocks; also occasionally in mixed-species foraging groups including *Neochmia temporalis*, white-eyes (Zosteropidae) and other small birds.

Breeding. Season Oct–Feb/Mar in Vanuatu, and Nov–Apr (in pre-wet and wet season) in Australia. Male bundles nesting material in bill, flies to female while uttering trilling song, perches and angles tail towards her, she angles her tail towards male, and the two move head in bobbing (but do not bow); she crouches and then flies off, giving a trill, male follows in undulating sexual pursuit-flight, she perches and, when male reaches her, she flies off again; pursuit-flight repeated several times, until it ends with copulation. Nest oval, pear-shaped and narrower towards bottom, tightly constructed, with side entrance, built from curly moss, dark fibres and strands of vine, lined with dead grass, placed high in sapling, banyan fig (*Ficus*) or *Pandanus* foliage or on cliff. Clutch 3–6 eggs; incubation period 12–14 days; nestling naked, skin pink, becoming black by day 8, each side of gape has two large blue reflecting papillae, yellow palate has five black spots, tongue has two lateral spots and a sublingual crescent; nestling period 21 days; fledglings fed by parents for a further ten days, begging young quivering the wings; most of the parental care is carried out by female.

Movements. Mainly resident; in New Guinea possibly nomadic. In Australia, moves to coastal lowlands in non-breeding season and to interior uplands in breeding season.

Status and Conservation. Not globally threatened. Fairly common in much of range; shy, and probably often overlooked as a result of its inconspicuous behaviour. Appears generally rare and local in W of range, but locally not uncommon in NC Sulawesi (where known only from NC & SC areas); heard far more often than seen. Reasonably common in E Caroline Is, but uncommon and difficult to find in Palau. Variably common but locally distributed in New Guinea. Rather uncommon throughout E part of range, where patchily distributed in Solomons and Vanuatu, and present also in Loyalty Is. Rare in Australia.

Bibliography. Barrett *et al.* (2003), Beehler *et al.* (1986), Bell (1971), Coates (1990, 2001), Coates & Bishop (1997), Craig (2003), Diamond (1972), Doughty *et al.* (1999), Goodwin (1982), Güttinger (1972), Heinrich (1956), Higgins *et al.* (2006), Marshall (1948), Mayr (1931), Mayr & Diamond (1976, 2001), McCarthy (2006), Nicolai & Steinbacher (2001), Oppenborn (1998b), Payne (2005a), Pratt *et al.* (1987), Rand (1942), Restall (1972), Schipper *et al.* (2001), Schodde & Mason (1999), Sharpe (1890), Steadman (2006), Stresemann & Heinrich (1940), Storr (1984b), Webb (1932), White & Bruce (1986), Ziswiler *et al.* (1972).


82
83
84
ssp hagenensis
85
ssp fuliginosus
86
87
PLATE 24
inches 2
cm 5
ssp evangelinae
88
ssp ruficauda
90
ssp clarescens
ssp phaeton
89
91

Subfamily LONCHURINAE

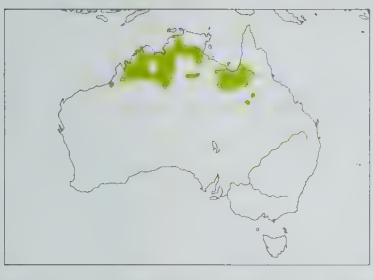
Genus *HETEROMUNIA* Mathews, 1913

82. **Pictorella Finch**

Heteromunia pectoralis

French: Diamant à poitrine blanche **German**: Weißbrustnonne **Spanish**: Diamante Pectoral
Other common names: Pictorella Mannikin/Munia, Pectoral Finch/Munia, White-breasted Finch/Mannikin/Munia

Taxonomy. *Amadina pectoralis* Gould, 1841, Derby, north Western Australia.
Has in the past been placed in a separate genus, *Munia*; alternatively, and more recently, in genus *Lonchura*. Differs from latter in morphology (more conical bill, longer wing, comparatively shorter tail, stronger legs). Results of recent studies of mitochondrial phylogeny indicate that the present genus represents one branch in a three-way polytomy with the grassfinches and *Lonchura*. Monotypic.
Distribution. N Australia from N Western Australia (the Kimberleys) E to Northern Territory (E to Banka Banka and Alexandria) and NC Queensland (S coast of Carpentaria Gulf S to Mt Isa and Homestead).



Descriptive notes. 12 cm; 13–18 g. Small, stocky finch with long, robust conical bill. Male has crown and upperparts light brownish-grey, slightly darker grey-brown on wings and darker still on tail, wing-coverts and tertials with small white spots at feather tips; face to throat black, surrounded by a fawn-buff line from nostrils to sides of neck; upper breast white, forming a breastband, with some black scallops showing here and there, lower breast and belly pinkish-buff, flanks and undertail-coverts pale buff with indistinct white scallops outlined in black; iris dark brown, eyering grey; bill light grey; legs pale pink. Female is rather similar to male, but typically has top of head and back browner, face blackish-brown, black scallops and bars extending across whole of breastband, underparts rather more buffy. Juvenile is brown above with rufous uppertail-coverts, breast peach-buff, and belly whitish; plumage nearly identical to that of juveniles of *Lonchura castaneothorax* and *Lonchura flaviprymna*. Voice. Call is a single "chip" or "pik"; flocks in flight tend to give a rain of calls. In courtship, male gives a simple "g'ee".
Habitat. Grassy dry woodlands, open grassy flats, long grass in swamps and along watercourses, marshes with bulrushes (*Typha*) and reeds (*Phragmites*), and rice fields; in dry interior country and spinifex (*Triodia*) grassland.
Food and Feeding. Seeds of standing grass, also seeds of weeds, rice; recorded foods include seeds of *Echinochloa colonum*, *Chloris virgata* and *Iseilema*; also small arthropods, including flying ants (Formicidae), termites (Isoptera), beetles (Coleoptera) and small spiders (Araneae); takes filamentous algae in shallow ponds. Terrestrial; feeds on ground, taking fallen seeds, or reaching for standing seedheads, or climbing or alighting on stems to feed. Drinks with quick sips, and takes moisture in early-morning dew. Forages singly and in pairs, and in non-breeding season also in flocks.
Breeding. Season Feb–May in Western Australia and Feb–Mar in Northern Territory. In "serious" courtship, male holds a stem in bill, points bill upwards, fluffs body feathers and spreads tail, hops around female, dragging his spread tail audibly over ground, his hopping becomes faster and he gives "g'ee" (equivalent of song); when in front of her, he drops stem and hops around her until the two are parallel, and, with tail fanned and angled towards her, he bows deeply, hops behind her to other side, and bows again, repeating the procedure until she crouches and quivers tail, this followed by copulation; during nest-building, male persistently chases female in sexual flight, then calls her to nest. Nest a bulky covered structure, small entrance hole at one side, made from green and dried grasses, rootlets, twiglets and fibres, lined with fine materials (including feathers), placed in tussock of grass or low down near ground in bush or spinifex. Clutch 4–6 eggs; incubation by both sexes during day, by female at night, period 12–14 days; nestling skin pink, without down, mouth has narrow gape-flange slightly swollen and white, with gape corner bluish, lined with streak of black, palate yellowish-white with single narrow black bar, tongue whitish with black spots or a black ring and black tip; nestling period 3 weeks; fledged young flutter wings at side (unlike young of most estrildids), begin to feed themselves 4 days after leaving nest.
Movements. Nomadic or irruptive, occurring locally in all seasons in some years. Generally moves inland in wet season (Nov–Jun), and to coastal regions in dry season. Isolated records from several areas a result of irruptive movements; e.g. records at Edward R, in N Cape York Peninsula (Queensland), in 1980, but apparently none there since then.
Status and Conservation. Not globally threatened. Formerly considered Near-threatened. Not well known; locally common within fragmented range. In Western Australia mainly in Kimberley Division, where reasonably widespread; occasional records elsewhere probably result of irruptions. Patchily distributed in N Northern Territory, where considered to be declining; found mostly in Top End. In Queensland occurs mainly in NW (E to Normanton, S to Mt Isa and Cloncurry), with records at a few other scattered sites to N, E & S of there; range in Queensland said to have contracted since beginning of 20th century, and not recorded so far E as formerly, but situation difficult to assess owing to this species' periodic eruptions, when it can appear to be locally common in places well outside normal range.
Bibliography. Anon. (2008g), Barrett *et al.* (2003), Butchart & Stattersfield (2004), Christidis (1987a), Fehrer (1993), Frith, H.J. (1976), Goodwin (1982), Güttinger (1976), Hall, B.P. (1974), Hall, M.E. (1962), Higgins *et al.* (2006), Hofmann & Mettke-Hofmann (1996), Immelmann (1965a), Immelmann *et al.* (1977), Kakizawa & Watada (1985), Nicolai & Steinbacher (2001), North (1909), O'Malley (2006), Pizzey (1980), Restall (1996b), Schodde & Mason (1999), Sorenson *et al.* (2004), Stattersfield & Capper (2000), Storr (1977, 1980, 1984b).

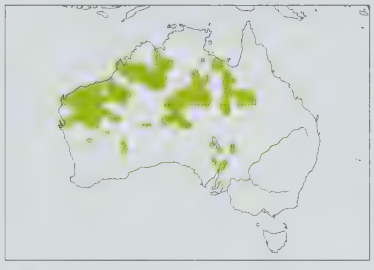
Genus *EMBLEMA* Gould, 1842

83. **Painted Finch**

Emblema pictum

French: Diamant peint **German**: Malerastrild **Spanish**: Diamante Pintado
Other common names: Painted Firetail, Mountain-Finch

Taxonomy. *Emblema picta* Gould, 1842, Depuch Island, Western Australia.
Monotypic.
Distribution. Arid and semi-arid country (mainly N of Tropic of Capricorn) discontinuously in Western Australia (mainly Kimberley Division and Pilbara Region S to Carnarvon), Northern Territory (mainly Tennant Creek S to Ayers Rock), W Queensland (E to Mt Isa and Longreach) and South Australia (mainly around L Eyre, L Torrens and L Frome, and Flinders Ranges).



Descriptive notes. 11 cm; 9·6–11·5 g. Male has red forehead and face, brown rear ear-coverts; crown to back and upperwing brown, rump and uppertail-coverts red, tail blackish-brown some rectrices with red on outer fringes; throat red with black feather margins, breast black, belly red in mid-line, sides of breast, belly and flanks black with white spots and bars, the spots small on breast and large on flanks, undertail-coverts black; iris dark brown, often with whitish outer rim, eyering grey; bill long, slender, black above with red tip and sometimes along culmen, red below with whitish to pale bluish base; legs fleshy-pink. Female is similar to male, but red on face normally restricted to lores, cheek and stripe over eye, throat black with white spots, belly black, bill with red of upper mandible only ever at tip. Juvenile is like female, but duller and browner above, duller below, lacks red on face, has mottled spots on side of breast and flanks, bill black, paler (becoming pinkish) on lower mandible. Voice. Call a loud, harsh "trut, chek-chek", and "ced up, cheddy-up". Song a wheezy chattering "che-che-che-che-che-che-chewerreeeeee-oweeeeee", sometimes ending with "cheeurr cheeurr".
Habitat. Arid and semi-arid areas, stone deserts, gorges, gulleys and rocky hills with scrub acacia (*Acacia*) or *Triodia* spinifex grassland, also orchards; usually near water, and occurs far inland in dry Australia when water available.
Food and Feeding. Seeds of grasses, mainly spinifex grass; occasionally fruit, and blades of grass; in captivity, takes insects as a large part of diet. Feeds mostly on ground, and spends much time in spinifex clumps; gleans seeds from ground, among grass tussocks and rocks. Forages in pairs and in small flocks, much time on ground.
Breeding. Breeds at almost any time of year, eggs recorded in all months except Nov–Dec; in Western Australia, breeds mainly Apr and Jul in Kimberley Division and Mar–Sept in Pilbara region; in Northern Territory, mainly Jun–Sept, but also Jan–Jul; in Queensland, Jan, Mar–May and Jul–Oct; and in South Australia, Jul–Dec. Male courts on ground, also on perch; in first part of display male and female pick up twigs, rootlets or small stones and drop them again (occasionally display with nest symbol), each twists tail towards the other, then singing male hops to female, sings in upright posture, feathers of head and belly fluffed, he pivots head, sometimes holding grass in bill, and bobs up and down. Before building nest, the bird prepares a platform of small stones, bits of earth, charcoal or twigs on ground. Nest a compact ball with side entrance, made from grass, stems and rootlets, lined with soft material including plant down, hairy seeds and fronds of ferns, well concealed, often in clump of spinifex grass near ground, occasionally on ground. Clutch 3–5 eggs; incubation from last egg, period 13–14 days; hatchling naked, skin pinkish, gape has inconspicuously swollen flange marked inside with thin black line (barely visible in fledged young), inside mouth two black parallel streaks on anterior end of upper mandible, whitish palate has thin long black bar or chevron in front of a raised white crest and two small black spots, tongue has black ring and black tip, and under it a black crescent; nestling period 21–25 days; young fed by parents for a further 2 weeks, begin to display courtship behaviour at age of 10 weeks.
Movements. Resident; in years of exceptional inland rain, may spread hundreds of kilometres S of usual range.
Status and Conservation. Not globally threatened. Considered to vary from locally fairly common to uncommon; widespread in inland and other arid and semi-arid areas. Occasional records well outside normal range; one confirmed record in New South Wales (Sturt National Park, in extreme NW).
Bibliography. Barrett *et al.* (2003), Beckham (2009), Bielfeld (1993), David & Gosselin (2002a, 2002b), Goodwin (1982), Hall (1962), Higgins *et al.* (2006), Immelmann (1962b, 1965a), Mayer (1993a), Mitchell (1987), Nicolai & Steinbacher (2001), North (1909), Puschner (2000b), Schodde & Mason (1999), Serventy & Whittell (1976), Storr (1977, 1980, 1984a, 1984b), Ziegler (1964, 1965).

Genus *OREOSTRUTHUS* De Vis, 1898

84. **Mountain Firetail**

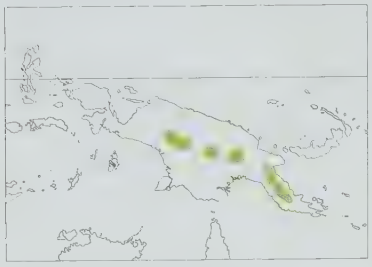
Oreostruthus fuliginosus

French: Diamant des montagnes **German**: Bergamadine **Spanish**: Diamante Montano
Other common names: Crimson-sided/Red-sided Mountain Finch, Crimson-sided Weaver Finch

Taxonomy. *Oreospiza fuliginosa* De Vis, 1897, Mount Scratchley, New Guinea.
Three subspecies recognized.

On following pages: 85. Diamond Firetail (*Stagonopleura guttata*); 86. Red-eared Firetail (*Stagonopleura oculata*); 87. Beautiful Firetail (*Stagonopleura bella*); 88. Crimson Finch (*Neochmia phaeton*); 89. Red-browed Finch (*Neochmia temporalis*); 90. Star Finch (*Neochmia ruficauda*); 91. Plum-headed Finch (*Neochmia modesta*).

Subspecies and Distribution.
O. f. pallidus Rand, 1940 – Oranje and Hindenburg Mts, in New Guinea.
O. f. hagenensis Mayr & Gilliard, 1954 – Central Highlands, in E New Guinea.
O. f. fuliginosus (De Vis, 1897) – mountains of SE New Guinea.



Descriptive notes. 13 cm; 17·2–20 g. Male nominate race has crown grey-brown, nape to back and upperwing dark olive-brown, rump and uppertail-coverts red, tail brownish-black; throat and underparts sooty brown, broad red feather tips on breast and flanks; iris brownish-red, eyering grey; bill red; legs grey. Female is similar to male, but buffy brown below, red of breast and flanks paler and less extensive, upper mandible mostly blackish, iris reddish-brown. Juvenile has rump and uppertail-coverts dull red, rest of plumage brown, bill black, turning red from base of lower mandible, lower gape with orange-yellow swellings, iris dark brown. Race *hagenensis* is paler brown than nominate, plumage washed with red; *pallidus* is paler. Voice. A mewing, rising "huwee"; when disturbed, utters repeated explosive "pit".
Habitat. High mountains, montane forest and forest edge near alpine grassland, mixed forest of southern beech (*Nothofagus*) and *Pandanus* palms, and forest openings; at 2700–3680 m, rarely as low as 2000 m.
Food and Feeding. Grass seeds; also fruit and insects. Feeds in thick stands of grass, in bamboo and on ground. Forages in pairs and in small groups. Inconspicuous.
Breeding. Nest with young in mid-Apr, and mummified nestling found in Dec in nest disused for no more than several weeks; nest-building observed in Sept and Oct. Nest covered, bulky and elongate, with side entrance, made from leaves of grass, ginger and ferns, covered with filmy fern fronds, bits of green moss and fine stems of epiphytic orchids, lined with fine grass, placed high up in palm. No other information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Poorly known species. Thought to be not uncommon, but very unobtrusive; probably under-recorded.
Bibliography. Beehler *et al.* (1986), Coates (1990, 2001), Diamond (1972), Frith & Frith (1990, 1993), Gilliard & LeCroy (1961), Goodwin (1982), Mayr & Gilliard (1954), Mayr & Rand (1937), Mitsch (1989), Nicolai & Steinbacher (2001), Rand (1940), Rand & Gilliard (1967).

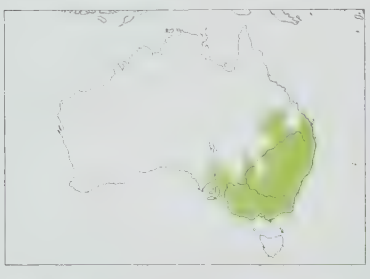
Genus *STAGONOPLEURA* Reichenbach, 1850

85. **Diamond Firetail**

Stagonopleura guttata

French: Diamant à gouttelettes **German**: Diamantamadine **Spanish**: Diamante Moteado
Other common names: Diamond Sparrow/Finch, Spot(ted)-sided Finch

Taxonomy. *Loxia guttata* Shaw, 1796, New Holland = Sydney region, New South Wales, Australia.
Has been placed in genus *Emblema*. Monotypic.
Distribution. SE Australia from SC & SE Queensland S to SE South Australia (S to S Eyre Peninsula and Kangaroo I) and S Victoria.



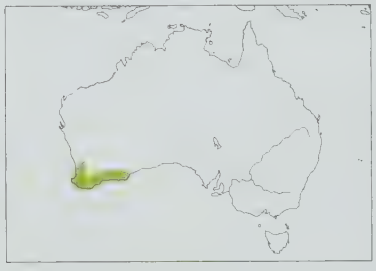
Descriptive notes. 12 cm; 14·1–22·7 g. Male has head pale grey, lores black, mantle, back and upperwing brownish-grey, rump and uppertail-coverts red, tail black; throat and upper breast white, broad black breastband, side of breast and flanks black with large white spots, belly and undertail-coverts white; iris red to dark brown, thick eyering bright red; bill red; legs grey. Female is very like male, but breastband narrower, eyering narrow and rose-red. Juvenile is similar to adult, but with breastband grey, flanks barred grey and white, bill black, eyering narrow and grey. Voice. Call a long drawn-out penetrating "twooo-hee", first syllable rising in pitch, second falling; call of male higher and longer than that of female; also a snoring nest call, given when bird returns to nest and when bird on nest responds. Song a long series of low raspy notes.
Habitat. Open eucalypt (*Eucalyptus*) forest and woodland with grassy understorey, mallee bush, scrubby grassland, parks and gardens; occurs in more open habitat than that favoured by the other firetails.
Food and Feeding. Seeds of grasses, also seeds of herbs, including goosefoot (*Chenopodium*) and wild geranium (*Erodium*); in breeding season also small insects. Feeds mostly on ground, where it hops quickly; also takes seeds from flowering grasshead by jumping or while perched on stem. Forages mainly in flocks, often of up to 40 individuals, flocks larger in autumn to early spring than in late spring and summer; sometimes large flocks of 150–300 or more individuals at food sources, predominantly in non-breeding period. Occasionally solitary or in pairs. Often forms mixed flocks with other finches.
Breeding. Breeds in all months except Jun and Jul, mainly in Aug/Sept–Dec/Jan. Usually in small colonies of up to c. 30 nests, with several nests in same tree; occasionally solitary. In courtship, male holds a long piece of green grass (sometimes longer than 1 m; very long grass used in building nest) in bill, he flies to branch near female, stretches neck upwards, head below level of perch, bill nearly touching breast, ventral plumage fluffed (appears double his normal size), and in this position bobs up and down by stretching and flexing legs, while singing; when female approaches, he drops grass, bends body forwards, lowers head, turns neck and opens bill, in posture like that of begging fledgling. Nest a bulky structure with ball-shaped nesting chamber and long entrance tunnel on one side, sometimes decorated with flowers especially at entrance; made from green stems and blades of grass, lined with grass and feathers, placed usually 1–6 m (occasionally to 30 m) above ground in bush or tree, often in mistletoe (Loranthaceae); adults continue to add lining material after incubation started, and open a second entrance through nest wall when eggs hatched. Clutch 4–5 eggs; incubation by both sexes, starting with second egg, period c. 14 days; nestling skin pale pink, sparse white down on head and back, gape with white swellings outlined in black and marked inside with large black spot on upper and lower swellings (showing as black line between white swellings when mouth closed), palate pinkish-white with open diamond-shaped mark formed by small black medial spot and two pairs of black spots all connected by a black line, behind hard palate a conspicuous pair of elongated white swellings on side and a whitish transverse ridge in mid-line, tongue at 1–2 days barely marked and in older nestlings has two black spots; chicks fed and brooded by both parents, nestling period 21–23 days; young independent at 45 days, at which time moult to adult plumage begins.
Movements. Resident. Some short-distance movements in Victoria, where single individuals, pairs and flocks observed in long-distance flight just above treetops, following watercourses and tree lines.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon; decreasing. Has undergone moderately rapid decline in numbers and reduction in density throughout range; population probably now fragmented. Global population thought to number c. 200,000 mature individuals; continuing to decline, especially in more heavily developed parts of range. Main problems are loss of habitat, remaining fragments of which gradually becoming unsuitable owing to competition with invasive species, overgrazing (which alters vegetation structure), weed invasion, and predation (of adults or young). In New South Wales, despite legislation against large-scale clearing of habitat, approval was given for clearance of 640,000 ha between 1998 and 2005; although not all of this will have been cleared, some was certainly cleared illegally. Principal factors thought to be having adverse impact on this species include loss of important foodplants and habitat through invasion by exotic grasses more suitable for *Neochmia temporalis*; expansion of latter (which forages in flock) in some areas may have disadvantaged present species. In N of range, changes in fire and grazing regimes thought to have had a major role in the decline. In addition, isolated subpopulations may be susceptible to illegal trapping. Proposed conservation measures include, among others, the effective protection of all woodland occupied by this species, and appropriate conservation management for all subpopulations on public land; use of appropriate incentives to promote good management of habitat by landowners, together with retention of native grassland, and efforts to encourage greater connectivity between subpopulations; control of activities such as firewood-gathering in areas occupied by this species, and, where necessary, reduction in grazing densities.
Bibliography. Anon. (2008g, 2009j), Beckham (2009), Butchart & Stattersfield (2004), Butler (1899), Cooney & Watson (2005), Frith, H.J. (1976), Goodwin (1982), Higgins *et al.* (2006), Immelmann (1962b, 1965a), McCarthy (2006), Mitchell (1987), Morris (1958), Myers (1987), Nicolai (1962), Nicolai & Steinbacher (2001), North (1909), Payne (2005a), Schodde & Mason (1999), Stattersfield & Capper (2000), Zann (1996).

86. **Red-eared Firetail**

Stagonopleura oculata

French: Diamant oculé **German**: Rotohramadine **Spanish**: Diamante Orejirrojo
Other common names: Red-eared Finch/Firetail-finch

Taxonomy. *Fringilla oculata* Quoy and Gaimard, 1830, King George Sound, Western Australia.
Present species and *S. bella* have sometimes been placed in a separate genus, *Zonaeginthus*. Monotypic.
Distribution. SW Western Australia from Darling Range S to Manjimup and Pemberton, and E along coast to Cape Le Grand National Park and Israelite Bay.



Descriptive notes. 12 cm; 12–14 g. Male has lores and very narrow area around eye black, bright red patch on ear-coverts; rest of head and upperparts olive-brown to brownish-grey with thin blackish bars (bars less distinct on head), rump and uppertail-coverts bright red, tail grey-brown to grey with blackish barring, outer webs of central rectrices have some red near base; throat to breast buff with dark brown scallops, rest of underparts black with large white spots; iris dark brown, prominent eyering pale blue to pale green; bill red; legs pink. Female is like male, but black on lores less extensive, ear patch duller red. Juvenile is brown with thin black bars above, rump and uppertail-coverts red, face brown, throat and underparts buff with brown scallop markings, forming broken bars. Voice. Calls include loud contact or identity call, "oowee", rising in pitch, given by both sexes (female's with wavering quality), repeated until mate responds; "twit-twit" nest call given when bird approaches nest, and its mate in nest returns call. Song "oooweee ü ü ü ü ü", given when in search of a nesting site.
Habitat. Dense shrubby vegetation in cool, wet evergreen forest, especially with jarrah (*Eucalyptus marginata*) and karri (*Eucalyptus diversicolor*), also coastal heath (*Hakea*), paperbark (*Melaleuca*) woodlands, thickets and sclerophyll woodland.
Food and Feeding. Seeds of grasses, including *Lepidosperma*, seeds of casuarina (*Casuarina*); small insects, some spiders (Araneae). Feeds in trees or shrubs, occasionally on ground. Perches on low or fallen branches, pulling seedheads towards itself and holding them under a foot while taking seeds; picks insects from foliage. Exploits the grasses that grow and seed after a forest fire. Forages singly and in pairs, also in family parties.
Breeding. Season Aug–Nov, in good years also Mar–May. Territorial; breeding pair will not tolerate another pair within 100 m. In courtship, male calls as he holds a long piece of grass in bill, when female arrives he jumps back and forth between two branches, his grass swinging from side to side, and jumps until he lands near female, then perches erect, plumage (especially that of belly) fluffed, bill up, and springs up and down like bouncing ball; female quivers tail, male drops grass and pair copulates. Nest a large, bulky, rough oval structure with long entrance spout 30–40 cm, built with green stems and tips, lined with fine grass, plant down and feathers, placed well above ground (as high as 16 m) in shrub or at end of leafy branch. Clutch 3–6 eggs; incubation period 14 days; nestling skin pale pinkish or yellowish, with whitish down, gape swellings conspicuous, white, each with inner black spot, palate pinkish with laterally elongated medial black spot, two long lateral black spots and two small black spots behind them, the five spots joined by a dark line in a diamond-shape (open posteriorly), behind this a pair of contrasting white swellings extending backwards (and lateral to black spots inside upper gape swelling), with whitish curved transverse ridge in mid-line (as in *S. guttata*), tongue has two spots and a black sublingual crescent; chicks fed by both parents, nestling period 21–24 days; young independent 7–9 days after fledging.

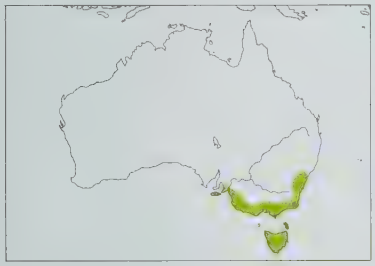
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Southwest Australia EBA. Uncommon. Extensive clearing of native vegetation in the past led to range contraction around coastal and near-coastal swamps and rivers; for example, was present in Perth area (on Swan R plain) in 19th century, but only a handful of records there in 20th century. In more recent decades, this species is adversely affected by replacement of native jarrah forest with plantations of exotic pines (*Pinus*); also, breeding disrupted by bauxite-mining in forests. Although forest habitats sometimes threatened by fire, this species is able to benefit from the subsequent growth of grasses in burnt areas.
Bibliography. Anon. (2008g), Christensen *et al.* (1985), Goodwin (1982), Higgins *et al.* (2006), Immelmann (1960, 1965a, 1982), Kunkel (1959), Landolt *et al.* (1975), Mitchell (1987), Myers (1987, 1992, 1994), Nichols *et al.* (1982), Nicolai & Steinbacher (2001), Pepper (1964), Pizzey (1980), Schodde & Mason (1999), Warham (1954).

87. Beautiful Firetail

Stagonopleura bella

French: Diamant queue-de-feu **German**: Feuerschwanzamadine **Spanish**: Diamante Hermoso
Other common names: Beautiful Firetail-Finch, Tasmanian Waxbill

Taxonomy. *Loxia bella* Latham, 1801, Sydney, New South Wales, Australia.
Present species and *S. oculata* have sometimes been placed in a separate genus, *Zonaeginthus*. In South Australia, proposed races *samueli* (from Kangaroo I) and *interposita* (described from Big Heath Conservation Park, in Naracoorte) appear to exhibit no constant differences from birds elsewhere in species' range. Treated as monotypic.
Distribution. SE South Australia (E from S Mt Lofty Ranges and Kangaroo I) E to S Victoria and SE New South Wales (E from E slope of Great Divide, S from Mulbring area), Flinders I and Tasmania.



Descriptive notes. 11 cm; 11–16 g. Male has lores and narrow area around eye black, ear-coverts and cheek brownish-buff with faint dark barring, brownish-buff extending onto throat and upper chest; top of head and upperparts finely barred olive-brown and black, rump and uppertail-coverts red, tail dark-barred olive-brown, red bases of central rectrices; flight-feathers dark greyish-brown; throat and underparts whitish with black bars, bars fine on throat and becoming coarse on upper belly and flanks, centre of belly and undertail-coverts black; iris dark brown, eyering pale blue to pale green; bill red; legs pink. Female is like male, but more extensive buff area on face extends to breast, and below only undertail-coverts blackish. Juvenile is brown with fine bars above, indistinct black on lores, cheek olive-brown, buffy white with fine brown barring below, barring finer on throat and breast and broader on belly and undertail-coverts, bill black; bill begins to turn red 20 days after fledging. Voice. Contact or identity call a mournful "weee", pitch rising and then levelling off; another call starts with 2 or 3 high notes and ends in downward run, "tee, tee, te, te, te, te". Male utters "uuuuiiii" call during courtship. Song a drawn-out whistled "pee-oo, pee-oo, pee-oo".
Habitat. Shrubland and woodland in mesic tablelands, SE coastal heath, favouring areas with casuarinas (*Casuarina*), tea-trees (*Leptospermum*), paperbarks (*Melaleuca*), river redgum (*Eucalyptus camaldulensis*) of Murray R, also gardens and thick undergrowth; lowlands to 1500 m.
Food and Feeding. Grass seeds, seeds of trees and shrubs; also small insects, and small snails (Gastropoda). Feeds low among vegetation and on ground; conceals itself in grass. Forages generally in small flocks of 3–12 individuals, including in family parties, and during breeding season also in pairs; at times forages also solitarily, e.g. in South Australia. Sometimes associates with *Neochmia temporalis*.
Breeding. Season Sept–Jan. Male begins courtship display by holding stem of grass in bill and giving soft call, and in courtship he bows to female; displays thought to be like those of *S. oculata*. Nest a large, bulky, roughly oval structure with entrance spout of 30–40 cm long, built with dry and green stems and tips, lined with fine grass, plant down and feathers, placed 2–7 m above ground in tree or bush, including paperbark, *Myoporum* and banksias (*Banksia*). Clutch 4–5 eggs, rarely 6–8; incubation period 14–16 days; nestling skin pale pinkish or yellowish, with whitish down, gape swellings conspicuous, white, each with inner black spot, palate pinkish with laterally elongated medial black spot, two lateral black spots and two small black spots behind them, the five spots joined by dark line that forms an open diamond, behind it a pair of contrasting white swellings rise in high relief and extend backwards and laterally to the black spots inside upper gape swelling, and a whitish curved transverse ridge in mid-line (as in *S. guttata*), anterior mouth has two parallel lines, tongue with two spots, black sublingual crescent; nestling period 25–27 days (longer than that of most estrildids); young begin to feed themselves 3 days after leaving nest, independent 7–9 days after fledging.
Movements. Resident; outside breeding season wanders locally.
Status and Conservation. Not globally threatened. Rare or scarce to locally not uncommon. Probably commonest in Tasmania, where density of 0.04–0.1 birds/ha recorded near Woodsdale. Has declined in many areas, especially near cities and towns, this due largely to expansion of urbanization and clearance and fragmentation of habitat. Although full protected by law, this species, said to have been very popular as a cagebird, was formerly trapped in fairly large numbers, and this has been cited as a cause of some local population declines; it is still occasionally trapped illegally.
Bibliography. Goodwin (1982), Higgins *et al.* (2006), Hofmann & Mettke (1995), Hofmann & Mettke-Hofmann (1996), Immelmann (1965a, 1982), Kunkel (1959), Mettke-Hofmann & Hofmann (1996), Mitchell (1987), Myers (1987, 1994), Nicolai & Steinbacher (2001), North (1909), O'Gorman (1984a, 1984b), Palmer (2005), Pizzey (1980), Schodde & Mason (1999).

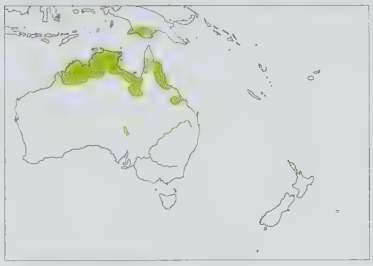
Genus *NEOCHMIA* G. R. Gray, 1849

88. Crimson Finch

Neochmia phaeton

French: Diamant phaéton **German**: Sonnenastrild **Spanish**: Diamante Escarlata
Other common names: Blood/Red-tailed/Red-faced Finch, Australian Firefinch; Common Crimson Finch (*phaeton*); Pale/White-bellied Crimson Finch (*evangelinae*)

Taxonomy. *Fringilla phaeton* Hombron and Jacquinot, 1841, Raffles Bay, Northern Territory, Australia.
Proposed race *albiventer* (described from Claudie R, in NE Queensland) treated as a synonym of *evangelinae*. Two subspecies recognized.
Subspecies and Distribution.
N. p. evangelinae D'Albertis & Salvadori, 1879 – S New Guinea (Trans-Fly region) and extreme NE Australia (S to C Cape York Peninsula).
N. p. phaeton (Hombron & Jacquinot, 1841) – N Western Australia (Kimberley Division), N Northern Territory and NW, NE & E Queensland.



Descriptive notes. 13 cm; 10 g. Male nominate race has forecrown dark grey fading to lighter brownish-grey on upper mantle and side of neck, rest of upperparts red to crimson, with variable amount visible of sandy or grey-brown bases and fringes, less or no red on primaries and on lower back, entirely red on rump and uppertail-coverts, tail red, all but central rectrices with dull brownish grey inner webs; face, throat and breast red, flanks red with small white spots, belly and undertail-coverts black; iris brown, eyering red; bill red with pale pink to pale bluish band on base, usually narrower and less noticeable on upper mandible (around nostrils); legs reddish grey to orange-yellow or fleshy-yellow. Female is similar to male above, also has face and throat red, but upper breast and flanks grey, flanks with white spots, belly to undertail-coverts whitish. Juvenile is brown above, with reddish feather edges on wing-coverts and back, rump, and uppertail-coverts, flight-feathers and tail feathers mostly red, throat and underparts buff, eyering grey, bill black. Race *evangelinae* male is slightly paler than nominate, differs further in having upper belly to undertail-coverts white or whitish, not black. Voice. Contact call or flight call a brisk, descending "tsee-tsee-tsee-tsee-tsee" or "che-che-che-che"; alarm call a sharp "chip" or "pit". Song a series of low rasping notes, "ra-ra, ra-ra, reee", ending with melodious descending treble note.
Habitat. Semi-arid country near dense grass or trees and shrubs. In New Guinea, bamboo, marshy grasslands and tall lake-edge grasses. In Australia, found in *Pandanus* palms, canegrass and bamboo in Northern Territory; at Mornington Wildlife Sanctuary, in Western Australia, occupies riparian zone, where it nests in *Pandanus* palms, and forages in grassy savanna; in Cape York Peninsula, in N Queensland, found in swampy grasslands with scattered *Pandanus* and tall grass along watercourses.
Food and Feeding. Seeds of grasses, including *Panicum* and *Themeda*, *Chrysopogon elongatus* and *Tridax procumbens*, also seeds of herbs (e.g. *Hibiscus*); also spiders (Araneae), and termites (Isoptera) and other insects, and lerp produced by Psyllidae; also takes green algae from shallow water. Nestling diet half-ripe seeds, small insects and spiders. Forages mostly in vegetation and on ground; takes grass seeds from ground, and from seedheads while clinging to tall stems; takes invertebrates from foliage of *Pandanus* and *Corypha* palms, and takes lerp from canopy foliage. Catches termite alates in flight. Forages in pairs and in small groups, occasionally in larger flocks of up to 50 individuals; sometimes with other estrildids, e.g. *N. ruficauda* and *Lonchura castaneothorax*.
Breeding. Breeds in latter half of dry season to late wet season, Sept, Nov–Dec and Feb, and birds with nesting material seen in Mar and Apr, in New Guinea; in Australia in wet months, Dec–Sept (mostly Jan–Apr) in Kimberley Division and as early as Sept or Oct in Queensland. Male carries grass stem or leaf in bill, perches near female and courts in a mostly horizontal stance, male and female parallel to each other, each twisting head and tail towards partner, male fluffs feathers on head, bobs up and down (feet leaving perch), then drops the grass, and pair copulates; when searching for nest-site, partners bow with head and tail twisted towards each other, bodies nearly touching, they call, male flies off and returns with first grass to build nest. Nest a bulky covered structure with side entrance, made from grass and strips of bark, loosely woven, lined with fine grass, seeding heads of sedge and feathers, built 3–16 m above ground in fronds of *Pandanus* palms from flood debris, or in grass tussock or behind a piece of bark or against a house. Clutch 4–6 eggs; female begins incubation with fourth egg, incubation period c. 14 days; hatchling pale, with grey down, skin changes from flesh-colour to nearly black by day 4, gape has yellowish-white swollen corners with large black spots on oral surfaces of swellings, palate creamy yellow with three black spots and two small spots behind (palate bright yellow around posterior spots), tongue with two black spots or black bar and with black crescent below; chicks fed by both parents, nestling period 20–22 days; young independent in 2 weeks.
Movements. Resident; some local movements.
Status and Conservation. Not globally threatened. Fairly common in New Guinea. Locally common in Western Australia and Northern Territory; less widespread and less numerous in Queensland. In Cape York Peninsula, race *evangelinae* considered "endangered" regionally, with estimated population of c. 2000 individuals. In Northern Territory, recorded densities of 0·08–2·64 birds/ha in Howards Peninsula. Adverse factors include overgrazing by livestock and habitat degradation caused by invasive rubber vine (*Cryptostegia grandiflora*); also fires, which can lead to extensive habitat damage in riparian habitats.
Bibliography. Anon. (2008g), Barrett *et al.* (2003), Burkard (1989), Coates (1990), Evans & Bougher (1986), Garnett & Crowley (2000), Goodwin (1982), Hall (1974), Higgins *et al.* (2006), Hofmann & Mettke-Hofmann (1996), Immelmann (1965a), Mayr & Rand (1937), Milenkaya (2010), Mitchell (1962), Morris (1958), Nelf (1981b), Nicolai & Steinbacher (2001), North (1909), Rand (1942), Schodde & Mason (1999), Storr (1977, 1980), Todd (2002), Todd *et al.* (2003).

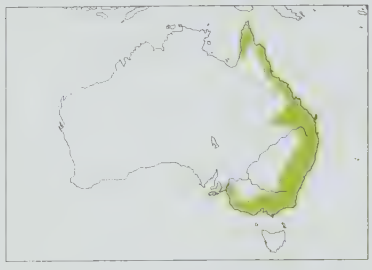
89. Red-browed Finch

Neochmia temporalis

French: Diamant à cinq couleurs **German**: Dornastrild **Spanish**: Diamante Cejirrojo
Other common names: Red-browed Firetail/Waxbill, Sydney/Australian Waxbill, Sydney Firetail

Taxonomy. *Fringilla temporalis* Latham, 1801, "New Holland" =Sydney, New South Wales, Australia.
Often placed in a monotypic genus, *Aegintha*, but appears to be closely related to *N. phaeton*. Nominate race and *minor* intergrade in E Queensland (from S of Cooktown S to Atherton Tableland). Proposed race *loftyi* (described from Mt Lofty, in South Australia) is synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.
N. t. minor (A. J. Campbell, 1901) – NE Queensland (Cape York Peninsula S to Atherton Tableland).
N. t. temporalis (Latham, 1801) – coastal Queensland (from S of Cooktown) S, inland to W slopes of Great Dividing Range, to Victoria and South Australia (W to Mt Lofty Ranges and Kangaroo I). Introduced (nominate race) in SW Western Australia (Darling Range) and in French Polynesia (Tahiti, Moorea, Fiji, Marquesas Is).



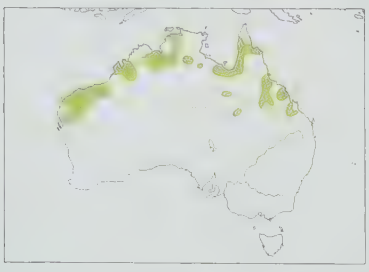
Descriptive notes. 11·5 cm; 8·4–14·6 g. Nominate race has crown and nape grey, broad red stripe above eye from lores to above ear-coverts, greenish-yellow patch on lower side of neck; mantle, back and upperwing olive-green, rump and uppertail-coverts red, tail dull black; throat whitish, face and breast to upper belly grey, lower belly and undertail-coverts pale grey; iris brown to reddish-brown, eyering grey; bill red, with black area on underside of lower mandible, and usually triangular black patch on culmen; legs fleshy-pink to orange-yellow or yellowish-brown. Sexes alike. Juvenile lacks red on head, is dark grey-green above, dull red on rump, greyish with faint olive tinge below, bill black, iris dark brown. Race *minor* is paler and brighter than nominate, side of head paler than top of head, sexes differ, undertail-coverts black on male, dark grey on female. Voice. Call a high-pitched piercing "ssitt-ssitt" or "ssee-ssee"; song in courtship or in solitary context a rhythmic repetition of these call notes.
Habitat. Open forest, woodland, mangroves, swamps, orchards and gardens, parks in towns and cities; near water.
Food and Feeding. Small seeds of grasses and weeds; also seeds of fruit and berries, occasionally small insects. Nestling diet initially insects, older nestlings fed with small de-husked grass seeds. Feeds on ground and in low vegetation; takes seeds from the ground or from stems. Insects taken also in flight. Forages in pairs, more commonly in small and medium-sized flocks of up top c. 30 individuals, and outside breeding season often in larger gatherings (up to 200 individuals). Often associates with other species, commonly in mixed flocks with other estrildids, e.g. *Erythrura trichroa* and *Stagonopleura guttata*, and with introduced fringillids; sometimes with other seed-eaters and insectivores.
Breeding. Recorded in all months: seasonal, Dec–Apr, in tropical N Australia, Jul–Aug in New South Wales (near Sydney) and Oct–Nov in temperate SE Australia; Jul–Mar in SW Western Australia (introduced). Solitary; some active nests within 1 m of each other. Courting male holds a long stem in bill, moves to side of mate and, parallel with her, begins to sing and dance, body erect, legs stretched, head held back, bill pointed skywards; in a bob display, feet leave perch, head held down and twisted towards female; in another display, body horizontal, beak pointed upwards, he sings and wipes the bill, holds tail up, and rocks body up and down. Nest retort-shaped, with short entrance tunnel, made from long, thin and stiff pieces of green grass or dry grass and sometimes strips of bark, inner wall of shorter and soft grass-heads and seedheads, lined with feathers, fur and thistle down, built 1–10 m above ground in dense and thorny shrub. Clutch 4–6 eggs; incubation period 13–15 days; nestling skin flesh-coloured, with sparse bluish down, gape has grossly swollen white corners with two large black spots on medial surface, palate has three elongate spots in front and two small spots behind, tongue has dark bar and under it a black crescent; chicks fed by both parents, nestling period 21 days; young beg from parents for a further 2–3 weeks.
Movements. Mainly resident. Some seasonal differences at some localities, with local movement outside breeding season; longest distance of ringing recovery 42 km.
Status and Conservation. Not globally threatened. Common to locally common. Recorded densities of 0·02–0·11 birds/ha in Queensland, 0·08–2 birds/ha in New South Wales, and 0·29–3·41 birds/ha in Victoria; in Victoria, also means of up to 4·41 birds/km along 600-m transects. Has expanded range in S New South Wales; in Western Australia, where first introduced apparently in late 1950s, has exhibited slow expansion of range.
Bibliography. Barrett *et al.* (2003), Dell (1965), Goodwin (1982), Higgins *et al.* (2006), Hofmann & Mettke (1995), Immelmann (1962b, 1965a), McCarthy (2006), Morris (1958), Nicolai & Steinbacher (2001), North (1909), Pajian (1994), Pizzey (1980), Pratt *et al.* (1987), Schodde & Mason (1999), Serventy & Whittell (1976), Steiner (1960).

90. Star Finch

Neochmia ruficauda

French: Diamant à queue rousse **German**: Binsenastrild **Spanish**: Diamante Colirrojo
Other common names: Red-tailed/Red-faced Finch, Rufous-tailed/Red-faced Grassfinch

Taxonomy. *Amadina ruficauda* Gould, 1837, "New Holland" = interior of New South Wales, Australia.
Sometimes placed in a monotypic genus, *Bathilda*. Proposed race *subclarescens* (described from Parry Creek, in NE Western Australia) appears to exhibit no constant differences from *clarescens*, and is synonymized with latter. Two subspecies recognized.
Subspecies and Distribution.
N. r. clarescens (E. J. O. Hartert, 1899) – N Western Australia (S to Gascoyne R and lower Fitzroy drainage) E to N Northern Territory (S to middle Victoria R and middle McArthur R) and N Queensland (Gulf of Carpenteria and Cape York Peninsula).
N. r. ruficauda (Gould, 1837) – WC & coastal E Queensland.



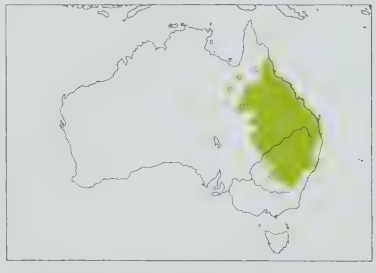
Descriptive notes. 11·5 cm; 8·5–13·8 g (*clarescens*). Male nominate race has forecrown, lores and face to upper throat red, white dots above eye and on cheek; rear crown and nape grey, back to rump and wing olive-grey or dull brownish-olive, longer uppertail-coverts with contrasting pale pink to whitish subterminal spots, rest of each feather purplish maroon or pinkish maroon, the same colour extending on central rectrices and part of outer edges of lateral rectrices, outer pairs drabber; breast and flanks olive-grey with white spots (3–3·5 mm broad), central belly pale yellowish to greenish-white, undertail-coverts whitish; iris orange to pale red, orbital ring orange-olive to red; bill red; legs orange-yellow. Female similar but with less red on head, usually not extending beyond forehead or upper chin. Juvenile is olive-green above, buff to whitish below, no red on face, no spots on underparts, iris yellowish-brown, bill black. Race *clarescens* differs from nominate in having more red on head (extending to crown and upper throat), brighter, paler and more yellowish-olive on upperparts, lower throat, breast and flanks mid-olive with smaller white spots (1–2 mm broad), rest of underparts pale yellow, becoming whitish on vent, female with red of head paler and restricted to anterior forehead, lores and anterior ear-coverts (and often chin), upper breast and flanks pale olive-grey, lower breast to belly and undertail-coverts pale yellowish-cream. Voice. Call a loud or penetrating "ssit" or "seet"; also a contact call, "tlit" or "psit", and rapid high-pitched rattle as alarm or excitement call. Song a short and quiet series of notes.
Habitat. Damp grassland and sedge (Cyperaceae) areas with scattered shrubs or trees, tall grass and rushes (Juncaceae) in swamps and watercourses, sandflats, rice and sugar-cane fields, also unburnt islands of grass and saltbrush on tidal saltpans; occurs also in grassy, open savanna-type sclerophyll woodland.
Food and Feeding. Grass seeds; also insects and other small invertebrates. Takes half-ripe and ripening grains of annual grasses, especially sorghum (*Sorghum*), also *Triodia*, *Echinochloa colonum*, *Iseilema*, *Chloris virgata*, *Chloris barbata*, *Brachyachne convergens*; on tidal saltpans, seeds of *Xerochloa imberbis*; at peak and end of dry season takes dry seeds from bare ground, and inland in wet season consumes fresh seeds of tall perennial grasses. Captures insects on the wing and gleans them from leaves and grasses; more insectivorous than are other grassfinches. Forages primarily in small groups, occasionally in larger flocks of c. 30 individuals; in non-breeding season, often associates in mixed flocks with *Taeniopygia castanotis*, *Lonchura flaviprymna* and *Lonchura castaneothorax*.
Breeding. Breeds immediately before and during wet months; eggs recorded in Feb–May and Sept, and nestlings in May–Jun and Aug. Nests in loose colonies, often with other estrildids. Courting bird holds long piece of grass in bill, both male and female sometimes making flight display with grass; on perch, male approaches female, tail angled towards her, erects the spotted feathers of face, breast and flanks, enlarging red face mask, sings, and bobs up and down, turning body from one side to other as he does so, and hops up and down (feet often leaving perch with upward movement), and later in display sequence he makes deep bows to her and sings; male holds grass in bill until he mounts, or he drops it in final stage of display. Nest covered, with side entrance, made from dry coarse grass or green and stiff grass stems, thickly lined with feathers, placed 3–6 m above ground in small bush or tree, or in tussocks of grass near ground. Clutch 3–6 eggs; incubation period 12–15 days; nestling skin pale pink, with sparse whitish down on back, gape has slightly swollen white flanges, bordered black and lined black inside mouth, palate yellowish-white with bar of black and two small spots behind it, raised ridge behind bar and around spots, black ring around tongue and a crescent under it; nestling period 21 days. Male song and display begin soon after development of adult plumage, at c. 4–6 months.
Movements. Resident. Local dispersal, with sporadic and irregular occurrence, and short-term absence from more regular sites; ringing recoveries to 10–15 km.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Locally common to rare. Estimated global population c. 205,000 breeding individuals, of which nominate race no more than 50 individuals. Population decreasing except in irrigated areas of Northern Territory. Nominate race formerly extended S to NE New South Wales. In Queensland, nominate race now listed as regionally "endangered", and estimated population possibly fewer than 50 individuals; no definite records since 1994, and possibly extinct. Main threat is habitat degradation caused by overgrazing and trampling by livestock; other threats include predation by feral cats, introduced foxes (*Vulpes*), invasive weeds, and cyanide contaminants in mining operations. Much more common race *clarescens* is declining; in Western Australia it is patchily distributed in Pilbara and lower Fitzroy R valley, but is still common at Kununurra (in association with Ord River Irrigation Scheme), and in Northern Territory it is common in Victoria R area; although decline in density particularly noticeable in NW Queensland, this race has an apparently stable population of c. 5000 individuals on Cape York Peninsula. Main threat to *clarescens* probably overgrazing of grasslands near water by livestock, which results in removal of both cover and food sources; invasion of grasslands occupied by this race by woody plants, e.g. *Melaleuca* species, is continuing at rate of c. 10% per decade, this probably facilitated also by cattle grazing and altered fire regimes.
Bibliography. Anon. (2008f, 2008g), Barrett *et al.* (2003), Beckham (2009), Butchart & Stattersfield (2004), Garnett *et al.* (2005), Goodwin (1982), Hall (1974), Higgins *et al.* (2006), Holmes (1998), Immelmann (1962b, 1965a), McCarthy (2006), Nicolai & Steinbacher (2001), North (1909), Pizzey (1980), Puschner (2002b), Schodde & Mason (1999), Serventy & Whittell (1976), Sperl (1996), Stattersfield & Capper (2000), Steiner (1960), Storr (1973, 1980, 1984a, 1984b), Todd *et al.* (2003).

91. Plum-headed Finch

Neochmia modesta

French: Diamant modeste **German**: Zeresastrild **Spanish**: Diamante Modesto
Other common names: Cherry/Diadem Finch, Plum-capped Finch, Modest Grassfinch

Taxonomy. *Amadina modesta* Gould, 1837, "New Holland" = interior of New South Wales, Australia.
Often placed in a monotypic genus, *Aidemosyne*, but recent studies of mitochondrial phylogeny indicate close relationship with *N. temporalis* and *N. ruficauda*. Monotypic.
Distribution. E Queensland S to E New South Wales, in E Australia.



Descriptive notes. 11 cm; 11·5–13·8 g. Male has forehead and crown dark reddish-brown (plum-coloured), nape to back and upperwing brown, rump and uppertail-coverts barred brown and white, upperwing-coverts with white spots (forming double wingbar), inner secondaries and tertials tipped white, tail black with pointed central feathers and white tips of outer feathers; lores blackish-purple, face white, brown bars on ear-coverts and side of neck; small bib blackish-purple, throat, breast and flanks white with brown bars, middle belly to undertail-coverts white; iris dark brown, orbital ring blackish; bill blackish with pale bluish to whitish-horn triangle at base of lower mandible; legs pinkish-grey. Female is similar to male, but dark cap smaller, eyebrow and chin white. Juvenile is paler than adult, with pale double wingbar, diffusely barred breast and flanks, bill black. Voice. Call a single "tlip" or "tyeet", sometimes as a double note; alarm a sharp "tyait". Song begins with quiet high-pitched chirps, followed by gargling notes that become louder, and ends with flute-like notes.
Habitat. Open woodland, scrub and thickets, tall grass and reeds along watercourses, also gardens and orchards; occurs in grassy interior, generally not on coastal plains.

Food and Feeding. Grass seeds, also small seeds of other annual plants; also some invertebrates. Feeds on the ground, and also while perched on stems of seeding plants. Forages in pairs and in small groups of up to 30–40 or more individuals, in non-breeding season in larger flocks occasionally of up to c. 200; frequently mixes with *Taeniopygia bichenovii*, *Taeniopygia castanotis* and *Stagonopleura guttata*.

Breeding. Season mainly Sept–Jan, in Queensland Aug–Apr; nestlings as late as Apr in New South Wales. Courting male carries grass in bill, perches upright, belly and some head feathers slightly fluffed, bill horizontal or pointed slightly down, tail towards female, he bobs up and down, extending and flexing legs, after several bobs drops the grass and sings (bill wide open and pointed down); variations include display without the grass, and song without open bill; displays vary with presence and interest of a female. Nest one of smallest of all grassfinch nests, a covered oval structure with small entrance hole on one side (no tunnel), built from grass, often grasses growing near nest-site, which it bends and weaves into the structure, chamber lined with grass or feathers, placed low down, usually within 1 m of ground, in grass or in bush. Clutch 3–5 eggs; incubation period 12 days; nestling skin pink, naked or with sparse whitish down on back, gape-flanges slightly swollen and light blue (with age, changing to white), bordered on face with black and inside mouth with two black bars, palate pale with transverse bar and two black spots behind it, white raised ridge and ring around the spots, tongue with black ring open on dorsal surface, mouth cavity pale pink (mouth like that of *N. ruficauda*); nestling period 21 days; young feed themselves 2 weeks after fledging. In captivity, first breeds from 9 months of age.

Movements. Resident and seasonally dispersive. In S limit of range appears mainly in summer, and vagrant W of usual range.

Status and Conservation. Not globally threatened. Locally common to scarce; occasionally very common at particular localities. Formerly more widespread and numerous in SE Queensland. Was previously trapped for trade in Queensland, e.g. in 1971 altogether some 5000 finches were sent thence to New South Wales, where they were offered for sale in shops for 90 cents each; trapping ceased in 1972.

Bibliography. Barrett *et al.* (2003), Beckham (2009), Goodwin (1982), Hall (1962), Harrison (1964b), Higgins *et al.* (2006), Immelmann (1962b, 1965a), McCarthy (2006), North (1909), Schodde & Mason (1999), Schwanke (1997), Steiner (1960).



PLATE 25

inches 2
cm 5

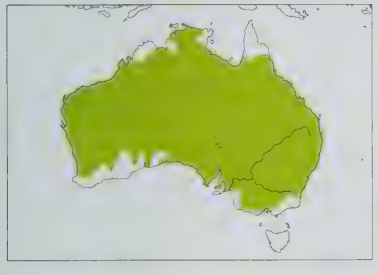
Genus *TAENIOPYGIA* Reichenbach, 1863

92. **Australian Zebra Finch**

Taeniopygia castanotis

French: Mandarin d'Australie **Spanish**: Diamante Cebra Australiano
German: Australzebraamadine
Other common names: Chestnut-eared/Spot(ted)-sided Finch

Taxonomy. *Amadina castanotis* Gould, 1837, interior of New South Wales, Australia.
Genus sometimes subsumed in *Poephila*. Formerly considered conspecific with *T. guttata*, and each is the other's closest relative, but they differ in plumage, size and songs and, when kept together in an aviary, each pairs with its own species; isolated individuals interbreed and offspring produced are fertile (unlike hybrids between this and other estrildids). Also, the two interbreed when male plumage experimentally painted to look like the other, or when male cross-fostered and imprinted as young; mate choice affected by experience, although cross-fostered individuals usually pair with their own species. Monotypic.
Distribution. Most of mainland Australia.



Descriptive notes. 10·5 cm; 9·4–15·7 g. Male has top of head and upperparts grey, rump white, very long uppertail-coverts black with white bars, almost covering blackish tail; from loral area a teardrop-shaped vertical white patch narrowly margined with black, ear-coverts orange to light chestnut; chin to side of throat and upper breast grey with fine blackish bars, black breastband broad at ends, lower breast to belly and undertail-coverts white, flanks chestnut with white spots; iris dark reddish-orange, eyering grey; bill orange to red or deep red-brown; legs orange to pinkish or flesh-coloured. Female lacks chestnut on ear-coverts, bars and band on underparts and chestnut flanks; bill normally slightly paler orange. Juvenile is like female but paler, white teardrop on face indistinctly bordered black, bill black, turning orange by 35 days, eyering grey, iris dark brown. Voice. Twelve call types described; best known are distance contact call, "nyii nyii", "tia" or "beep", nasal like a toy trumpet, differing between sexes and among individuals, and soft "tet" as contact call when birds moving about. Song composed of nasal call notes and chattering trills, beginning with a few "beep" notes and leading into complex rhythmic song; each male gives song elements and phrases in a set sequence, and these include calls given in other contexts; a male varies the elements and repetitions in groups or "chunks", and songs are characteristic of individual males.
Habitat. Grassland with scattered trees and shrubs, open sclerophyll woodland and open shrublands, generally near fresh water; mostly in arid zone, locally common in semi-arid zone, uncommon in subhumid zone.
Food and Feeding. Half-ripe and ripe seeds of grasses, both native and introduced. Nestling diet almost entirely half-ripe grass seeds, rarely insects, e.g. termites (Isoptera). Takes seeds from stems or from ground, and takes growing tips of grass shoots. Occasionally catches insects in air. Social, foraging in flocks throughout year: in breeding season typically in small to medium-sized flocks, but sometimes in larger gatherings; flocks of 500 or more individuals usually only in non-breeding season. Occasionally mixes with other estrildids. When nesting, regularly travels up to 1 km daily between nest and feeding area; in non-breeding season may travel back and forth many kilometres between feeding sites and surface water.
Breeding. Timing varies with latitude, seasonal temperature and rainfall, begins a month or two after onset of rains (and timed to coincide with fresh growth of grass and development of growing grass seeds): in warm areas where grasses grow and produce seed when it rains, breeding can occur at any time of year; in more temperate areas with warm and cold seasons (where grasses cannot respond in the cold), breeds mainly in warm months Sept/Oct–Apr; in inland C Australia (Alice Springs), did not breed at all during a dry spell lasting for longer than a year, but when rains fell continuously the species bred repeatedly for months on end (after first flush of seeding grasses). Monogamous, with long-lasting pair-bond; female sometimes copulates with a second male, as well as with her social mate (c. 10% of her broods fathered by two males). Usually in loose colonies of up to c. 50 nests, but generally many more adults present (up to c. 230 during breeding season, to 350 in non-breeding season), often several breeding nests in one bush; occasionally solitary. In first stage of courtship, male flies towards female, perches upright with body parallel to her, and in greeting display he adopts horizontal posture, twists head and tail towards mate and bows towards her as he hops and pivots ever closer, she may join in a dance in which partners hop around each other, each keeping head and tail twisted towards the other; in second stage, male perches upright, head erect, and begins a song and dance, he fluffs feathers of belly, flanks and ear-coverts, sings, with legs flexed, swings body from side to side and keeps head toward female as he beams song to her. Male brings nest material and both sexes incorporate it into nest, a bulky and rounded structure with side entrance, made from dry grass, lined with fine, soft material, placed in thorny shrub or tree. Clutch usually 4–6 eggs; female sometimes lays an egg in nest of another pair (13–32% of wild nests); incubation from fourth egg, period 11–14 days; nestling skin pink, with sparse down on head and back, gape white, slightly swollen, constricted in middle, a black line inside swelling, upper line extends forward to bill tip, lower line less than half-way to tip, palate pinkish-white to yellowish-white with three rounded spots and two short arcs behind them, arcs open anteriorly, tongue with two black dorsal spots and below it a black crescent; nestling period 17–18 days; young feed themselves by 35 days after hatching. Juvenile first gives subsong at 28–50 days, and at 80 days of age some sing adult song and breed in the wild.
Movements. Mainly resident, with some seasonal movement; also nomadic, moves about over large region, and movements into new areas occur with rain. Present all year in habitat with plenty of grass seed; in areas with irregular rainfall may be irruptive when conditions suitable for breeding, then disappear in following seasons and years. At one site, only two of 5000 birds ringed were recovered at a distance, both within 6 km of site (where recaptures most likely to occur). Colony-specific distance calls from one region sometimes heard in other nesting areas, providing evidence of breeding dispersal.
Status and Conservation. Not globally threatened. Widespread and common throughout most of mainland Australia; absent in Cape York Peninsula (N Queensland), scarce or absent in Nullarbor Plain and Great Victoria Desert (Western Australia–South Australia), areas lacking surface water or succulent plants as source of dew, and absent in wet areas in extreme coastal E, SE & SW. Densities highly variable, dependent largely on rainfall; e.g. in NE Queensland (Townsville), means of 3·47 birds/ha in wet season and 2·23 birds/ha in dry season in 1980, but in 1997 8·16/ha in wet season and 1·59/ha in dry; in areas of colonies, 0·7–76 active nests/ha. Widely kept as a cagebird.
Bibliography. Balakrishnan & Edwards (2009), Balakrishnan, Clayton & London (2009), Baptista *et al.* (1999), Barrett *et al.* (2003), Beckham (2009), Birkhead, Burke *et al.* (1990), Birkhead, Clarkson & Zann (1988), Birkhead, Hunter & Pellatt (1989), Birkhead, Pellatt & Hunter (1988), Böhner *et al.* (1984), Cambell & Hauber (2010), ten Cate (1982), Clayton (1989, 1990a, 1990b, 1990c, 1990d, 1992), Clayton & Pröve (1989), Clayton *et al.* (1991), Dunn & Zann (1996a, 1996b), Fehrer (1993), Goodwin (1982), Higgins *et al.* (2006), Immelmann (1959, 1962b, 1965a, 1965b, 1968a, 1968b, 1985b), Morton (2009), Nicolai & Steinbacher (2001), North (1909), Pizzey (1980), Riebel (2009), Runciman *et al.* (2005), Schodde & Mason (1999), Serventy & Whittell (1976), Sossinka (1970), Sossinka & Böhner (1980), Warren *et al.* (2010), Zann (1993a, 1993b, 1996, 1997), Zann & Runciman (1994), Zann *et al.* (1995).

93. **Timor Zebra Finch**

Taeniopygia guttata

French: Mandarin de Timor **German**: Timorzebraamadine **Spanish**: Diamante Cebra de Timor
Other common names: Sunda Zebra Finch, Spot(ed)-sided Finch

Taxonomy. *Fringilla guttata* Vieillot, 1817, Timor.
Genus sometimes subsumed in *Poephila*. Formerly considered conspecific with *T. castanotis*, and each is the other's closest relative, but they differ in plumage, size and songs and, when kept together in an aviary, each pairs with its own species; isolated individuals interbreed and offspring produced are fertile (unlike hybrids between this and other estrildids). Also, the two interbreed when male plumage experimentally painted to look like the other, or when male cross-fostered and imprinted as young; mate choice affected by experience, although cross-fostered individuals usually pair with their own species. Monotypic.
Distribution. Lesser Sundas from Lombok and Sumbawa E to Luang and Sermata, S to Sumba, Sawu, Dao, Roti and Timor.



Descriptive notes. 10 cm; 10 g. Male has top of head and upperparts grey, rump white, uppertail-coverts black with white bars, tail blackish; ear-coverts orange to light chestnut, at loral area a teardrop-shaped vertical white patch narrowly margined with black; chin to side of throat and upper breast grey, black breastband tapering at ends, lower breast to belly and undertail-coverts creamy-buff, flanks chestnut with white spots; iris deep reddish-orange, eyering grey; bill orange-red to orange; legs pink. Differs from slightly larger *T. castanotis* mainly in lack of black bars on throat and breast, smaller black breastband tapered (not broad) at ends, creamy-buff (not white) lower underparts. Female lacks chestnut on ear-coverts and flanks, has ear-coverts, breast and flanks unmarked grey (little or no breastband); bill orange-red to orange, normally paler than in male. Juvenile is like female but paler, white teardrop indistinctly bordered black, bill black. Voice. Loud distance call "beep", higher in pitch (loud band 2·4 kHz) than that of *T. castanotis* (1·2 kHz). Song a chattering trill, longer than song of *T. castanotis*, has longer elements and more elements in a repeating phrase, and is faster and higher in pitch.
Habitat. Grassland with scattered shrubs and trees, grassy woodland, dry coastal grassland and cultivated areas, rice fields; low coastal regions, following cultivation and grassland into montane elevations. Sea-level to 2300 m; to 600 m on Lombok and 500 m on Sumbawa.
Food and Feeding. Grass seeds, taken mainly on the ground. Forages singly and in pairs, also in flocks of up to 100 or more individuals.
Breeding. Nest-building in Nov on Timor, and eggs in Mar and Apr on Roti; monsoon rains in these areas bring new cycle of ripening grass seeds in c. Dec–May. In courtship, male perches upright, head erect, fluffs feathers of forehead, belly and flanks, swings body from side to side and keeps head towards female as he sings; display similar to that of *T. castanotis*, but posture more upright and forehead feathers (not those of back of head, as in *T. castanotis*) are raised. Little other information: nesting apparently similar to that of *T. castanotis*, and nestling skin colour, natal down and mouth like those of latter; young independent at 40 days.
Movements. Little information; evidently locally nomadic. One record from Bali.
Status and Conservation. Not globally threatened. Locally common to uncommon. Occurs throughout most of Lesser Sundas, from Lombok E to Sermata, including smaller islands of Padar and Paloe (off Flores), Sawu, Dao, Roti and Simau (all between Sumba and Timor) and, in E of range, Kisar, Leti, Moa, Luang and Sermata. Very common on Komodo and Flores; locally common on Sumba and Timor, and also, at least formerly, on Kisar, Leti, Moa and Luang; uncommon in rest of range.
Bibliography. Balakrishnan & Edwards (2009), Baptista *et al.* (1999), Beckham (2009), Böhner *et al.* (1984), Clayton (1990a, 1990b, 1990c, 1990d, 1992), Clayton & Pröve (1989), Clayton *et al.* (1991), Coates & Bishop (1997), Fehrer (1993), Goodwin (1982), Mayr (1944), McCarthy (2006), Nicolai & Steinbacher (2001), Price (2008), Noske (2003), Oppenborn (1992), Ullrich (1997), Verheijen (1976), White & Bruce (1986), Zann (1996).

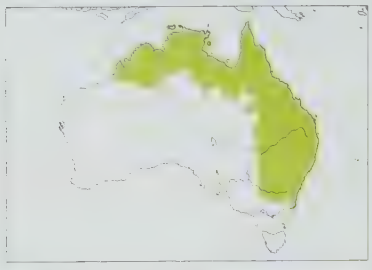
94. **Double-barred Finch**

Taeniopygia bichenovii

French: Diamant de Bicheno **German**: Ringelamadine **Spanish**: Diamante de Bichenov
Other common names: Double-banded Finch, Owl/Bicheno/Banded/Ringed Finch; Black-ringed Finch (*annulosa*)

On following pages: 95. Masked Finch (*Poephila personata*); 96. Long-tailed Finch (*Poephila acuticauda*); 97. Black-throated Finch (*Poephila cincta*); 98. Madagascar Bibfinch (*Lepidopygia nana*); 99. African Silverbill (*Euodice cantans*); 100. Indian Silverbill (*Euodice malabarica*); 101. Grey-headed Silverbill (*Spermestes caniceps*); 102. Bronze Mannikin (*Spermestes cucullata*); 103. Magpie Mannikin (*Spermestes fringilloides*); 104. Black-and-white Mannikin (*Spermestes bicolor*).

Taxonomy. *Fringilla Bichenovii* Vigors and Horsfield, 1827, Shoalwater Bay and Broad Sound, southern Queensland, Australia.
Genus sometimes subsumed in *Poephila*. This species has sometimes been separated in a monotypic genus, *Stizoptera*. Races intergrade in region S of Gulf of Carpenteria, from where most museum specimens are either white-rumped or black-rumped; in breeding experiments with captives, mixed pairs of black-rumped race *annulosa* and white-rumped nominate produced white-rumped offspring, suggesting a single genetic locus with white dominant over black. Two subspecies recognized.
Subspecies and Distribution.
T. b. annulosa (Gould, 1840) – N Western Australia (E from Dampier Land) and N Northern Territory.
T. b. bichenovii (Vigors & Horsfield, 1827) – E Northern Territory (coastal region), N & E Queensland, New South Wales and N Victoria.



Descriptive notes. 10–11 cm; 7–12 g. Nominate race has forehead black, crown to back brown with indistinct blackish bars, rump and uppertail-coverts white, tail black; upperwing black, whitish spots and bars on wing-coverts and inner flight-feathers; face and throat white, ringed with thin black band; breast greyish-white with fine grey barring at side, thin black band across lower breast; belly and flanks creamy white, undertail-coverts black; iris dark brown, eyering brown; bill pale bluish-grey; legs grey. Sexes alike. Juvenile is similar in pattern to adult, but forehead brown, upperparts brownish-buff, wings brown with whitish spots and bars, two bars around face and across breast brownish, bill blackish. Race *annulosa* differs from nominate in having lower back, rump and uppertail-coverts black. Voice. Close contact call a high-pitched "tat, tat"; distance contact call a longer "tiaat tiaat" like sound made by toy trumpet, or plaintive "twoooo-twoooo", female lower-pitched; has high-pitched nest call. Song a series of buzzy contact calls and trills.
Habitat. Grassy woodland and scrubland, open woodland and forest edge, vegetation along watercourses, cane fields, roadsides, wasteland, parks and gardens.
Food and Feeding. Seeds of grasses and other herbs; occasionally insects and their larvae, mainly in breeding season. Takes seeds from ground, and sometimes jumps up to pull seeds from stem heads. Forages singly, in pairs and in small flocks of up to c. 12–14 individuals; sometimes in larger flocks of 50 or more. Sometimes in mixed flocks, often with other finches, mainly *Stagonopleura guttata*, but also *T. castanotis*, *Neochmia temporalis*, *Neochmia modesta*, and others.
Breeding. Breeds during second half of wet season in N Australia; in all months in Queensland, mainly in Jul–Nov/Dec in New South Wales. Male only occasionally performs a stem display; in courtship male hops towards female, feathers of neck, cheeks, breast, flanks and belly fluffed, switches body from side to side, and sings. Nest a ball with side entrance, usually no tunnel (occasionally a short tunnel of less than 5 cm), made from grass, lined with soft grasses or feathers, often placed in bush, sometimes in small tree, palm, or canegrass, or in hole in tree or under roof of shed, and often sited near nest of paper wasps (*Polistes humilis*); sometimes takes over old nests, repairing and relining them. Clutch 3–6 eggs; incubation period 11–12 days; hatchling skin pale pink, turning dark pinkish-grey and black by day 6, short whitish or grey down on head, back, femur and wings, has gape white, slightly swollen, with black medial surface on each flat flange, palate pinkish-white with three laterally elongated black spots and two small black ares in mediolateral position (arcs open towards rear), two black spots on tongue and a black spot below, black sublingual crescent; nestling period 19 days; young independent 21 days after fledging.
Movements. Resident, present throughout year in many areas. Some seasonality of movement N along E Australia coast after breeding; considered a dry-season visitor in NW Queensland, perhaps dispersing or moving locally in response to dry seasons/rainfall in N Australia.
Status and Conservation. Not globally threatened. Common to locally common. Recorded densities of 0·24–0·6 birds/ha in Northern Territory (Howards Peninsula) and 0·49–2·55 birds/ha in Queensland (near Tallegalla); in New South Wales, 0·08 birds/ha near Armidale and 0·2 birds/ha at Hawkesbury R; 0·07–0·67 birds/ha near Canberra. During 20th century expanded its range E in SE Australia, but in later decades declines noted in several E coastal regions of that state; since early 1970s evidence also of range expansion W & SW in New South Wales. In Victoria, recorded only from 1980, with few published records at a few sites in N & NE. Commonly kept as a cagebird.
Bibliography. Baptista & Horblit (1990), Beckham (2009), Goodwin (1982), Hall, B.P. (1974), Hall, M.E. (1962), Higgins *et al.* (2006), Hochmal (2009), Immelmann (1962b, 1965a, 1982), Keast (1958), Kunkel (1959), McCarthy (2006), Mobbs (1986), Morris (1958), Nicolai & Steinbacher (2001), North (1909), Payne (2005a), Pizzey (1980), Schodde & Mason (1999), Schwanke (2002), Storr (1973, 1977, 1984b), Vit (1994).

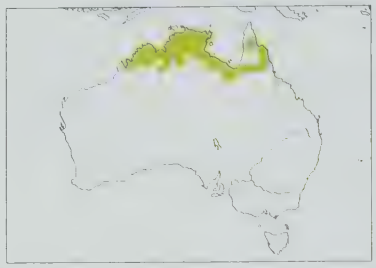
Genus *POEPHILA* Gould, 1842

95. **Masked Finch**

Poephila personata

French: Diamant masqué **German**: Maskenamadine **Spanish**: Diamante Enmascarado
Other common names: Masked Grassfinch; White-eared Grassfinch (*leucotis*)

Taxonomy. *Poephila personata* Gould, 1842, interior from Port Essington = Cobourg Peninsula, Northern Territory, Australia.
Sometimes separated in a monotypic genus, *Neopoephila*. Two subspecies recognized.
Subspecies and Distribution.
P. p. personata Gould, 1842 – Western Australia (from Kimberley Division) E to NW Queensland (SE Gulf of Carpenteria at lower Nicholson R).
P. p. leucotis Gould, 1847 - N Queensland from Cape York Peninsula S to SE Gulf of Carpenteria (lower Norman R) and, in E, to Cairns area.
Descriptive notes. 13 cm; 10·5–17 g. Nominate race has crown to back and upperwing brown, rump and uppertail-coverts white, long pointed tail black; forehead and lores to upper throat black, well demarcated from brown of crown, ear-coverts brown; throat and most of underparts buffy brown, black flank patch, centre of belly and undertail-coverts white; iris warm brown to dark brown, eyering dark grey; bill yellow; legs pink or orange to coral-red. Sexes alike. Juvenile has face mask brown, flanks brownish-grey, bill black. Race *leucotis* differs from nominate in having



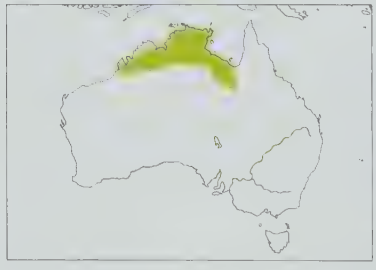
rear ear-coverts to lower throat silvery-white, back redder brown, crown darker than back, narrow black band across lower forehead merging into brown of crown, also smaller in wing, tail and bill. Voice. Distance contact call a loud "tiat"; soft contact call a soft "twat, twat"; nest call high-pitched whining notes; adults have 14 distinct calls given in different social contexts. Song soft, a short burst of nasal notes, given by bird next to mate, at start of courtship and during selection of nest-site. Calls and songs distinct from those of congeners: notes shorter and lower in pitch, notes within a song less phrased into repeated motifs, time between notes shorter, and notes have more complex harmonic structure. Songs differ among local populations, and each male has its own individually distinctive song phrase.
Habitat. Open woodland with good cover of small scrub and grass, on open grassy plains with a few bushes.
Food and Feeding. Grass seeds, both ripe and half-ripe, especially of *Sorghum*; also some invertebrates, especially during breeding season. Nestling diet half-ripe seeds, also insects. Forages mostly on ground, taking seeds from ground in dry season and directly from seedheads in wet season; sometimes captures aerial insects. Gregarious, in small to large flocks; occurs in small flocks throughout year, and in very dry years hundreds and thousands gather together for food and water; regularly associates with *P. acuticauda* in Western Australia and Northern Territory, and in N Queensland forms large foraging flocks with *P. cincta* in dry season.
Breeding. Breeding after end of wet season, Feb–Jun in Western Australia (Kimberley), Nov–Jul in Northern Territory and Apr and Aug in Queensland. Generally in loose colonies, with 20–50 m between nests. A stem display is infrequent; in first phase of courtship, one bird lands within 10 cm of mate, adopts bill-up posture and turns tail and head towards mate, gives deep bow with head down towards mate, the two hop to and fro or around each other, with head-bobs and bill-wipes, turning head and angling tail towards partner; in second stage, male starts courtship dance in upright posture, jerks head upward, neck stretched up and then retracted, as he fluffs and displays black bib (sometimes holds a grass stem in bill in this display), he pivots body from side to side while his feet stay on perch; aspects of behaviour that lead to copulation are a greeting approach flight, hopping to and fro, and song. Nest construction takes several weeks, both male and female bringing material, nest bulky and globular, with side entrance, made with grass, lined with soft plant wool or feathers or fur, and with charcoal, placed in bush or tree, or in grass, or in termitarium in old nesting hole of parrot (Psittacidae) or kingfisher (Alcedinidae). Clutch 4–6 eggs; incubation from fourth egg, both sexes in nest at night, period 13–15 days; nestling skin dark pink with sparse down, gape-flange blue at hatching and white by fledging, black streaks on oral surfaces of gape, palate pale with short black bar in middle (extending a quarter of way to gape) and lateral bar on each side (markings forming broken line of five black bars), pair of black spots behind the three anterior black palate spots, pair of black spots on tongue and black V-mark under tongue; nestling period 20–23 days.
Movements. Resident, with some local movement; a few ringing recoveries at 10–100 km. In dry seasons appears in N coastal regions.
Status and Conservation. Not globally threatened. Widespread in much of N Australia; common to locally common. In N Northern Territory, recorded densities of 0·23 birds/ha at Yinberrie Hills (NW of Katherine) and 0·2 birds/ha at South Alligator R. In the past, was trapped in large numbers for trade, e.g. 1188 exported from Western Australia in 1957–1958 and 609 in first half of 1959; in Kimberley Division, legal trapping ceased in 1986.
Bibliography. Beckham (2009), Higgins *et al.* (2006), Immelmann (1962b, 1965a, 1982), Kirschke (1995), Mayer (1991c), Nicolai & Steinbacher (2001), North (1909), Pizzey (1980), Schodde & Mason (1999), Schwanke (2001), Storr (1977, 1980, 1984b), Tidemann & Woinarski (1994), Zann (1975, 1976a, 1976b, 1977).

96. **Long-tailed Finch**

Poephila acuticauda

French: Diamant à longue queue **German**: Spitzschwanzamadine **Spanish**: Diamante Colilargo
Other common names: Long-tailed Grassfinch, Blackheart/Black-hearted Finch; Heck's Finch/Grassfinch, Red-billed/Orange-billed Finch (*hecki*)

Taxonomy. *Amadina acuticauda* Gould, 1840, King Sound, Western Australia.
Forms a superspecies with *P. cincta*. Race *hecki* sometimes treated as a separate species on basis of morphology (bill colour) and differences in quantitative genetics (although no genetic comparison made of races of other members of genus), and slight differences exist in songs and loud contact calls. Conversely, other authors have questioned whether two races are taxonomically recognizable, as distribution of yellow-billed and orange-billed birds is continuous across N Australia, with intergradation in W Northern Territory (and bill-colour differences do not persist in museum specimens); in addition, the two are similar in courtship behaviour, and in captivity individuals with no prior breeding experience do not mate assortatively. Further study required. Two subspecies currently recognized.
Subspecies and Distribution.
P. a. acuticauda (Gould, 1840) – N Western Australia (Kimberley).
P. a. hecki Heinroth, 1900 – N end of Northern Territory and NW Queensland (S to Mt Isa), in N Australia.



Descriptive notes. 15·5 cm; 10·9–17·2 g (*hecki*). Male nominate race has forehead to nape and face pale bluish-grey, lores black, hindneck buffy brown, mantle, back and upperwing brown, lower back with band of black, rump and uppertail-coverts white, long pointed tail black; chin to upper breast black, lower breast and belly pale buff with pink to salmon tinge, black patch on rear flanks, undertail-coverts white; iris dark brown, eyering grey; bill yellow; legs reddish-pink to orange or coral-red. Female is very like male, but often has slightly less black on breast. Juvenile is paler than adult, throat dark grey, flank patch dark grey, bill black. Race *hecki* differs from nominate in having crown darker grey, belly darker, bill orange to red (plumage paler and bill coral-red in SE of range). Voice. Soft

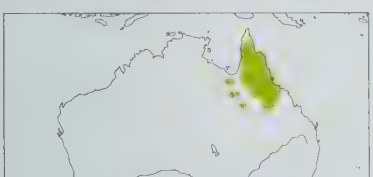
contact call "tet", loud distance contact call a descending "peew" or "we-wooooh", a whistling "thwirr"; alarm a rapid rising "cheek-chee-chee-cheek"; adults have 14 (nominate race) or 15 (*hecki*) distinct calls. Song soft, audible at close range, used in courtship before copulation, consists of short introductory notes, then a series of louder pure notes rising in pitch from first to last, "tu-tu-tu-tu-tu wóó-wáh-wéééé".; harmonics vary with male's distance from a mate.
Habitat. Dry grassy savanna country with watercourses, grassy bushland, and *Pandanus* savanna.
Food and Feeding. Ripe and half-ripe seeds of grasses, especially those of *Sorghum*, *Iseilema*, *Eragrostis* and *Eriachne obtusa*; also adult and larval insects, especially in breeding season. Forages mostly on ground, taking both seeds growing on the stem and those fallen on the ground; captures aerial insects by sally-striking. Forages in pairs and in small flocks of up to c. 20 individuals; often associates with *P. personata*, Hooded Parrots (*Psephotus dissimilis*) and Black-faced Woodswallows (*Artamus cinereus*).
Breeding. Breeds in wet season and post-wet season, eggs recorded in Feb–Nov. Nests in loose colonies, generally no more than one nest in each tree. One record of young male, 4 months after leaving nest, helping its parents in caring for another brood. In courtship display, male holds head up, often with grass in bill, bobs up and down, bending and straightening legs; in second stage of display, he fluffs feathers of head and raises rear feathers of black bib, bobs head and wipes bill. Nest bulky and rounded, with entrance tube, made from grasses, creepers and stems, lined with feathers, plant wool or fine grass (sometimes charcoal placed in nest), built in tree (usually in treetop branches, several metres above ground), bush or creeper, or in clump of grass; will use nestboxes. Clutch 3–6 eggs; incubation 13–14 days; nestling (both races) has skin pink to black, sparse light grey down, gape-flange unswollen bluish-white to white, oral surfaces with elongate black spots outlined in black (between pink skin and whitish gape-flange) and inside mouth lined above and below with a black mark, palate yellowish-white with long narrow black bar, behind this two small black spots connected by black bar on raised whitish ridge, tongue with two spots or a band (perhaps changing with age), and a black V-mark under tongue; nestling period 21 days; young independent 21 days later.
Movements. Resident. Local movements occur, flocks of thousands appearing near water during extended drought; ringing recoveries to 15 km.
Status and Conservation. Not globally threatened. Fairly common to locally common. In N Northern Territory, recorded densities of 0·16–0·24 birds/ha at Howards Peninsula, 0·56 birds/ha at Yinberrie Hills (NW of Katherine) and 0·05 birds/ha at South Alligator R. In the past, large numbers were trapped for trade, e.g. 3968 exported from Western Australia in 1957–1958 and 2403 in first half of 1959; in Kimberley Division, legal trapping ceased in 1986.
Bibliography. Barrett *et al.* (2003), Beckham (2009), Bielfeld (1996, 2008), Cracraft (1986), Goodwin (1982), Hall (1974), Higgins *et al.* (2006), Immelmann (1962b, 1965a, 1982), Jennings & Edwards (2005), Mayer (1985a), Mayr *et al.* (1968), McCarthy (2006), Morris (1958), Nicolai & Steinbacher (2001), North (1909), Payne (2005a), van Rooij & Griffith (2009), Schodde & Mason (1999), Schönborn (1984), Slater (1974), Storr (1977, 1980, 1984b), Tidemann & Woinarski (1994), Zann (1975, 1976a, 1976b, 1977).

97. **Black-throated Finch**

Poephila cincta

French: Diamant à bavette **German**: Gürtelamadine **Spanish**: Diamante Gorjinegro
Other common names: Parson Finch; Black-tailed/Black-rumped/Diggles's Finch (*atropygialis*)

Taxonomy. *Amadina cincta* Gould, 1837, New South Wales, Australia.
Forms a superspecies with *P. acuticauda*. Race *atropygialis* has been considered a distinct species, differing morphologically, but the two forms intergrade over a broad area, are nearly identical in song and display behaviour and, in mixed aviaries, show no tendency for assortative mating; in breeding experiments with captives, black rump colour dominant over white, and in some offspring black rump has some white feathers. Proposed race *nigrotecta* (described from Chester R. in N Cape York Peninsula) is a synonym of *atropygialis*, which varies clinally. Two subspecies recognized.
Subspecies and Distribution.
P. c. atropygialis Diggles, 1876 – NE Queensland (C & S Cape York Peninsula, S to SE Gulf of Carpentaria and upper Mitchell R drainage), in NE Australia.
P. c. cincta (Gould, 1837) – EC Queensland S from Townsille and upper Burdekin R basin.



Descriptive notes. 11 cm; 12·9–17·1 g. Nominate race has forehead and anterior face whitish, grading to grey on crown, ear-coverts and nape, lores black; mantle, back and upperwing buffy brown to cinnamon-brown, darker and duller on wing, lower back with band of black, rump and uppertail-coverts white, short tail black; chin and throat to upper breast black, lower breast and belly rich cinnamon-buff, sometimes paler, black patch on rear flanks, undertail-coverts white; iris dark brown, eyering grey; bill black; legs pink-red or orange to coral-red. Sexes very similar, although female tends to have bib slightly narrower. Juvenile is a dull version of adult, dark grey on throat and rear flanks. Race *atropygialis* tends to be slightly paler than nominate, sandy with salmon-pink tinge, has lower back to uppertail-coverts black. Voice. Short contact call "tet", distance contact call a descending "peew" or whistling "thwirr"; alarm "cha" or "chee-cheek" in rapid bursts; adults have 13 distinct calls. Song soft, audible to only c. 10 m, short introductory notes followed by a series of louder pure notes rising in pitch, with harsher final note. Calls and songs similar to those of *P. acuticauda*, but lower in pitch and less piercing.
Habitat. Open woodland with grass and shrub understorey, along watercourses; sometimes cultivated fields with scattered trees. Nominate race occupies grassy woodland dominated by eucalypts (*Eucalyptus*), paperbarks (*Melaleuca*) or acacias (*Acacia*); *atropygialis* in savannas dominated by eucalypts and paperbarks.
Food and Feeding. Seeds of grasses *Setaria sugens*, *Digitaria ciliaris*, *Stylosanthes humilis* and *Dactyloctenium radians*, also other seeds; also termites (Isoptera) and other small insects, mainly in breeding season. Feeds on ground, taking fallen seeds, and stretching up to take seeds directly from seedhead; also, jumps up to reach seedhead and then pull it down. Forages in small flocks of up to c. 30 individuals, in dry season sometimes in larger flocks containing hundreds of individuals; often associates with other finches, especially *P. personata*.
Breeding. Breeds in all months, mainly Feb–Jun in N and Sept–Jan in C & S parts of range. Nests in loose colonies, with several nests in one tree. In courtship, male holds head up, often with grass stem in bill, bobs up and down, he fluffs head feathers and erects rear feathers of black bib, bobs head and wipes bill; courtship behaviour the same as that of *P. acuticauda*. Nest a ball with side entrance and tunnel, made from grass stems, lined with soft seedheads, plant down or feathers, built in tree, sometimes in hole in tree or termitarium. Clutch usually 4–6 eggs; incubation begins after fourth egg laid, period 12–14 days; nestling skin black, down light grey at 2 days of age, gape-flange whitish with black streaks on oral surfaces, palate whitish with short black transverse bar and behind this a pair of black spots, a pair of black spots on tongue and a black V-mark under tongue; nestling period 21–22 days; young first feed themselves c. 4 days after fledging, independent 2 weeks later.
Movements. Resident; erratic appearance in far S localities suggests some movement.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon to locally common. Has undergone moderately rapid population reduction and range contraction. Formerly found in grassy woodland throughout NE Australia, from Cape York Peninsula S to NE New South Wales. Nominate race declined considerably throughout 20th century and last seen in SE Queensland in 1990s; presumed extinct in New South Wales, where recent searches unsuccessful; rate of decline was believed to be 20% per decade, and this is assumed to be continuing. Since 1980s, reduction in density and range noted also for N race *atropygialis*. Causes of decline of both races evidently linked with spread of pastoralism, changes in seasonality and intensity of fires, and increases in density of weeds in grassy savanna; woodland clearance a problem, but decreases recorded also in uncleared savanna. Decline first evident in S part of range, where sheep grazing dominates and feral rabbits abaundant, and less extreme in N, where woodland-clearing less extensive and cattle dominate; recent substantial range contraction in N coincides with intensification of cattle grazing and change in fire regimes. In the past, trapping for cagebird trade probably led to local extinctions of populations already reduced by other factors. For nominate race, recovery plan has been prepared and habitat conserved near Townsville.
Bibliography. Anon. (2008g, 2009j), Barrett *et al.* (2003), Blakers *et al.* (1984), Butchart & Stattersfield (2004), Cracraft (1986), Ford (1986), Goodwin (1982), Hall (1974), Higgins *et al.* (2006), Immelmann (1962b, 1965a, 1982), Jennings & Edwards (2005), Mayer (1985a, 1994c), McCarthy (2006), Nicolai & Steinbacher (2001), North (1909), Schodde & Mason (1999), Schwanke (2009a), Storr (1984b), Zann (1975, 1976a, 1976b, 1976c, 1977).

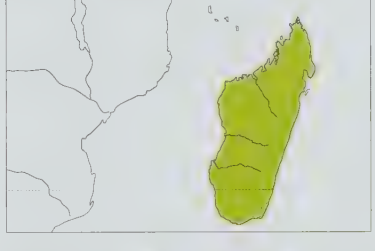
Genus *LEPIDOPYGIA* Reichenbach, 1863

98. **Madagascar Bibfinch**

Lepidopygia nana

French: Capucin de Madagascar **German**: Zwergelsterchen **Spanish**: Capuchino Malgache
Other common names: Madagascar Munia/Mannikin, (African) Bibfinch, African Parsonfinch, Dwarf Mannikin

Taxonomy. *Pyrrhula nana* Pucheran, 1845, Madagascar. *Lemuresthes* was proposed as a replacement for current genus name, which had been thought, erroneously, to be preoccupied. Genus appears close to, and is often subsumed in, *Lonchura*; has sometimes been merged in *Spermestes*, but differs significantly in courtship display and in nestling appearance. Monotypic.
Distribution. Madagascar.



Descriptive notes. 9 cm; 7·4–9 g. Top of head is grey, faint blackish mottling on crown, becoming brownish-grey on nape and side of neck, upperparts brown or grey-brown, primaries, outer secondaries and tail much blacker-brown, rump and uppertail-coverts yellowish; face grey, lores, chin and most of throat black, underparts pinkish-buff, indistinct darker spot-like markings on breast and undertail-coverts; iris dark brown; bill black above, below variable, reddish-horn to pale pink or bluish-grey; legs pinkish-grey to fleshy-pink. Sexes alike. Juvenile is dark greyish-brown above, grey below, bill black. Voice. Call a soft "tsit"; thin "tsip-tsirip" in flight. Song soft, a purring or rattling tone lasting for 2·5–3 seconds.
Habitat. Scrub and grassland, degraded forest and clearings, marshes, rice paddies and around villages; often near human dwellings. From sea-level to 2000 m.
Food and Feeding. Grass seeds. Feeds on ground and while perched on grass stems. Gregarious, often in small flocks of up to c. 50 individuals; sometimes in mixed foraging flocks with other granivorous species, e.g. Red Fody (*Foudia madagascariensis*).
Breeding. Sept–Jul. In courtship display, male holds grass or fibre in bill, sings and bobs up and down, stretching and bending legs. Nest a ball, entrance hole near top and shielded by porch, made from grass, placed usually in bush or tree, or a lining of grass placed in old nest of another bird (e.g. fody). Clutch 3–8 eggs; incubation by both parents, both also roost in nest, no information on duration of incubation; nestling skin pinkish and naked, gape slightly swollen and white to yellowish-white, black margin and teardrop-shaped black marks inside gape, palate yellow with long, narrow curved black bar (extending nearly to black marks inside upper gape), tongue has a pair of small spots, black mark below tongue, black line along sides and tip of lower mandible; nestling period 21 days (or longer, to 31–33 days); young feed themselves from 9 or 10 days after leaving nest.
Movements. Resident.
Status and Conservation. Not globally threatened. Common, widespread. Found throughout Madagascar in suitable habitat; more common in N than in other parts. Apparently recorded on Mayotte, in Comoro Is, in mid-19th century.
Bibliography. Beckham (2009), Dee (1986), Dunning (2008), Fry & Keith (2004), Giebing (2000), Güttinger (1976), Immelmann *et al.* (1977), Langfeldt (1974), Mayer (2001), McCarthy (2006), Morris & Hawkins (1998), Nicolai & Steinbacher (2001), Payne & Sorenson (2003), Rand (1936), Restall (1996b), Steiner (1960), Wöhrmann (1992).

Genus *EUODICE* Reichenbach, 1863

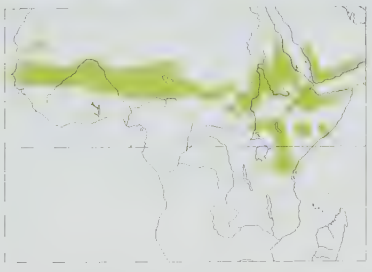
99. **African Silverbill**

Euodice cantans

French: Capucin bec-d'argent **Spanish**: Capuchino Picoplata Africano
German: Afrikasilberschnabel

Other common names: Silverbill, Warbling/Black-rumped Silverbill

Taxonomy. *Loxia cantans* J. F. Gmelin, 1789, Dakar, Senegal.
Genus often subsumed in *Lonchura*. May form a superspecies with *E. malabarica*; often treated as conspecific, but, in mixed-species populations in aviaries, the two tend to mate assortatively. Two subspecies recognized.
Subspecies and Distribution.
E. c. cantans (J. F. Gmelin, 1789) – C & S Mauritania and Senegambia E to Niger, N Nigeria, Chad and W & S Sudan; also S Algeria (origin of birds uncertain).
E. c. orientalis (Lorenz von Liburnau & Hellmayr, 1901) – extreme SE Egypt (Gebel Elba), E Sudan, Eritrea, Ethiopia, Djibouti, Somalia, N Uganda, Kenya and N Tanzania, and S Arabian Peninsula (SW Saudi Arabia, Yemen, W Oman).
Introduced in Hawaiian Is.



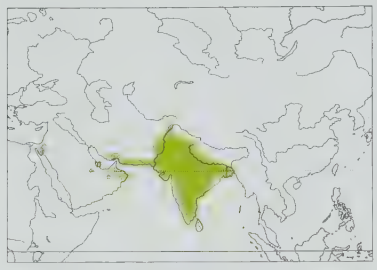
Descriptive notes. 11 cm; 10–14 g (nominate). Nominate race is mostly light brown above, head normally more tawny, crown scaly, upperwing duller earth-brown with variable brownish bars, outer and central remiges and outer greater coverts blackish-brown, tertials with pale fringe at tip, rump black, long, pointed tail black; face and throat tan, breast to belly and undertail-coverts whitish, flanks light buff; iris dark brown, orbital ring light cerulean blue to mid-grey; bill pale silvery bluish-grey overall, to dark grey on most of upper mandible and distal part of lower mandible and light greyish-blue on basal part of lower mandible; legs grey to pinkish. Sexes alike. Juvenile is similar to adult, but rump and undertail-coverts mottled brown, central rectrices shorter and slightly rounded, bill grey. Race *orientalis* is darker than nominate, barring above more distinct. Voice. Call of male a sharp, thin loud "tseep", of female a double-noted "tsiptsip". Song a series of rising and then falling notes rapidly repeated in a trill.
Habitat. Savanna, subdesert steppe and villages, dry acacia (*Acacia*) grassland, thorn-scrub, edge of marshes, sorghum (*Sorghum*) and millet cultivation, and short-grass floodplains. Lowlands and hills; to 2000 m in Mauritania, to 1750 m in Ethiopia.
Food and Feeding. Seeds, mainly of grasses, also of weeds and small shrubs; few insects, e.g. aphids (Aphidoidea). Forages mostly on ground; seeds picked from the ground, also from growing plants if easily available; clings to grass stems to pluck seeds from inflorescences. Forages usually in flocks, sometimes in pairs when breeding; generally in large flocks outside breeding season. Mixes freely with *Spermestes caniceps* in E of range where ranges overlap.
Breeding. Season varies regionally, mainly late rainy season, Oct–Apr in Mauritania, Nov–Jan in Senegal, Feb–May and Sept in Ethiopia, and Mar–Aug in E Africa. Usually solitary nester, occasionally several nests close together. Courting male grasps a stem of grass by one end, flies to female and drops stem, he sleeks plumage, body erect with tail pointed down, and then jerks head up and down several times, leans forward, points tail towards female and erects belly feathers; bobs up and down, stretching and bending legs, as he sings to female. Nest a bulky ball with entrance hole in side, made from grass and twigs, lined with large feathers or soft stems and leaves of grass, placed near end of branch of thorn tree or c. 1–1·5 m up in shrub, or in other vegetation; more often, uses old nest of other bird, mainly weaver (Ploceidae) or sparrow (*Passer*), which it lines with feathers, and in deserted weaver colony several pairs of present species may use old nests only a few meters apart. Clutch 3–6 eggs, sometimes more than one female lays in a nest; incubation 11–13 days; nestling skin blue-black, naked (some nestlings have sparse natal down on back), mouth has thick and swollen white gape, palate yellowish-white, broad black band extends from palate around gape to lower jaw to form a circle, tongue has a black spot; nestling period 21 days; young independent 2–3 weeks after fledging. Nest occasionally parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident in most of range; seasonal wandering linked with rainfall. Local migrant in Sudan, where dry-season visitor to E areas; other seasonal movements in Ghana and Mali.
Status and Conservation. Not globally threatened. Scarce to locally common in W of range; common to locally common in E. Common in S Arabia. Recorded in S Algeria, where small colony developed, but source of these birds uncertain. Introduced in Hawaiian Is, where now found from Kauai E to Maui, and locally abundant. Commonly kept in captivity (captive strains have plumages variously of chocolate-brown, fawn, cinnamon and white). Escaped individuals recorded in many places, including in Arabian Gulf States and in N Saudi Arabia (Riyadh).
Bibliography. Anon. (2000), Ash & Atkins (2009), Baptista & Horblit (1990), Baptista *et al.* (1999), Beckham (2009), Beibachir (2000), Brown & Britton (1980), Carswell *et al.* (2005), Cramp & Perrins (1994), Fry & Keith (2004), Goodman & Meininger (1989), Goodwin (1982), Güttinger (1970), Harrison (1964b), Hollom *et al.* (1988), Koepff & Romagnano (2001), Lewis & Pomeroy (1989), McCarthy (2006), Meadows (2003), Morel & Morel (1962, 1990), Mundy & Cook (1974a), Nicolai & Steinbacher (2001), Nikolaus (1987), Pratt *et al.* (1987), Redman *et al.* (2009), Restall (1996b), van Someren (1956), van Someren & Cunningham-van Someren (1949), Steiner (1960).

100. **Indian Silverbill**

Euodice malabarica

French: Capucin bec-de-plomb **Spanish**: Capuchino Picoplata Indio
German: Indiensilberschnabel
Other common names: Warbling/Common Silverbill, White-rumped/White-throated Munia/Silverbill

Taxonomy. *Loxia malabarica* Linnaeus, 1758, Malabar, south-west India.
Genus often subsumed in *Lonchura*. May form a superspecies with *E. cantans*; often treated as conspecific, but, in mixed-species populations in aviaries, the two tend to mate assortatively. Monotypic.
Distribution. E Saudi Arabia, United Arab Emirates, E Oman, and S Iran E along coast to Indian Subcontinent S of Himalayas, from Pakistan and Nepal E to Bangladesh (Sundarbans) and S to N & E Sri Lanka (dry zone); also Israel, Jordan, extreme NE Egypt (Sinai) and extreme NW Arabia (origin uncertain, possibly introduced).
Introduced in Hawaiian Is, Puerto Rico and Virgin Is (St Croix).
Descriptive notes. 11 cm; 10–14 g. Male is dull brown above, crown scaly, lower back to rump and uppertail-coverts white, outer webs of longest uppertail-coverts contrastingly black, outer and central remiges and outer greater coverts blackish, rest of wing drab brown with very faint or no barring,



long, pointed tail blackish-brown variably tinged chestnut or dull reddish-brown; loral area and narrow supercilium whitish, cheek and throat white, breast to belly and undertail-coverts whitish, flanks light buff with rufous barring; iris dark brown, eyering dark grey; upper mandible dark grey to blackish, lower mandible pale blue-grey; legs grey. Female is similar to male, but lores, face and breast dingier, more buff, supercilium less prominent, flanks less distinctly barred, pointed tail feathers shorter. Juvenile is similar to adult, but rump and undertail-coverts mottled brown, central rectrices shorter and slightly rounded, flanks unbarred, bill grey. Voice. Call of male a single loud "tseep"; female has double-noted "tsiptsip", sometimes repeated in staccato. Song a series of notes, rising and then falling, rapidly repeated in a trill; similar to song of *E. cantans*.
Habitat. Open country, semi-desert and scrub, open dry woodland, cultivated areas, and towns and villages. Occurs in plains and hills, up to 600 m; in sub-Himalayan region, to 1200 m in W (Chitral) in summer.
Food and Feeding. Grass seeds, also seeds of sedges (Cyperaceae), rice and cultivated millet when available; also small insects, and nectar of *Erythrina* flowers. Feeds usually on the ground, taking fallen seeds, and regularly seeds from heads of growing grasses. Highly social, usually in large or small flocks; occurs in large flocks after monsoon and in early winter. Reported as associating with Ashy-crowned Sparrow-lark (*Eremopterix griseus*) in Sri Lanka.
Breeding. Breeds throughout year, varying locally, generally beginning with onset of rains; mainly in winter months in Indian Subcontinent; mid-Mar–Jun (mainly Apr–May) in Israel. Possibly has helpers at nest. Courting male stretches upright and sings and twists towards female, then grasps a stem of grass by one end, flies to her and drops stem, sleeks feathers, body erect with tail pointed down, and jerks head up and down several times; he leans forward, body oblique to horizontal, erects belly feathers, points tail towards her, and jerks head up and down, and he bobs up and down, stretching and bending legs, as he sings. Male brings nest material and female builds nest, an untidy globular mass with entrance hole at one side, made with twigs, straw and grass, lined with feathers, placed 2–3 m above ground in dead thorn bush, small tree, date palm or thatched roof; often takes over old nest of weaver (Ploceidae) or sparrow (*Passer*). Clutch 3–8 eggs; on occasion, many eggs laid in a single nest, their different shapes suggesting several laying females, and two or three pairs seen to enter a single nest; incubation period 12–14 days; nestling naked, skin blue-black, thick and swollen gape white, palate yellowish-white, a broad black band extends from it around side to lower jaw, tongue has black spot; nestling period 21–23 days.
Movements. Resident, with local movements. Shifts linked to rainfall.
Status and Conservation. Not globally threatened. Locally common. Less common in Sri Lanka, where the species has apparently declined in recent decades; cause of decline not known. Local in extreme W of range (at top of Red Sea), where origin of small populations uncertain; thought possibly to have originated from escaped cagebirds. Widely kept in captivity. In Puerto Rico, introduced population breeding in numbers sufficient to supply the bird trade in USA.
Bibliography. Baptista & Horblit (1990), Clement *et al.* (1993), Cramp & Perrins (1994), Earsom (2004), Goodwin (1982), Grimmett, Inskipp & Inskipp (1999), Grimmett, Roberts & Inskipp (2008), Güttinger (1970), Harrison (1964b), Hollom *et al.* (1988), Hume (1873), McCarthy (2006), Nicolai & Steinbacher (2001), Payne & Sorenson (2003), Rasmussen & Anderton (2005b), Restall (1996b), Roberts (1992), Shirihai (1996), Whistler (1928).

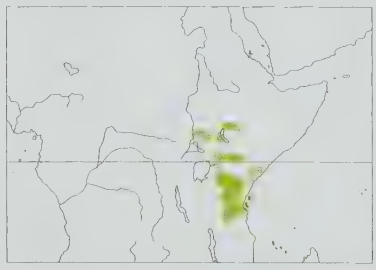
Genus *SPERMESTES* Swainson, 1837

101. **Grey-headed Silverbill**

Spermestes caniceps

French: Capucin à tête grise **German**: Graukopfelsterchen **Spanish**: Capuchino Cabecigrís
Other common names: Pearl-headed Amadine/Mannikin/Silverbill, Pearl-winged/Pearl-shouldered Mannikin, Grey-headed Mannikin(!)

Taxonomy. *Pitylia caniceps* Reichenow, 1879, Massa, Tana River, Kenya.
Genus often subsumed in *Lonchura*. Under such treatment, current name invalid, as preoccupied, and species then known as *Lonchura griseicapilla*. This species has sometimes been placed in a monotypic genus, *Odontospiza*; in recent phylogenetic studies, it appeared to be basal to the clade formed by the other African mannikins in present genus, which it resembles in courtship behaviour and in nestling markings, natal down and begging behaviour. Monotypic.
Distribution. SE Sudan, extreme NE Uganda, S Ethiopia, Kenya, S Somalia, Tanzania (including Zanzibar and Pemba).



Descriptive notes. 11 cm; c. 15 g. Head is blue-grey, with white pearly spots from forehead to side of face and upper throat; mantle and back brown, rump and uppertail-coverts white, upperwings dark brown, tail blackish, rounded central rectrices; breast and flanks cinnamon, belly whitish, undertail-coverts pale buff; iris dark brown, eyering grey; bill grey; legs grey. Sexes alike. Juvenile lacks white spots on face, has dark buff breast, whitish underparts to undertail-coverts, bill grey; spots appear on face and throat at 8 weeks. Voice. Call a high and thin "tsi", and a silvery trill. Begging call of young a double-note "peed yee'eh". Song soft and whispering, louder towards end.
Habitat. Semi-arid acacia (*Acacia*) thorn-scrub, open woodland and grassland.
Food and Feeding. Small seeds of grasses and herbs; some small insects taken, especially during brood-rearing period. Feeds on the ground. Forages in pairs and in small flocks, sometimes up to 30 individuals together; mixes with *Euodice cantans*.
Breeding. Few data on season; one record in Jan. Male displays with a straw or grass stem in bill, then drops stem, turns bill and tail towards female and sings, sometimes holds mouth open with

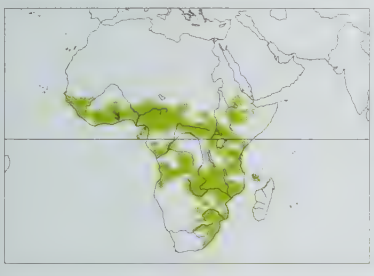
tongue erect and quivers tongue in her direction; in successful courtship he bobs, flexing and extending legs, female crouches and quivers tail, and pair copulates; patterned feathers of face erected during interactions with other males, but not in courtship display. Nest a bulky ball with entrance hole in side, made from grass, lined with finer material, including feathers, placed in tree. Clutch 4–5 eggs; incubation period 13–14 days; nestling skin pink, with sparse whitish down on head and back, thin bluish-white gape-flange bordered black and lined with two long black spots, palate whitish with black double arc (arcs horseshoe-shaped and widely separated by white), two whitish spots surrounded by posterior tips of arc, two black streaks near tip, tongue bluish-white with two black spots and a band on lower surface, and double black crescent on lower mandible below tongue; nestling period 22–23 days; young independent and give non-directed song 2 weeks after leaving nest.
Movements. Resident; wanders in non-breeding season.
Status and Conservation. Not globally threatened. Fairly common to uncommon; common in Tanzania. Patchily distributed.
Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Baptista (1973a), Baptista *et al.* (1999), Beckham (2009), Brown & Britton (1980), Dickinson (2003), Fry & Keith (2004), Goodwin (1982), Güttinger (1976), Hofmann & Mettke-Hofmann (1999), Koepff & Romagnano (2001), Langberg (1963), Lewis & Pomeroy (1989), Mayer (1994b), Nicolai & Steinbacher (2001), Nikolaus (1987), Pilz (1962), Puschner (2002a), Restall (1996b), Rossouw & Sacchi (1998), Short *et al.* (1990).

102. **Bronze Mannikin**

Spermestes cucullata

French: Capucin nonnette **German**: Kleinelsterchen **Spanish**: Capuchino Bronceado
Other common names: Green-headed/Bronze-winged Mannikin, Bronze Munia, Hooded Weaver (Finch), Hooded Mannikin(!)

Taxonomy. *Spermestes cucullata* Swainson, 1837, Senegal.
Genus often subsumed in *Lonchura*. Races intergrade in NE DRCongo and Uganda. Proposed race *tessellata*, described from Nampini (middle R Zambesi valley), in NW Zimbabwe, is synonymized with *scutata*. Two subspecies recognized.
Subspecies and Distribution.
S. c. cucullata Swainson, 1837 – Senegambia, S Mali, Guinea-Bissau and Guinea, Sierra Leone and Liberia E to Nigeria, S Chad and S Sudan, S to Gabon, PRCongo, Central African Republic and W Kenya (W of Rift Valley); also Bioko I (Fernando Póo) and other islands in Gulf of Guinea.
S. c. scutata Heuglin, 1863 – Ethiopia and Kenya (E of Rift Valley) S to S DRCongo, Angola, N & E Botswana, Mozambique and C & SE South Africa; also islands off Tanzania (Pemba, Zanzibar and Mafia), and Comoro Is.
Introduced in Puerto Rico and Hawaiian Is.



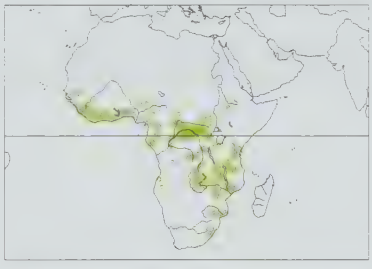
Descriptive notes. 9 cm; 7·7–11·8 g. Nominate race has head and upper breast brownish-black, browner on hindneck and neck side, with variable amounts of greenish gloss on cap and face, often also some purplish gloss on cheeks and breast, rest of upperparts dull brown with strong green gloss on some outer scapulars, blackish and whitish barring on rump and uppertail-coverts; white from lower breast downwards except for a blackish patch with strong green gloss on sides of lower breast and deep brown and/or blackish barring on flanks and undertail-coverts; iris dark brown, eyering dark grey; bill black above, pale bluish-grey below, generally bluer and palest on at base of lower mandible; legs grey to black. Sexes alike. Juvenile is unmarked brown above, face tan, upper breast and flanks light brown, lower breast and belly to undertail-coverts buff, bill black; in adult plumage by 6 months. Race *scutata* lacks green gloss on barred flanks. Voice. Contact and flight calls a wheezy "tsek" or "chik-chik", twittering in flocks; roosting and nest-advertisement calls a series of short phrases, "chi, chi chi chi chu chuu". Begging call of fledged young "si, si, si, si...". Courtship song a quiet "chi, chu, chi, chu, cheerihit, chu", lasting 1–2 seconds.
Habitat. Grassy open woodland and grassy semi-arid scrub; areas with seeding grasses, including cultivations. Lowlands to mountains; 750–2000 m in Ethiopia, and to 2200 m in E Africa.
Food and Feeding. Small seeds of annual grasses, including *Echinochloa*, *Urochloa*, *Setaria*, *Eleusine*, *Digitaria* and *Panicum*; some insects, including termites (Isoptera) and ants (Formicidae); also, filamentous green algae in standing water, leafy greens in gardens, and nectar from flowers. Feeds mostly on ground, where it picks up fallen seeds; takes seeds also from fruiting heads while clinging to grass stem. Catches emerging termites in the air. Occurs in flocks all year; flocks well-co-ordinated, generally of up to c. 15 individuals, often larger, to c. 50 individuals, and large numbers gather near abundant seeding grasses. Often mixes with other estrildids.
Breeding. Season prolonged, Jan–Sept (mainly beginning with Mar rains) in Ghana, Aug–Oct in Ethiopia, mainly Apr, May, Oct and Nov in Uganda, nearly all months in Kenya, Oct–May in Zambia, Dec–May in Malawi, and Aug–April/May (mainly Nov–Apr) in Zimbabwe and South Africa. Solitary nester, or in small colony with nests in adjacent trees. In courtship, male often holds a stem at start, soon drops it, holds body upright, belly feathers fluffed, head and tail turned towards female, sings, bill open and pointing down, tongue protruding and wagging; display involves a vertical bob, stretching and bending legs, and a lateral zigzag, each hop twisting the body, and holding head and tail forward towards female. Male brings material to nest-site, female builds nest, a loose ball of grass with hole in one side, lined with fine grass tips, placed in tree, shrub, thatch or sometimes hole (e.g. in stick nest of raptor), sometimes near nest of wasps (Vespidae); often uses old or new covered nest of other finch, e.g. bishop (*Euplectes*) or weaver (*Ploceus*); defended territory extends only c. 1 m around nest; roosting nest, sometimes built by groups of up to twelve birds, has thinner walls and no soft lining. Clutch 4–8 eggs; incubation period 14 days; hatchling skin pink, blackish with age, sparse grey down, gape slightly swollen, corners of mouth white with black margin, palate yellowish-white with two long black horseshoe-shaped arcs, between them a raised yellowish ridge, tongue with black band, and under tongue a double black crescent on lower mandible (yellow and black arcs on palate persist after independence); nestling period c. 20 days, but may leave nest from 14 days, when unable to fly. Maximum recorded longevity in the wild 8 years (in Malawi); 35% of adults at onset of breeding season survive to following year, further life expectancy 12·5 months. In coastal Ghana, nest parasitized by Pin-tailed Whydah (*Vidua macroura*).
Movements. Resident. Some local movements in response to rains and seeding of grasses; longest distance of ringing recovery in Malawi 60 km.
Status and Conservation. Not globally threatened. Common to abundant and widespread throughout most of range; one of the commonest avian species in Africa. Estimated population in S Mozambique (Sul do Save) in excess of 500,000 individuals. Density of 8–15 birds/ha around villages in Gabon. In some areas, especially in W Africa, regarded as a pest in rice and cereal fields.
Bibliography. Ash & Atkins (2009), Calder (1955), Carswell *et al.* (2005), Chapin (1917, 1954), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Friedmann (1960), Fry & Keith (2004), Goodwin (1982), Güttinger (1970, 1973, 1976), Güttinger & Achermann (1972), Kunkel (1959, 1965), Kunkel & Kunkel (1975), Leventis & Olmos (2009), Macdonald (1979b), Maclean (1993), Mayer (2001), McCarthy (2006), Morris (1957), Nicolai & Steinbacher (2001), Payne (2005a), Raffaele *et al.* (2003), Restall (1996b), Sinclair (1990), Thompson (1989), Thompson & Tye (1995), Wöhrmann (1992), Woodall (1975).

103. **Magpie Mannikin**

Spermestes fringilloides

French: Capucin pie **German**: Riesenelsterchen **Spanish**: Capuchino Pío
Other common names: Pied Mannikin/Munia/Grassfinch/Weaver Finch, Giant Mannikin, Magpie Munia

Taxonomy. *Plocus* [sic] *fringilloides* Lafresnaye, 1835, India; error = Liberia.
Genus often subsumed in *Lonchura*. Birds from Dondo Forest, in S Mozambique, described as race *pica*, but appear to differ little from those elsewhere in species' range. Monotypic.
Distribution. Senegal, Gambia, Guinea-Bissau, Guinea, Sierra Leone and Liberia E, very patchily, to Nigeria, Cameroon, Central African Republic, S Sudan and W Ethiopia, S to Gabon, N & SW Angola, Zambia, Zimbabwe, S Mozambique and E South Africa.



Descriptive notes. 12 cm; 13–18·9 g. Head to throat and hindneck are black, rump black, rest of upperparts, including upperwing dark brown, scapulars with fine white shaft streaks, tail black; underparts white, in fresh plumage with cream tinge that becomes more intense towards undertail-coverts, side of breast with broad black patch, flanks with bars of brown and black; iris dark brown, eyering dark grey; bill somewhat elongate, black above, bluish-grey below, base of lower mandible bluish-white; legs grey to black. Sexes alike. Juvenile is dark brown above, face and throat light brown, breast to undertail-coverts white to buffy white, side of breast and flanks brown, bill black. Voice. Contact call a loud "pyoo-wee" or "pyoo-wee-yoo", the whistled downslurs longer and not so mournful as those of *S. bicolor*; flight call a short high "chee". Song a soft and bubbling series, "peu peu peu peu".
Habitat. Riparian forest, grassy bush country along rivers and streams and bases of rocky outcroppings, rank grass in abandoned cultivations, reeds and sedges, bamboo thickets, millet cultivation and rice fields, also forest edge and along grassy logging roads.
Food and Feeding. Rice, other grass seeds, including *Panicum* and cereal grains, large seeds of bamboo (seeds 12–16 mm long, 2–2·5 mm in diameter); also sap from grass, filamentous green algae from shallow water, fresh greenstuff; also some insects, including alate termites (Isoptera) and ants (Formicidae). Opportunistically takes seeds from indigenous bamboos *Oxytenanthera abyssinica* and *Oreobambos buchwaldii*, perhaps also other bamboos; the bamboo produces fruit at intervals of several years, or for a few years in a row. Feeds in standing vegetation, perching on grass stem as it feeds; also on ground, picking up fallen seeds. Forages usually in pairs and small groups, sometimes in larger flocks of up to c. 20 individuals, uncommonly more (to 40); exceptionally, flocks of up to 500 recorded. Associates freely with congeners.
Breeding. Season Jun in Ghana, Jul–Sept in Cameroon, Feb–Mar in Zambia, Aug, Oct and Jan–May in Malawi and Oct–Mar in Mozambique. Courting male holds a stem when he begins display, when singing male holds body upright, belly feathers fluffed, head and tail turned towards female, bill open and pointing down, tongue protruding and wagging; display involves a vertical bob with legs alternately flexed and extended, and a lateral zigzag, twisting head and tail as he faces her. Nest a loosely thatched ball with side entrance, made from grass and leaves, with finer lining, placed in bush or tree, often near another mannikin nest. Clutch usually 4–6 eggs; when sitting bird leaves, it often partly blocks entrance by pulling a few feathers into hole, incubation period 13–14 days; hatchling skin pink, becoming blackish, sparse grey down, gape slightly swollen, corners of mouth white with black margin, palate yellowish-white with two long black horseshoe-shaped arcs, between the arcs a raised yellowish ridge, tongue has black band; nestling period c. 21 days.
Movements. Resident; irregular movements where associated with bamboo.
Status and Conservation. Not globally threatened. Locally uncommon to rare; very patchily distributed. Local populations appear to be small. Few recent records in Ethiopia, Kenya and N Tanzania, and often irregular elsewhere. Irregular appearance in E & S of range perhaps linked with infrequent seeding of bamboo. Regularly trapped on a small scale for cagebird trade.
Bibliography. Beckham (2009), Brickell *et al.* (1980), Carswell *et al.* (2005), Chapin (1954), Dowsett *et al.* (2008), Dowsett-Lemaire (2006), Dowsett-Lemaire & Dowsett (2005, 2006), Fry & Keith (2004), Goodwin (1982), Güttinger (1970, 1973), Hall, D. (1981), Jackson (1972), Kunkel (1965), Macdonald (1979b), Maclean (1993), McCarthy (2006), Nicolai & Steinbacher (2001), Redman *et al.* (2009), Restall (1996b), Serle (1950), van Someren & Cunningham-van Someren (1949), Thompson (1989), Wöhrmann (1992).

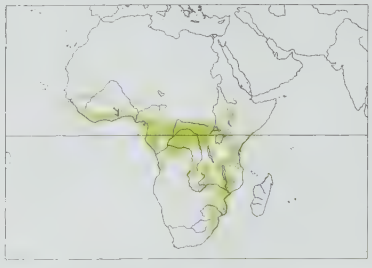
104. **Black-and-white Mannikin**

Spermestes bicolor

French: Capucin bicolore **German**: Glanzelsterchen **Spanish**: Capuchino Bicolor
Other common names: Blue-billed/Red-backed/Rufous-backed/Chequered/Bicoloured Mannikin, Black-and-white Munia; Brown-backed/Rufous-backed/Chestnut-backed Munia, Red-backed Mannikin (*nigriceps*); Fernando Po Munia/Mannikin (*poensis*)

Taxonomy. *Amadina bicolor* Fraser, 1843, Cape Palmas, Liberia.
Genus often subsumed in *Lonchura*. Rufous-backed *nigriceps* has been treated as a separate species, distinct from black-backed races (nominate and *poensis*), but brown-backed *woltersi* is intermediate in characters, suggesting that variation may be clinal; in addition, nominate race and *poensis* intergrade in Cameroon, and *poensis* back colour varies clinally from black in W to brown in E; birds in S Sudan and E DRCongo intermediate between *poensis* and *woltersi* are sometimes treated as race *stigmatophora* (from Bukoba, on L Victoria), but better included within *poensis*. Proposed race *minor* (from Fanole, in S Somalia) is treated as a synonym of *nigriceps*. Four subspecies recognized.

Subspecies and Distribution.
S. b. bicolor (Fraser, 1843) – Guinea-Bissau, S Mali, S Guinea and Sierra Leone E to S Nigeria and Cameroon.
S. b. poensis (Fraser, 1843) – Bioko I (Fernando Póo) and S Cameroon S to N Angola, E to DRCongo (except NE & S), S Sudan, SW Ethiopia, Uganda, W Kenya and NW Tanzania.
S. b. woltersi (Schouteden, 1956) – SE DRCongo and NW Zambia.
S. b. nigriceps Cassin, 1852 – S Somalia, E Kenya and Tanzania S to Zambia, S Mozambique and NE & E South Africa.



Descriptive notes. 10 cm; 8–11 g. Nominate race has head to upper breast and upperparts glossy black, upperwing and tail black, usually with one or two white spots on some tertials, lower breast to belly and undertail-coverts white, flanks barred black; iris dark brown, eyering dark grey; bill blue-grey; legs dark grey. Sexes alike. Juvenile is brown on head and upperparts, breast grey to grey-brown, lower breast and undertail-coverts white, bill black. Race *poensis* differs from nominate in having wing, rump and uppertail-coverts finely barred black and white; *nigriceps* has barring similar to previous, but back, upperwing-coverts and unbarred portion of secondaries rufous-brown, juvenile upperparts reddish-brown; *woltersi* resembles last, but back and wings dark brown. Voice. Soft contact calls "sip" and "seep, tsik tsik"; loud contact calls a high shrill "pee" and "pew", and sweeter piping "peeeeya", or whistled downslurs, "tsiu tsiu...". Song consists of soft calls given together.
Habitat. Tall rank grass in forest clearings, woody marshland, secondary growth, abandoned cultivation, rice fields and native gardens; lowlands to mountains, in Ethiopia at 1300–2700 m.
Food and Feeding. Small grass seeds, including those of millet, sorghum and rice, many small-seeded grasses (*Panicum*, *Digitaria*, *Sporobolus*, *Chloris*, *Urochloa*, *Eragrostis*), and seeds of stinging nettles (of genus *Laportea*); also fibrous mesocarp of fruits of oil palm (*Elaeis guineensis*), flower petals; green algae (strands to 15 cm long) taken from shallow water; also small invertebrates. Nestling diet includes termites (Isoptera), flies (Diptera) and spiders (Araneae). Forages in vegetation and on ground. Takes seeds while perched on stem and swinging seedhead to near the ground, also picks fallen seeds from ground. Captures termites in flight. Often forages in flocks, usually of up to 10 individuals, sometimes 30; often as many as 100 individuals in area no greater than 2 m².
Breeding. Season Sept–Nov (during maturation of rice and availability of green algae) in Sierra Leone, May–Aug in Ghana, Nov–Mar or May in Gabon, in many months (peaks in Apr and Oct) in Uganda, varying with regional rainy season in Kenya, Jan–May in Zambia, Dec and Apr in Malawi, Nov–May in Zimbabwe and Aug–Apr in South Africa. In courtship, male holds a stem when he begins display; singing male holds body upright, belly feathers fluffed, head and tail turned towards female, bill open and pointing down, tongue protruding and wagging; display involves a bob with legs alternately flexed and extended, and a lateral zigzag through a wide angle, the male twisting his head and tail as he maintains frontal orientation towards her. Nest a thick-walled thatched ball with side entrance, made from dry coarse grass and leaves with finer lining, placed in bush or tree or in thatch, well apart from other mannikin nests. Clutch 4–5 eggs; incubation period 14 days; hatchling skin pink, becoming blackish, sparse grey down, gape slightly swollen, corners of mouth white with black margin, palate yellowish-white with two long black horseshoe-shaped arcs, between the arcs a raised yellowish ridge, tongue has black band (during begging, tongue moves back and forth, tracing pattern of palate arcs); nestling period 16–21 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Common to locally common. Common to abundant in W & C parts of range; more local and patchily distributed in E & S. Estimated population in S Mozambique (Sul do Save) in excess of 10,000 individuals; recorded densities of 4–8 birds/ha in Gabon. Sometimes considered a pest in rice cultivations.
Bibliography. Adlersparre (1931), Akinpelu (1994a, 1994b), Bates (1911), Beckham (2009), Carswell *et al.* (2005), Chapin (1954), Chittenden & Nichols (2006), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Eisentraut (1963), Fry & Keith (2004), Ginn *et al.* (1989), Goodwin (1982), Güttinger (1970), Hall, D. (1981), Kunkel (1965), Kunkel & Kunkel (1975), Macdonald (1979b), Maclean (1993), Nicolai & Steinbacher (2001), Redman *et al.* (2009), Restall (1996b), van Someren (1956), Thompson (1989), Thompson & Tye (1995), Wöhrmann (1992).

PLATE 26 ➤



PLATE 26

inches 2

cm 5

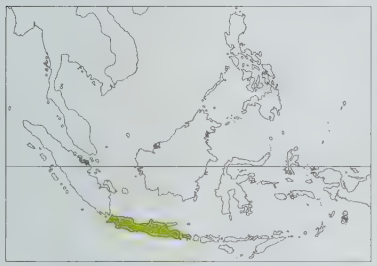
Genus *LONCHURA* Sykes, 1832

105. Java Sparrow

Lonchura oryzivora

French: Padda de Java **German**: Javareisfink **Spanish**: Capuchino Arrocero de Java
Other common names: Rice/Paddy Bird, Rice Munia, Java Finch

Taxonomy. *Loxia oryzivora* Linnaeus, 1758, "Asia and Ethiopia" = Java.
This species and *L. fuscata* often placed in separate genus *Padda*, and may form a superspecies. In recent study of mitochondrial phylogeny, these two species and *L. tristissima* were found to comprise two clades that are basal to the other members of the genus. Monotypic.
Distribution. Java and Bali.
Widely introduced elsewhere: Sumatra, Bawean, Borneo, Lombok, Sumbawa, Sulawesi, Philippines, Caroline Is, Japan, SE China, Taiwan, Myanmar (Arakan and Tenasserim, perhaps extirpated), Thailand (N Bangkok, Phuket I), Vietnam, Peninsular Malaysia, Singapore (perhaps extirpated), India (Calcutta, Chennai), Sri Lanka, Tanzania (including Zanzibar and Pemba), Seychelles, Christmas I, Fiji, Hawaiian Is, Puerto Rico, Venezuela, Colombia, St Helena I.



Descriptive notes. 15 cm; 22·5–27·8 g. Male has forehead, crown, lores, chin and upper throat black, black line around conspicuous white lower face; upperparts pale bluish-grey, rump and tail black; breast pale bluish-grey, belly pale purplish-grey, undertail-coverts white; iris dark brown to blood-red, orbital ring red; large bill pink to red, much paler on tip and on cutting edges; legs pale pink. Female very similar to male, but eyering narrower and duller, bill smaller. Juvenile has upperparts greyish-brown, cheek buff, throat white, breast buff with indistinct streaking, belly and undertail-coverts whitish, bill brownish to horn-coloured, eyering buff, iris dusky grey, legs pale pink. (Domesticated birds with white, pied and fawn plumage, bred in captivity, sometimes occur in wild populations as escapees.) Voice. Calls include low churring "tup, t-luk" or "ch-luk", a sharp "tak"; in nest gives a mewing sound, as do many munia species. Song begins with bill-clicks, then a complex jingle and rattle ending in a whistle, "weeee".
Habitat. Open grassland and wilderness ground, cultivations (especially rice fields), open woodland; also residential areas. Mainly in lowlands, to 500 m, locally to 1500 m in Java (where now much restricted); in Venezuela (introduced), lowland rice cultivation to 400 m.
Food and Feeding. Cereal crops, especially rice, also other grass seeds, spilled grain, seeds of flowering plants, including bamboo and *Lantana camara*; a few insects. Takes seeds while clinging to grass stems and while on ground. Social, generally in small flocks, generally larger flocks outside breeding season; formerly in very large flocks.
Breeding. Breeds at end of rainy season, Apr–Aug in Java and Bali; introduced populations Sept–Feb (and one egg record Jun and nest-building Aug) in Borneo, May–Aug on Christmas I, May–Sept in Thailand, and nest-building seen in May–Jul and (from dates of eggs and fledglings) laying Apr–Jun, Oct and Dec in Malay Peninsula. Sometimes loosely colonial in Java. In greeting display before courtship, male bows, and then, with posture upright and bill horizontal, twists head and tail towards female; in courtship, he often carries a stem as he displays, or drops it and sings with open bill, he stands upright and, bent over perch, with head and tail pointing down, bows to female, and in this posture bounces up and down, extending and bending legs (feet leave perch and make a noise on contact). Nest a bulky mass, either open or covered and with side entrance (depending on nest-site), made from grass, lined with palm leaves, epiphytes or grass, placed in hole in tree, in temple or in other building; in Malay Peninsula (introduced), sites have included cavity beneath house roof tiles and other cracks in building masonry, roof supports, cavities in limestone cliff face and abandoned holes of woodpeckers (Picidae). Clutch 4–7 eggs in Java, 3–6 in captivity; incubation period 13–14 days; nestling skin pink, sparse down on head and back, or only on back (or sometimes naked), gape creamy white with two black streaks on each side, palate yellow to whitish with transverse black bar, tongue and sublingual area (nestling of domesticated white-plumaged birds lacks black mouth marks); nestling period in captivity 33–35 days.
Movements. Resident or nomadic. Post-breeding flocks often make substantial short-distance movements in response to local food supplies and water availability.
Status and Conservation. VULNERABLE. CITES II. Uncommon and local. Population in native range fewer than 10,000 individuals; decreasing. Has declined greatly in its original range as a result of intense trapping activity for cagebird trade and habitat changes. Current population in Java derived from introduced populations on other Indonesian islands and from China. Formerly widespread and abundant, it is now difficult to find; in recent survey of 64 sites where it had been recorded in the past, it was found at only 17, with total of just 109 individuals. Majority of recent records from E Java and Bali. A popular cagebird, this species has for long been trapped (for both domestic and international markets), this activity reaching a peak in 1960s and 1970s; its tendency to form large flocks, particularly at roost-sites, makes it susceptible to mass trapping. In the past, it was regarded as a serious pest in rice fields (hence one of its colloquial names, "Rice Bird"), and was persecuted. Moreover, it is hunted by local inhabitants for food, and further possible threats are increased pesticide usage and competition with Eurasian Tree Sparrow (*Passer montanus*). Currently occurs in only four protected areas, with recent records from Cikepuh Wildlife Reserve and Baluran and Meru Betiri National Parks, in Java, and Bali Barat National Park, in Bali. Unless protection laws and stringent regulations are enforced, it is likely that this estrildid's numbers will continue to fall. The species has declined also in areas outside its native range. In places where introduced in 19th and 20th centuries, populations have collapsed: in Singapore, numbers dropped with disappearance of draft horses and their feed, then with rice shortages of 1940s, and loss of most other regular sources of spilled grain (rice-growing disappeared two decades ago); populations in Malay Peninsula may have depended on release of additional captive stock around temples and commensal association with humans, especially rock temple complexes, rice mills and large food markets; introduced populations in India have likewise declined precipitously.

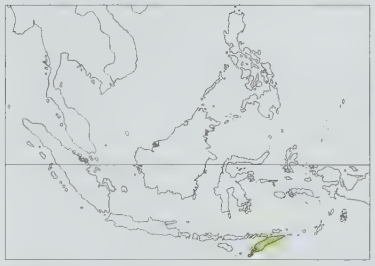
Bibliography. Anon. (2008g, 2009j), Baptista *et al.* (1999), Beckham (2009), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Dickinson *et al.* (1991), Dunning (2008), Fry & Keith (2004), Goodwin (1982), Grimmett *et al.* (1999), Güttinger (1976), Higgins *et al.* (2006), Islam (1997), Kennedy *et al.* (2000), Kuroda (1933), MacKinnon (1988), Mann (2008), van Marle & Voous (1988), McCarthy (2006), Medway & Wells (1976), Myers (2009), Myers & Bishop (2005), Nicolai & Steinbacher (2001), Oppenborn (2010), Payne (2005a), Pratt *et al.* (1987), Rasmussen & Anderton (2005b), Restall (1996b), Restall *et al.* (2006), Ridgely & Tudor (2009), Robson (2000, 2002), Round (2008), Seller (1974), Smythies (1986), Smythies & Davison (1999), Stattersfield & Capper (2000), Wallace (1863), Wang Luan Keng & Hails (2007), Wells, D.R. (2007), White & Bruce (1986), Whitten *et al.* (1996).

106. Timor Sparrow

Lonchura fuscata

French: Padda de Timor **German**: Timorreisfink **Spanish**: Capuchino Arrocero de Timor
Other common names: Timor Dusky Sparrow, Timor Munia/Finch, Kupang Sparrow/Munia, Brown Ricebird/Padda

Taxonomy. *Loxia fuscata* Vieillot, 1807, Timor.
This species and *L. oryzivora* often placed in separate genus *Padda*, and may form a superspecies. In recent study of mitochondrial phylogeny, these two species and *L. tristissima* were found to comprise two clades that are basal to the other members of the genus. Monotypic.
Distribution. Timor, Semau and Roti, in Lesser Sundas.



Descriptive notes. 12 cm; 19·2–22·2 g. Has forehead and crown black, lower face white, upperparts chocolate-brown, remiges and tail blacker, rump sometimes tinged ashy; chin and throat are black, breast brown with narrow black band below, belly and undertail-coverts white; iris dark brown, orbital ring grey; bill is proportionately smaller than that of *L. oryzivora*, steel-grey, paler on cutting edges; legs greyish-flesh to pinkish-flesh. Sexes alike. Juvenile is greyish-brown above, indistinct buff supercilium from bill to behind eye, lores brown, side of face buff, throat whitish, breast light brown, belly and undertail-coverts whitish, bill dark grey, legs pale flesh-coloured. Voice. Call "tchik" and "tchuk!"; male in nest gives "wheeee". Song a series of gurgling, rattling notes, rising in pitch, "chip chip chip chip chipchipchipchip".
Habitat. Degraded monsoon forest, grassy area with scattered bushes and trees, edges of cultivation, *Eucalyptus alba* savanna, wooded cattle pasture, rice paddies, degraded coastal shrublands, and riparian woodland dominated by casuarinas (*Casuarina*); also scrub and overgrown gardens. Lowlands, occasionally to 720 m.
Food and Feeding. Seeds of grasses, weeds and thistles. Feeds mostly on the ground, picking up fallen seeds; also takes seeds from seedheads while climbing on stem. Forages usually in pairs and in groups of 3–5 individuals; sometimes in larger flocks of up to 50 individuals; occasionally mixes with other seed-eating species. Will perch in trees, and occasionally on tree stumps and fence posts.
Breeding. Recorded in Jun and Oct. In courtship display, male twists head and tail towards female, and bobs up and down, sometimes jumping clear of perch. No information on nest in the wild. In captivity, a loose ball of grass with side entrance and opening with spout, built inside nestbox; clutch 4–6 eggs, incubation period 13–16 days; nestling naked, skin pink, gape white with black border, palate pink with transverse black bar, tongue unmarked; nestling period 29–34 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Timor and Wetar EBA. Locally moderately common; generally sparsely and patchily distributed. In East Timor (Timor-Leste), variously uncommon to abundant; in recent surveys at two sites along R Laivai, several groups of 30–50 individuals found in a short period within a few hectares at both localities, indicating that total population for entire river region may amount to several thousands; reports from local inhabitants suggest that flocks could contain hundreds to thousands of individuals. Habitat destruction throughout the island has been extensive; in West Timor, monsoon forest now covers only c. 4% of land area, scattered in and around seven small unprotected patches, and these continuing to decline in size owing to overgrazing and burning. Large numbers captured for international cagebird trade, e.g. more than 4000 imported by European Union countries since 1997, and this level of trapping could become a major threat in the future. Considered a serious pest in rice cultivations in Timor-Leste, where it has benefited from conversion of land to rice fields (which afford easy access to food and water for long periods). Local inhabitants use slingshots and throw stones to disturb the species from rice fields; although this thought unlikely to cause significant mortality, little information is available on hunting success. Occurs in Kateri Wildlife Sanctuary, in West Timor.

Bibliography. Anon. (2008g, 2009j), Baptista *et al.* (1999), Bielfeld (1996, 2008), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Dunning (2008), Goodwin (1982), Mayer (2000a), Mayr (1944), Nicolai & Steinbacher (2001), Restall (1996b), Stattersfield & Capper (2000), White & Bruce (1986).

107. Streak-headed Mannikin

Lonchura tristissima

French: Capucin à tête rayée **Spanish**: Capuchino Cabeciestriado
German: Trauerbronzemännchen
Other common names: Streak-headed Munia; White-spotted Mannikin (*leucosticta*)

Taxonomy. *Munia tristissima* Wallace, 1865, north-west New Guinea.
Has sometimes been placed in a monotypic genus, *Mayrimunia*, on basis of vocal characters. Recent study of mitochondrial phylogeny indicated that this species, and *L. oryzivora* and *L. fuscata*, comprise two clades that are basal to the other members of present genus. S race *leucosticta* sometimes treated as a separate species, but apparent hybrid with *hypomelaena* recorded in SW (R Noord

On following pages: 108. Scaly-breasted Munia (*Lonchura punctulata*); 109. Black-throated Munia (*Lonchura kelaarti*); 110. Black-faced Munia (*Lonchura molucca*); 111. White-rumped Munia (*Lonchura striata*); 112. Dusky Munia (*Lonchura fuscans*); 113. White-bellied Munia (*Lonchura leucogastra*); 114. Javan Munia (*Lonchura leucogastroides*); 115. Tricoloured Munia (*Lonchura malacca*); 116. Chestnut Munia (*Lonchura atricapilla*); 117. White-capped Munia (*Lonchura ferruginosa*).

area) and existence of an intermediate or hybrid population in SE (Ihu and upper R Purari E to Port Moresby) indicate that it intergrades with other races. SE race *bigilalae* possibly a hybrid population; proposed race *moresbyae* (described from specimen thought to have come from Port Moresby area), apparently from same area as *bigilalae*, but without precise data on locality, date, collector or field observations. Further study needed. Five subspecies recognized.

Subspecies and Distribution.

L. t. tristissima (Wallace, 1865) – NW New Guinea (Vogelkop Peninsula E to S shores of Geelvink Bay).

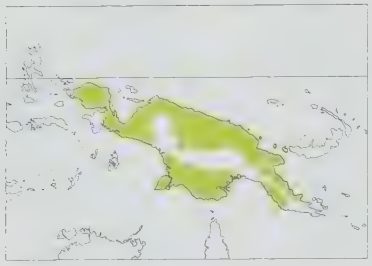
L. t. hypomelaena Stresemann & Paludan, 1934 – W New Guinea from Weyland Mts area E to R Mamberamo and, in S, to R Noord.

L. t. calaminoros (Reichenow, 1916) – N New Guinea from region of R Mamberano E to Huon Gulf and Cape Nelson, including Karkar I, Long I and Umboi.

L. t. leucosticta (D'Albertis & Salvadori, 1879) – S New Guinea from R Noord E to Fly R and NW Gulf of Papua.

L. t. bigilalae Restall, 1995 – SE New Guinea from SC Gulf Province E to Port Moresby.

Also, in NC Western Province of C New Guinea (race unknown).



Descriptive notes. 10 cm; 7·5–10 g. Much individual variation. Male nominate race is mainly dark brown above, crown and nape with pale shaft streaks, upper rump with blackish bar, rump and lesser uppertail-coverts yellowish, longer uppertail-coverts and tail black; upperwing-coverts and tertials more reddish-brown, some of them with pale tips, rest of wing blackish-brown; face dark brown with pale streaks, throat blackish, breast to belly dark brown, lower belly and undertail-coverts blackish; iris dark brown, eyering grey; bill and legs bluish-grey, the bill often paler, with whitish tip. Female is similar to male, but streaks on head perhaps broader, rump perhaps less extensively yellow. Juvenile has crown and face lightly streaked or spotted buff, rump brown. Race *hypomelaena* is darker than nominate, wing-coverts with dark tips, upper rump with broad black bar, underparts nearly black; *calaminoros* lacks black bar on upper rump, has whitish wingbar on greater upperwing-coverts, in E of range (Karkar I) prominent whitish wingbar on both median and greater coverts; *bigilalae* lacks black bar on upper rump, longest uppertail-coverts brown (not black), underparts lighter brown, flanks spotted white and buff; *leucosticta* is distinctive, male brownish above, fine white spots on head, mantle and wing-coverts, yellowish of rump more extensive (upper rump without blackish bar), chin and throat whitish, underparts cinnamon, white spots on breast and flanks, female slightly duller overall, with more spotting on breast, giving more scaly appearance, undertail-coverts greyish-brown. Voice. Call a buzzy thin "tseed", upslurred and querulous, also "jjbb!". Song a high-pitched buzzy jingle, begins with 2 trumpet notes and then a complex of squeaky notes, "bzeet bzeet squeek-bdiddly-wee squeak bdiddly-wee bzeet bdiddlly-wee beer", lasting 7–8 seconds. Race *leucosticta* soft call a quick "tik" and loud call a short nasal buzzing "toot" (for both calls, female higher and shorter); song a high-pitched buzzy jingle, begins with 3–4 "zwee" notes, then a rising "zee" and higher, longer "tsee", then a low note and a rollercoaster of wheezes and buzzes with "tik" and "zee" notes (songs of nominate and *leucosticta* similar in notes, frequency, timing and complexity).

Habitat. Grassy edges of streams and trails through forest, grassy clearings in secondary growth and forest edge, reedbeds, riparian grass and bamboo, floating marsh grass, and old gardens. Lowlands and hills generally to 1000 m; in N New Guinea to 1700 m, in SE New Guinea to at least 600 m.

Food and Feeding. Seeds of grasses, including *Echinochloa*, seeds of bamboo; also insects (on Karkar I). Forages low down in vegetation and on ground, also on floating mats of vegetation. Generally in small flocks, sometimes 20–30 individuals together; often in mixed groups with other members of genus.

Breeding. Recorded in Nov–Dec (during wet season) and juveniles seen in May. Nests sometimes in small colonies. Male perches upright, neck stretched, feathers of crown and belly fluffed, tail spread, bill open in song; when female present, more fluffed and body twisted side to side, singing male stretches upwards and leans forward, hops towards her, leaning and twisting, female invites copulation by leaning forward and quivering tail. Nest a ball of grass with side entrance, built in rattan (*Calamus*) or in tree in forest or forest edge. In captivity: incubation period 14 days; nestling (race *leucosticta*) naked, skin pale, gape-flange white, bordered black, palate yellowish; young males began to sing 10 weeks after fledging. No other information.

Movements. Resident; locally nomadic.

Status and Conservation. Not globally threatened. Locally common; in S of range, race *leucosticta* fairly common or locally common. Not very well known.

Bibliography. Baptista, L.F. (1990), Beehler *et al.* (1986), Bielfeld (1982), Coates (1990, 2001), Diamond & LeCroy (1979), Gilliard & LeCroy (1961, 1967a), Goodwin (1982), Immelmann *et al.* (1977), LeCroy (1999), Mackay (1969), Mayr & Rand (1937), Mees (1958), Nicolai & Steinbacher (2001), Rand (1938), Rand & Brass (1940), Rand & Gilliard (1967), Restall (1995, 1996b), Ripley (1964), Snow (1997).

108. Scaly-breasted Munia

Lonchura punctulata

French: Capucin damier **German**: Muskatbronzemännchen **Spanish**: Capuchino Punteado
Other common names: Scaly-breasted/Nutmeg Mannikin/Finch, Spotted Munia/Mannikin, Barred Munia, Spice Finch/Bird/Mannikin, Ricebird

Taxonomy. *Loxia punctulata* Linnaeus, 1758, Asia = Calcutta, India.

Proposed races *fortior* (described from Lombok) and *holmesi* (from Semitau, in SW Borneo) are treated as synonyms of *nisoria*. Eleven subspecies recognized.

Subspecies and Distribution.

L. p. punctulata (Linnaeus, 1758) – N Pakistan, India (except NE), Nepal terai and Sri Lanka.

L. p. subundulata (Godwin-Austen, 1874) – Bhutan, Bangladesh, NE India (Assam) and W Myanmar.

L. p. yunnanensis Parkes, 1958 – S China (SE Xizang, S Sichuan, Yunnan) and N & NE Myanmar.

L. p. topela (Swinhoe, 1863) – S Myanmar, Thailand, SE China, Hainan I, Taiwan, Laos, Cambodia and Vietnam.

L. p. cabanisi (Sharpe, 1890) – Philippines (Luzon, Mindoro, Calauit, Palawan, Panay, Negros, Cebu, Mindanao) and N Borneo (coastal W Sabah and Brunei).

L. p. fretensis (Kloss, 1931) – S Malay Peninsula, Singapore, Sumatra and Nias I.

L. p. nisoria (Temminck, 1830) – S Borneo (W & S Kalimantan), Java, Bali, and W Lesser Sundas (Lombok, Sumbawa).

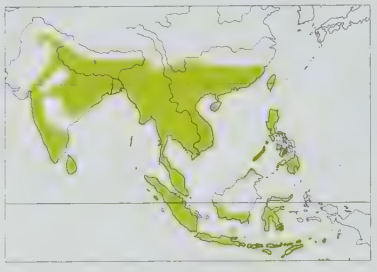
L. p. particeps (Riley, 1920) – Sulawesi.

L. p. baweana Hoogerwerf, 1963 – Bawean I, off NE Java.

L. p. sumbae Mayr, 1944 – Sumba, in W Lesser Sundas.

L. p. blasii (Stresemann, 1912) – C & E Lesser Sundas (Flores E to Timor and Tanimbar Is).

Introduced (mainly race *topela*) in Seychelles, Mascarene Is, Japan, Australia, Palau Is (extirpated), Caroline Is, Hawaiian Is, Tahiti, West Indies (Cuba, Puerto Rico, Jamaica, Hispaniola), Guadeloupe; nominate race in S USA (California).



Descriptive notes. 12 cm; 12–16 g. Nominate race has head to foreneck deep reddish-brown, darker on foreface and especially on chin and throat, slightly paler and duller on mantle, back and wings, with barely noticeable barring and often more noticeable pale shaft streaks; barred dark brown and whitish or yellowish on rump, dull golden-yellow to orange-brown barred darker on uppertail-coverts; tail similar to remiges in colour, but central rectrices have a strong golden tinge; breast and belly white with black feather edges, giving scaled or scalloped appearance; iris dark brown to brownish-red, eyering dark grey; bill blackish, lower mandible often paler bluish-grey at base; legs grey. Sexes alike. Juvenile is brownish-buff above, buff to whitish below, bill black. Races differ mainly in colour of uppertail-coverts and colour and pattern of underparts, nominate the only one having black and white underparts with single black marking on edge of feathers, lower mandible entirely bluish-grey in some races: *subundulata* is duller brown above than nominate, has uppertail-coverts olive-yellowish, underparts with narrow brown margin and central V-mark on each feather ("double-scaled"); *yunnanensis* has uppertail-coverts straw-coloured, underparts double-scaled; *topela* similar to *subundulata* but even duller, with underpart markings paler and more elongated, underparts double-scaled; *cabanisi* has streaks above only on back, belly cream-coloured, feathers lightly double-scaled; *fretensis* has uppertail-coverts pale straw-coloured, underparts lightly double-scaled or not; *nisoria* lacks streaks above, has uppertail-coverts straw to greyish, underparts double-scaled; *baweana* has streaks above restricted to back, uppertail-coverts pale straw, underparts white and indistinctly scaled; *sumbae* is unstreaked above, has uppertail-coverts warm olive, underparts reddish and single-scaled, lacking marks on belly; *blasii* has uppertail-coverts yellow, underparts cream; *particeps* is unstreaked above, has uppertail-coverts pale olive-grey, underparts rusty and single-scaled. Voice. Soft contact call a repeated "tit-ti, tit-ti"; loud contact call "kit-teee, kit-teee", disyllabic, tone differing between sexes; flock call and flight call a rising "puip" or "sieuw!". Song a series of quiet notes followed by a short series of whistles and churrs and ending with a longer slurred whistle "weee"; variable, described also as a series of short nasal notes rising in pitch, then a twitter, a slowly rising and then falling nasal yowl, a short nasal buzz, a series of sharp notes, and so on.

Habitat. Grassland with bushes, trees and scrub, scrubby mangroves, coastal landfill, rice fields, cultivated land, wasteland and gardens. Lowlands and foothills, including mesic parts of plains; locally to 2300 m in Lesser Sundas (Timor), to 2500 m in cultivated areas of Himalayas in India, and to 3000 m on Myanmar–China border.

Food and Feeding. Seeding grasses (including rice at milky stages, *Cynodon*, *Panicum auritum*, *Digitaria marginata*, *Pennisetum purpureum*, *Eleusine*), weeds, casuarinas (*Casuarina*); also berries (including those of *Lantana*); takes nutrient-rich filamentous algae (of genus *Spirogyra*) in shallow water; some insects and household scraps taken. Forages on ground and in vegetation. Climbs stems to reach seeding heads and takes fallen seeds on ground; exploits casuarina cones high in crown. Forages in social groups throughout year, also in larger flocks outside breeding season; sometimes mixes with other estrildids.

Breeding. Breeds throughout year, in India mainly during May–Sept monsoon season and in almost all months in S Thailand (Bangkok) and Philippines; in Malay Peninsula nest-building recorded in all months except Nov and broods initiated in all months from Dec to late Sept, with last broods fledged in Oct (wild-caught males maintain testes in breeding condition nearly all year, apparently able to respond to favourable nesting conditions in any month); Feb–Sept in Singapore, Mar and Jul in Borneo, Mar–Jul (mainly Mar–Apr) on Flores, and nest-building May and Jun in Timor; outside native range, introduced populations breed at varying times, e.g. mainly Jun–Oct in West Indies (Hispaniola). In some regions usually colonial, with ten or more nests in a single tree; in other areas more solitary, with nests distant from others. Courting male holds grass in bill, carries it, then drops it as he begins to sing and posture; sings, and swings head from side to side and pivots body, then perches upright, fluffs body feathers, and bobs as he stretches and bends legs. Nest a loosely constructed ball with low side entrance, made from flowering grass-heads, strips of *Imperata* and *Pandanus* leaves and twigs (can incorporate 180 to more than 1000 grass-heads, or 5–300 strips of grass blades), internal chamber lined with fine grass, well concealed in grass, ferns, palms, creepers, orchids or other epiphytes, to height of 13 m (rarely below 4 m) in bush or tree; sometimes uses old nest of other bird. Clutch 3–6 eggs, larger clutches presumed result of two or more females laying in same nest; observations of two females at nest in Malay Peninsula, and some nests contain large broods of mixed ages (e.g. both newly hatched and well-advanced young, or fresh eggs laid alongside brood of advanced nestlings), and suspected instance of three adults building a nest; incubation period 14 days; nestling skin purplish-grey, sparse grey down on scapular, dorsal and femoral regions, swollen gape whitish, bordered black and with black marks on oral surface, palate whitish with black bar, behind it the mouth yellowish-white, tongue pink with black ring and below it a black crescent; nestling period 18 or 19 days. Broods of up to five young fledge from a single nest.

Movements. Resident. Some local movements influenced by ripening of grain crops; in Malay Peninsula, two adults recovered at 5 km and 17 km from ringing site.

Status and Conservation. Not globally threatened. Common to very common throughout most of range; somewhat uncommon on some islands of Lesser Sundas. First seen in W & S Borneo in 1974, and may have been introduced or possibly colonized from elsewhere (similar in appearance to individuals in Java). Introduced, either deliberately or by accident (through escaped cagebirds), in many parts of the world; in Australia, for example, introduced in SE Queensland in 1930s and in E New South Wales probably in 1920s, and now very common along most of E coast of Australia. In many areas regarded as an agricultural pest, feeding in large flocks on cultivated cereal grains and rice. In SE Asia, widely trapped in large numbers for Buddhist religious purposes, but most birds are later released.

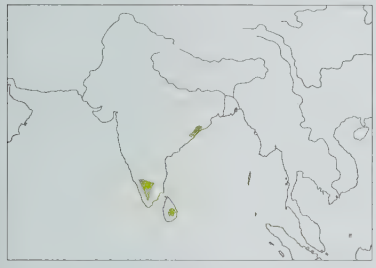
Bibliography. Baptista & Horblit (1990), Baptista *et al.* (1999), Barrett *et al.* (2003), Beckham (2009), Bielfeld (1992), Coates & Bishop (1997), Dickinson (2003), Dickinson *et al.* (1991), Fisher & Hicks (2006), Goodwin (1982), Grimmett *et al.* (1999), Hall (1962), Higgins *et al.* (2006), Hume (1873), Immelmann *et al.* (1977), Kennedy *et al.* (2000), LeCroy (1999), MacKinnon (1988), Mann (2008), Mayr (1944), McCarthy (2006), Morris (1958), Moynihan & Hall (1954), Myers (2009), Nicolai & Steinbacher (2001), Noske (2003), Phillips (1948), Raffaele *et al.* (2003), Rasmussen & Anderton (2005b), Restall (1992, 1995, 1996b), Roberts (1992), Robson (2000, 2002), Round (2008), Sharma (1987b), Smythies (1940), Smythies & Davison (1999), Verheijen (1964), Wang Luan Keng & Hails (2007), Wells, D.R. (2007), White & Bruce (1986), Whitten, Mustafa & Henderson (1987).

109. Black-throated Munia

Lonchura kelaarti

French: Capucin à ventre roux **German**: Bergbronzemännchen **Spanish**: Capuchino Golinegro
Other common names: (Ceylon/Sri Lanka) Hill Munia, Rufous-bellied Munia/Mannikin, Rufous-breasted Munia; Jerdon's Munia/Mannikin (*jerdoni*)

Taxonomy. *Munia kelaarti* Jerdon, 1863, Sri Lanka.
Three subspecies recognized.
Subspecies and Distribution.
L. k. vernayi (Whistler & Kinnear, 1933) – E India (S Orissa and NE Andhra Pradesh).
L. k. jerdoni (Hume, 1873) – SW India (S Karnataka, Kerala and W Tamil Nadu).
L. k. kelaarti (Jerdon, 1863) – Sri Lanka.



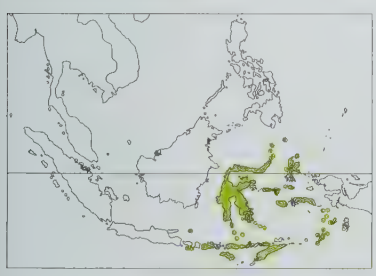
Descriptive notes. 12 cm; 9·5–17 g. Male nominate race has face to throat and centre of breast black, crown to lower back brown with whitish shaft streaks, rump black with small white cruciform spots, uppertail-coverts brown, fringed with dull gold or dull greenish-gold, upperwing and tail dark brown; rear ear-coverts to side of upper breast tinged dull pinkish-fawn, rest of underparts blackish with white anchor-shaped markings, becoming longer streaks on undertail-coverts; iris dark brown, eyering dark grey; bill mostly blackish, with triangular pale bluish-grey base of lower mandible; legs grey. Female is very like male, but often more spotted on rump. Juvenile is unmarked brown above from crown to uppertail-coverts, cheek buff, throat, belly and undertail-coverts buff, breast light rufous with thin black bars, bill dark grey. Race *jerdoni* is black on crown from bill to above eye, rump paler brown than nominate and unspotted (or with small white spots), ear-coverts to side of breast buff, lower breast to belly pinkish-fawn, cross-marks restricted to lower belly and undertail-coverts, juvenile warmer brown above and duller and more weakly barred below than nominate, undertail-coverts indistinctly streaked; *vernayi* is paler than previous, black on crown restricted to forehead, rump brown with pinkish-white cross-like marks, uppertail-coverts light yellowish-brown, ear-coverts to side of breast buff, breast and upper abdomen pale pinkish-buff, lower belly pearly pink with cross-marks, juvenile paler brown above. Voice. Not well known. Contact call a short, high-pitched nasal "éénh"; song a series of 5 notes.
Habitat. Forest edge and grassy clearings, *Lantana* scrub, tea and coffee plantations, and gardens; from foothills to 2100 m.
Food and Feeding. Grass seeds, flowers and seedheads of chickweed and groundsel, rice; probably also some insects. Takes small seeds from ground. Forages in small groups; in non-breeding season in larger flocks, often mixed with other members of its genus.
Breeding. Season prolonged, peak in monsoons during Mar–May and Aug–Nov. No information on courtship display. Nest built by both sexes, a compact sphere made from grass, lined with finer grass, often placed in tree or against building. Clutch 5–7 eggs, larger clutches of 8–12 eggs probably laid by two females; hatchling has pale skin with sparse light grey down on back, palate pale yellow with black bar; no information on incubation and nestling periods.
Movements. Resident; some seasonal movements, descends from higher altitudes in winter.
Status and Conservation. Not globally threatened. Locally common. An old record from near Belgaum, in NW Karnataka (Western Ghats), is considered dubious; confirmation required.
Bibliography. Ali & Ripley (1974), Goodwin (1982), Grimmett *et al.* (1999), Henry (1955), Legge (1880), Majumdar (1978), Mayer (1986), McCarthy (2006), Nicolai & Steinbacher (2001), Phillips (1948), Rasmussen & Anderton (2005b), Restall (1996b), Stuart Baker (1934).

110. Black-faced Munia

Lonchura molucca

French: Capucin jacobin **Spanish**: Capuchino Carinegro
German: Wellenbauch-Bronzemännchen
Other common names: Moluccan Munia/Mannikin/Finch

Taxonomy. *Loxia molucca* Linnaeus, 1766, Ambon.
Proposed race *vagans* (described from Tukangbesi Is) is treated as a synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
L. m. molucca (Linnaeus, 1766) – Talaud Is, Sangihe, Siau, Ruang, Sulawesi and associated islands and archipelagos (S to Kalao, Kalaotoa and Tukangbesi), Sula Is, and Moluccas from Morotai and Halmahera S to Buru, Seram, Tayandu Is and Kai Is.
L. m. propinqua (Sharpe, 1890) – Kangean Is (off NE Java), Lembongan and Nusa Penida (both off S Bali), and Lesser Sundas (Sumbawa, Komodo, Sumba, Flores, Paloe, Besar, Adonara, Pantar, Alor, Timor and Tanimbar Is).



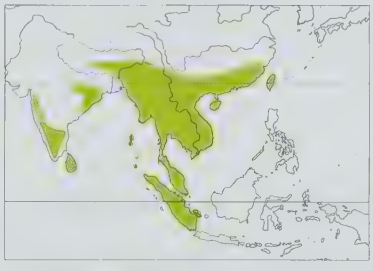
Descriptive notes. 10–11 cm; 12 g. Male nominate race has head to breast black, nape to back and upperwing-coverts brown, upper mantle with indistinct barring, rump white with wavy fine black bars, uppertail-coverts black, upperwing dark brown, tail blackish; lower breast to undertail-coverts white with fine dark bars; iris dark brown, eyering grey; bill dark grey above, pale bluish-grey below; legs grey. Female is very similar to male, but back more extensively barred, pale neck patch less distinct. Juvenile is brown above, darker on forehead, crown and lores, with rump and underparts paler tan, the rump, uppertail-coverts and undertail-coverts with indistinct brown bars; like adult by c. 3 months. Race *propinqua* slightly paler brown above, lacks bars on upperparts, has fewer and not-so-black markings on underparts. Voice. Call a buzzy "tissip" or "t'sip"; song a run of wheezing "peep" and "wheee" sounds.
Habitat. Grassy and bushy areas, rice paddies, cotton grass (*Imperatum arundinacea*), and cultivated lands; sea-level to 1150 m.
Food and Feeding. Seeds of grasses and herbs; possibly also some small insects. Feeds both while perched on stem and while on the ground. Usually singly, in pairs and in small flocks.
Breeding. Breeds at end of rainy season and beginning of dry season, Jul–Sept and Jan, in Sulawesi; nests in Mar–Jun on Flores; juveniles seen in May–Jul on Sumba and in Jun on Timor. Male in undirected display leans forward, tail horizontal; in directed display to female, he swivels from side to side, and hops towards her, swaying and twisted towards her, bows, and gives "inverted curtsey" display by straightening legs and raising body upright, head upright, belly feathers fluffed; when female crouches, male becomes more upright, hops closer and attempts to mount. Nest a ball of grass, placed in tree or in paddy grass. Clutch 4–5 eggs; incubation period 15–16 days; nestling skin flesh-coloured, one or two tufts of white down on back, gape with whitish swollen margin, palate cream with thin black bar and two small spots behind it, tongue with black ring and black tip; nestling period 18–21 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Generally common to fairly common; widespread throughout Wallacea. Very common on Flores and Tanahjampea; appears to be uncommon in far N of range (Talaud Is, Sangihe, Siau), in SE Sulu Is (Sanana), in Halmahera, in Kai Is (Kai Kecil) and on Timor. Not shy or wary of man.
Bibliography. Beckham (2009), Coates & Bishop (1997), Dunning (2008), Goodwin (1982), MacKinnon (1988), Mayr (1944), Nicolai & Steinbacher (2001), Noske (2003), Restall (1996b), Riley & Mole (2001), Stresemann & Heinrich (1940), Trainor (2002), Verheijen (1964), Watling (1983), White & Bruce (1986).

111. White-rumped Munia

Lonchura striata

French: Capucin domino **Spanish**: Capuchino Culiblanco
German: Spitzschwanz-Bronzemännchen
Other common names: Sharp-tailed/Long-tailed/Striated/White-backed/Hodgson's Munia, White-rumped Mannikin, Striated Mannikin/Finch; Bengalese Munia (races other than nominate); Bengalee, Bengalese/Society Finch (domesticated varieties)

Taxonomy. *Loxia striata* Linnaeus, 1766, Bourbon Island [=Reunion]; error = Sri Lanka.
Has been thought to form a superspecies with *L. leucogastroides*. All races apart from nominate sometimes considered a separate species, but the two forms appear to intergrade in SE India. Taiwan population sometimes separated as race *phaethontoptila*, but appear hardly different from *swinhoei*, and therefore included within latter. Proposed race *explita*, a replacement for preoccupied *sumatrensis* (described from Tanjong Kassan, in Sumatra), is treated as a synonym of *subsquamicollis*. Six subspecies recognized.
Subspecies and Distribution.
L. s. striata (Linnaeus, 1766) – W & NE peninsular India, and Sri Lanka.
L. s. acuticauda (Hodgson, 1836) – N India (E from Uttarakhand) and S Nepal E in Himalayan foothills to Bangladesh, Arunachal Pradesh, Myanmar (except S), NW Thailand, N Laos and NW Vietnam (W Tonkin).
L. s. fumigata (Walden, 1873) – Andaman Is.
L. s. semistriata (Hume, 1874) – Nicobar Is.
L. s. subsquamicollis (Stuart Baker, 1925) – S Myanmar (Tenasserim), Thailand (except NW), C & S Laos, Vietnam and Cambodia S to Singapore, Sumatra and Bangka I.
L. s. swinhoei (Cabanis, 1882) – S & SE China (E from Yunnan), NE Vietnam (E Tonkin), Hainan I and Taiwan.
Introduced in Japan.



Descriptive notes. 11–12 cm; 9·5–13 g. Nominate race has forehead, face and throat to upper breast blackish-brown, crown to back dark brown with fine pale shaft streaks, rump white, uppertail-coverts brown, tail blackish; lower breast, belly and flanks white, lower belly and undertail-coverts brown; iris dark brown to dark red-brown, eyering grey; bill dark grey above, pale blue-grey below; legs grey. Sexes alike. Juvenile is rufous-brown with indistinct streaks above, rump buffy grey, breast light rufous, underparts buffy grey, undertail-coverts darker buff-grey, bill grey; adult plumage acquired at c. 3 months. Race *acuticauda* has head and breast brown (not black), back variably streaked whitish, tail feathers pointed, breast with buff scallops, belly whitish with fine dark scaling; *fumigata* has back unstreaked brown, tail feathers pointed, upper breast often with reddish-brown feather fringes, belly unmarked white with creamy-buff wash; *semistriata* has back brown with few pale streaks, breast with fine pale edgings, belly unmarked creamy white; *subsquamicollis* is dark brown with whitish streaks above, tail feathers pointed, breast dark brown, breast feathers scalloped, belly whitish, lower belly and undertail-coverts rufous brown; *swinhoei* similar to *acuticauda*, but more profusely marked, with blackish foreface and throat contrasting strongly with paler ear-coverts and breast, which have broader pale buff shafts and scallops, belly and flanks with more intense greyish scaling. Voice. Loud call or distance call of male a single "peep!", female gives double or churring "trtrrrt". Song a rapid set of ascending and then descending notes, sometimes with dry metallic twitter, "pit pt pit spee boyee", or "prt prt prt, spee, boyee", with downturned note at end; individual males have distinctive songs that differ from those of other local males.
Habitat. Dry open grassland to shrubby open country, forest edge, weedy clearings, thickets, plantations, clearings with bushes, village gardens, rice fields. In India mainly below 1200 m, moving upslope in summer to 2500 m; to mountain summits above 2000 m in Peninsular Malaysia.
Food and Feeding. Grass seeds, mainly rice, also of other grasses (including *Eragrostis*), bamboo and sedge (Cyperaceae); also seeds from casuarina (*Casuarina*) cones; takes filamentous green algae (of genus *Spirogyra*) from shallow water. Takes seeds both on the stem and fallen on the ground, also near tops of bamboo; feeds on seeds from casuarina cones high in trees. Social, usually in small groups of 6–20 individuals, sometimes in larger flocks; occasionally in pairs.
Breeding. Season prolonged, nearly all year in India (mainly Feb–Sept) and Thailand, and all year (mainly Jan–Aug) in Malay Peninsula; peaks of nesting activity coincide with periods of ripening rice. Male crouches, legs bent, belly and nape feathers ruffled, tail spread and held higher than body, approaches female as he pivots from side to side: in display he twists from side to side, bouncing up and down at end; in higher-intensity courtship he perches upright, erects body feathers more fully, raises head, sings with open bill, and faces female. Male brings nesting material and female places it into nest, an untidy ball of coarse grass stems and grass-heads, and leaves of bamboo, lined with fine grass and other fibres, sited 1·5–8 m above ground in bush or tree (often in

garden) or in grass; often built in existing cavity; adults defend area of only c. 1 m around nest. Clutch 3–6 eggs, larger clutches (to 10) the product of more than female; in captivity, incubation period 14 days; nestling skin pink, naked or with some down, gape white, oral surface black, palate yellow with U-shaped curved bar and two small spots behind it, and ring around tongue (mouth of wild birds in Sri Lanka and E China the same as that of dark domesticated Bengalese Finch; in nestlings of pied and white-plumaged Bengalese Finch, melanin pigment is reduced or lacking in skin and palate, palate bar is sometimes broken into discontinuous lines or is lacking, and marks on and under tongue vary); in captivity, nestling period 21–25 days, young independent 35–38 days after hatching.

Movements. Resident. Apparently highly mobile, as marked individuals in Malay Peninsula had low recapture rate; local seasonal movements include altitudinal migration.

Status and Conservation. Not globally threatened. Common to locally common; uncommon in some parts of range. Locally common in Indian Subcontinent and in China; common throughout SE Asia, local in Singapore; locally common to scarce in Sumatra and Bangka I. In Singapore was formerly common and widespread, but numbers greatly reduced and now found in only a few wooded areas and cultivation; considered secure only on islands of Ubin (maximum population of 20 individuals) and Tekong (population no more than 15 individuals). Regularly trapped for cagebird trade, mostly in Malay Peninsula (where this activity illegal); in Thailand trapping now on a far smaller scale than previously, and this species remains very common; no evidence of trapping for trade in Sumatra, where this species probably too scarce to make such activity worthwhile. In India, often trapped and then purchased for subsequent release, as part of religious or superstitious practices. Very widespread in captivity, where domesticated strains known by various names, e.g. "Bengalese Finch", "Bengalee", "Society Finch".

Bibliography. Avery (1978, 1980), Baptista (1995), Baptista & Horblit (1990), Baptista *et al.* (1999), Beekham (2009), Bielfeld (1996, 2008), Clayton & Prŏve (1989), Dickinson (2003), Dietrich (1980, 1983), Eisner (1957, 1960), Goodwin (1982), Grimmett *et al.* (1999), Honda & Okanoya (1999), Hume (1873), LeCroy (1999), MacKinnon & Phillipps (1993), van Marle & Voous (1988), Mayer (1995c), McCarthy (2006), Medway & Wells (1976), Morris (1958), Nicolai & Steinbacher (2001), Payne (2005a), Payne, Payne & Woods (1998), Payne, Payne, Woods & Sorenson (2000), Phillips (1948), Rasmussen & Anderton (2005b), Restall (1995, 1996b), Robson (2000, 2002), Round (2008), Smythies (1986), Wang Luan Keng & Hails (2007), Wells, D.R. (2007), Whitten, Damanik *et al.* (1987).

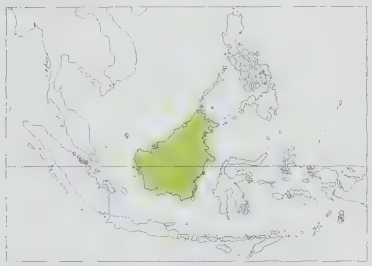
112. Dusky Munia

Lonchura fuscans

French: Capucin sombre **German**: Borneobronzemännchen **Spanish**: Capuchino Sombrío
Other common names: Dusky Mannikin, Borneo Munia/Mannikin, Black(!) (Borneo) Mannikin

Taxonomy. *Spermestes fuscans* Cassin, 1852, Borneo.
Monotypic.

Distribution. Natuna Is, Borneo (including Banggi I, off N coast), and Mapun I (in extreme SW Philippines).



Descriptive notes. 11 cm; 9·5 g. Plumage is mostly dusky brown, feathers of crown faintly streaked pale brown, feathers of underparts with black edges (giving dark-scalloped appearance); iris dark brown, eyering grey; bill blackish above, pale grey below; legs blackish-grey. Sexes alike. Juvenile is brownish above, pale brown below, bill black; lower mandible turns pale about a month after fledging, moult to adult plumage completed after 4 months. Voice. Calls a shrill "pee pee" and a thin "chirrup", and in flight a low "teck teck". **Habitat**. Rice fields and grassland, along riverbanks at forest edges, secondary scrub and cultivated areas; from sea-level to 500 m.

Food and Feeding. Rice, other grass seeds, seeds of sedges (Cyperaceae); also insects. Creeps low in vegetation, and feeds also on ground. Takes seeds from turned clods and buffalo dung, as well as from seedheads and ground.

Breeding. Records in nearly all months, varying with local rice crop, mainly Oct–Feb. No information on courtship displays. Nest built from grass, often with mass of grass-heads over side entrance, in dark site, usually 5–15 m above ground (as high as 75 m in Niah caves) in crevice, low bush, dense foliage of tree, hollow tree or roots of fallen tree; sometimes takes over nest from smaller *L. atricapilla*; nest used for roosting, as well as breeding. Clutch 4–6 eggs, larger clutches (to 8 eggs) probably the product of more than one female; incubation period 14 days; nestling skin pink, down lacking or a few tufts of light grey on back, swollen gape blue-white at hatching and white at fledging, palate whitish with long black bar and two spots behind bar; nestling period 20–23 days.

Movements. Resident.

Status and Conservation. Not globally threatened. Not well known. Appears to be common in Borneo; status on Cagayan Sula uncertain, probably common. So far as can be ascertained, trapping for cagebird trade is comparatively rare in Borneo, and this species almost unknown in dealers stocks.

Bibliography. Davison & Chew Yen Fook (1996), Dickinson *et al.* (1991), Dunning (2008), Glatthaar & Ziswiler (1971), Goodwin (1982), Kennedy *et al.* (2000), MacKinnon & Phillipps (1993), Mann (2008), Mayer (1984), McCarthy (2006), Myers (2009), Nicolai & Steinbacher (2001), Restall (1996b), Smythies & Davison (1999), Vriends & Heming-Vriends (2002), Whitehead (1893).

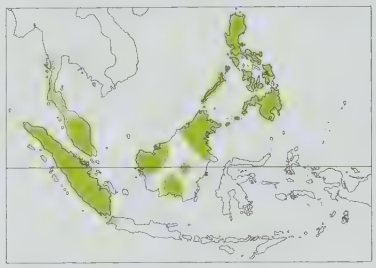
113. White-bellied Munia

Lonchura leucogastra

French: Capucin à ventre blanc **Spanish**: Capuchino Ventriblanco
German: Weißbauch-Bronzemännchen
Other common names: White-bellied Mannikin, White-breasted Munia/Mannikin

Taxonomy. *Amadina leucogastra* Blyth, 1846, Malacca, Peninsular Malaysia.
Sometimes considered conspecific with *L. leucogastroides*, which it closely resembles in plumage; recent study of mitochondrial phylogeny indicated that each is the other's closest relative. Six subspecies recognized.

Subspecies and Distribution.
L. l. leucogastra (Blyth, 1846) – extreme S Myanmar (S Tenasserim), S Thailand, Peninsular Malaysia, Sumatra and W Java.
L. l. everetti (Tweeddale, 1877) – N Philippines (Luzon, Mindoro and Catanduanes).
L. l. manueli Parkes, 1958 – C & S Philippines.
L. l. palawana Ripley & Rabor, 1962 – W Philippines (Palawan) and N & E Borneo (Sabah, Brunei, NE Sarawak and NW part of E Kalimantan).
L. l. smythiesi Parkes, 1958 – W Borneo (W Sarawak and W Kalimantan).
L. l. castanonota Mayr, 1938 – S Borneo.



Descriptive notes. 11 cm; 10·6–12·3 g. Nominate race has head to back and rump dark brown, back and rump with pale shaft streaks on, uppertail-coverts brownish-black, tail quills dark brown with straw-yellow fringes; face to breast black, belly white, incomplete streaks and bars on lower breast and flanks, undertail-coverts blackish-brown; iris dark brown, eyering grey; bill grey, base of lower mandible pale blue-grey; legs grey. Sexes alike. Juvenile is similar to adult in pattern, but lighter brown, face and breast brown, pale shaft streaks restricted to mantle and back, bill blackish-horn. Races differ mainly in prominence and extent on streaks above: *everetti* has streaks from nape to lower back, tail edged straw; *manueli* has back earth-brown, uppertail-coverts brown, streaks from nape to lower back; *palawana* has pale streaks from crown to rump; *smythiesi* is streaked from back to rump; *castanonota* is distinctive, chestnut from crown and rear face to back and wings, bib and flanks blacker brown. Voice. Call of male "twyrt", of female "tee tee tee"; alarm a strong "tik!" or "tchek!". Song "di-di-ptcheee-pti-pti-ti-pteep!" (lacks whistled "weeeeee").

Habitat. Lowland forest, forest edge, peatswamp-forest, fern tangles, scrub of disturbed forest, rice fields and wet grasslands, grassy fields along tracks and around rural houses, stables and latrines. Lowlands and hills; in Malay Peninsula lowlands to 700 m.

Food and Feeding. Grass seeds, including those of rice, *Brachiaria distachys* and *Digitaria marginata*, also sedges (Cyperaceae) and seeds of weeds. Forages in small groups, sometimes in pairs.

Breeding. Season Mar–Jun in SE Asia, Dec to late May and early Jun in Malay Peninsula; in Philippines, Mar–May on Luzon and Mindanao and Dec on Palawan; Feb–Jun and nest-building Dec in Borneo. Solitary or in small colonies. Courting male holds a grass stem, hops about and calls excitedly, drops stem as he begins to sing in upright posture with belly fluffed; crouches and bows towards female, yellow edges of tail feathers directed towards her as he raises tail over back and spreads it in display (much as for other munia species with distinctively coloured rump and tail); in high-intensity courtship, male bows towards female and swings body from side to side, and bobs up and down on perch, feet clearing perch on upward jump. Nest a loose oval structure with side entrance, made from grass stems and flowering heads or palm leaflets, bamboo leaves or other grass and fibres, placed 1·5–3 m above ground in crown of understorey or forest-edge sapling, among dead foliage hanging off branch. Clutch 4–6 eggs, larger clutches (up to 9) apparently the result of laying by more than one female; incubation period 14–16 days; nestling skin pink, naked or with one or two tufts of down on back, gape-flange whitish with black streak on upper and lower mouth-lining (upper streak broader), palate yellowish with narrow black arc and two mediolateral spots, tongue unmarked or with two black spots, lower mouth with long black arc extending nearly to gape; nestling period 19–21 days; young independent 2 weeks after fledging.

Movements. Resident; some seasonal altitudinal movements in Borneo.

Status and Conservation. Not globally threatened. Locally common in Malay Peninsula; fairly common to rare in Philippines; rare and local in Borneo; uncommon to rare in Sumatra; one record from W Java, involving male on nest with eggs near Bogor. In Philippines, most of this species' forest habitat has been destroyed; in 1990–1991 small numbers located on Luzon and on Mindanao, and reasonable numbers present on Palawan, but possibly extirpated in some other parts of the archipelago. Habitat destruction in rest of the species' range has probably resulted in declines or even local extinctions. So far as is known, this munia is rarely trapped (legally or otherwise), and is virtually unknown in cagebird trade.

Bibliography. Baptista & Horblit (1990), Dickinson *et al.* (1991), Dunning (2008), Fisher & Hicks (2006), Goodwin (1982), Hoogerwerf (1949c), Immelmann *et al.* (1977), Kennedy *et al.* (2000), MacKinnon & Phillipps (1993), Mann (2008), van Marle & Voous (1988), Medway & Wells (1976), Myers (2009), Nicolai & Steinbacher (2001), Payne (2005a), Restall (1996b), Robson (2000, 2002), Sheldon *et al.* (2001), Smythies (1986), Smythies & Davison (1999), Wells, D.R. (2007).

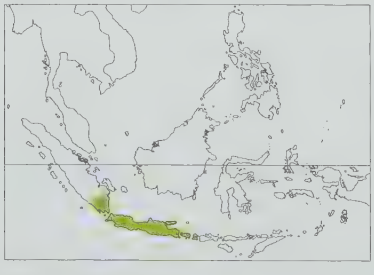
114. Javan Munia

Lonchura leucogastroides

French: Capucin javanais **German**: Javabronzemännchen **Spanish**: Capuchino de Java
Other common names: Javanese (White-bellied) Munia, Javan(ese) Mannikin, Black-rumped Munia, Black-beaked Bronze Mannikin

Taxonomy. *Munia leucogastroides* F. Moore, 1858, Java.
Has been thought to form a superspecies with *L. striata*. Sometimes considered conspecific with *L. leucogastra*, which it closely resembles in plumage; recent study of mitochondrial phylogeny indicated that each is the other's closest relative. Monotypic.

Distribution. S Sumatra, Java, Bali and Lombok.
Introduced in Singapore and S Malay Peninsula; possibly introduced in Sumatra.



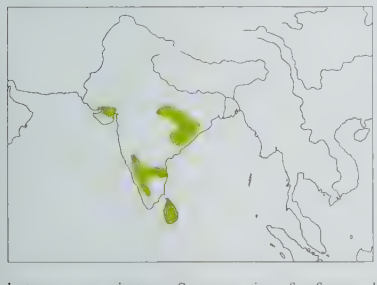
Descriptive notes. 10–11 cm; 11·7 g. Male has forehead, face and throat to breast black, crown to back dark greyish-brown, rump and uppertail-coverts black, flight-feathers and tail blackish-brown; breast and belly white, lowermost belly, thighs and undertail-coverts blackish-brown; iris dark brown, orbital ring blackish; bill dark grey to blackish above, grey to blue-grey below with palest area at base; legs grey. Sexes similar. Juvenile is buffy brown above and on breast, upperparts lack streaks, rump, uppertail-coverts and undertail-coverts tan with brown barring, belly buffy white, bill horn-black; first-year like adult, but has pale shaft streaks on mantle and scapulars, white of underparts more creamy, brown spot-like markings on lower breast and flanks (marks more U-shaped on female). Voice. Call a short "tit";

two loud contact calls, male a simple "p'tit", female a two-part "peteet!" or "chirrup". Song long and complex, lacks "wheeee" note.
Habitat. Cultivation, rice fields, old fields, edge of mangrove forest, grassland at edge of inland forest, woodlands and gardens. Sea-level to 500 m; to c. 1800 m on Lombok.
Food and Feeding. Seeds of grasses and cultivated rice, both ripe and unripe, also seeds of herbs. Forages on ground, also in vegetation, including tall grasses, trees and shrubs. Often in groups of up to ten birds, occasionally in larger flocks; also singly and in pairs. Associates with other munias at abundant food sources.
Breeding. Throughout year in Java, and in wetter part of year on Lombok; Mar–Oct in Singapore (introduced). Courtship includes a straw display; when female near, male sings, fans tail and crouches forward, tail horizontal, and, with belly feathers erected and flanks fluffed, he edges towards her and sways from side to side; when she is receptive, male takes a more erect posture, stops singing, and attempts to mount. Nest a loose ball of grasses and soft fibres, built in long grass, creepers, shrub or tree, or in potted plant hung around house; sometimes with other munia species in same tree. Clutch usually 4–6 eggs, larger clutches (to 9) presumed the product of more than one female; incubation period 13 days; nestling skin pink, bare or with one or two tufts of down, gape-flange white with black border and lined black inside mouth, palate yellowish with black horseshoe-shaped transverse bar, tongue with two spots, black sublingual mark; nestling period 18–20 days.
Movements. Resident; some local movements.
Status and Conservation. Not globally threatened. Common to locally common or very common. Locally common in S Sumatra, where possibly introduced or may have colonized from Java; very common in Bali; locally common on Lombok. Formerly widespread and very common in Java, but significant population decline since 1950. In Singapore, where introduced in early decades of 20th century, was formerly widespread and common, but has declined greatly; now uncommon to scarce and confined to rural areas and Syungai Buloh Nature Park. Record in S Peninsular Malaysia (Johor Baru) probably involved escaped cagebird. Regarded as a serious pest in rice crops, and is persecuted as a consequence. Trapped in very small numbers for trade.
Bibliography. Baptista & Horblit (1990), Coates & Bishop (1997), Dickinson (2003), Dunning (2008), Goodwin (1982), Holmes & Nash (1989), Hoogerwerf (1949a, 1962), Kuroda (1933), MacKinnon (1988), MacKinnon & Phillipps (1993), van Marle & Voous (1988), Mayer (1998b), Mayr (1938), Mayr *et al.* (1968), McCarthy (2006), Medway & Wells (1976), Nicolai & Steinbacher (2001), Restall (1996b), Robson (2000), Round (2008), Wang Luan Keng & Hails (2007), Wells, D.R. (2007), White & Bruce (1986), Whitten *et al.* (1996).

115. Tricoloured Munia
Lonchura malacca

French: Capucin à dos marron **German**: Schwarzbauchnonne **Spanish**: Capuchino Tricolor
Other common names: Black-headed Munia/Mannikin/Nun, Indian Black-headed Munia, Three-coloured Nun, Tricoloured Mannikin/Nun

Taxonomy. *Loxia malacca* Linnaeus, 1766, China, Java and Malacca; error = Belgaum, Karnataka, India.
May form a superspecies with *L. atricapilla* and *L. ferruginosa*, and sometimes considered conspecific with former or with both, the three taxa being very similar vocally. Recent study of mitochondrial phylogeny indicated that *L. atricapilla* (nominate race and *sinensis*) and *L. ferruginosa* were more closely related to each other than either was to present species. Formerly, hybrid zone between present species and *L. atricapilla* apparently existed in E peninsular India (NW Orissa S to NE Tamil Nadu); it is suggested that some apparently intermediate individuals may be plumage morphs of present species, as they occur also in Sri Lanka, well outside range of *L. atricapilla*. In a mixed captive group, these two species associated and paired assortatively; also, no interbreeding reported in Hong Kong, where escaped individuals of both breed in Mai Po marshes. Monotypic.
Distribution. Peninsular India S from Gujarat, C Madhya Pradesh and Orissa, and Sri Lanka. Introduced in Hawaiian Is, West Indies (Cuba, Jamaica, Hispaniola, Puerto Rico, Martinique), Colombia (Tolima), and Venezuela.

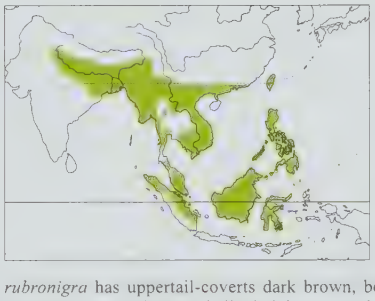


Descriptive notes. 11–12 cm; 9·8–14·4 g. Head to nape, side of neck and upper breast are glossy black, mantle to back and upperwing chestnut-brown, rump and uppertail-coverts brighter chestnut, rather short tail, dull chestnut-brown with reddish-chestnut to reddish-gold fringes, fringes widest on central pair; lower breast and flanks white, belly, thighs and undertail-coverts black; iris dark brown, eyering light grey; bill light grey; legs grey. Sexes alike. Juvenile is warm brown above, buff below. Voice. Soft contact call a quiet "tcht tcht"; loud contact call a nasal downturned "nyek, nyek", or a strong "peet!", differing between sexes in tone. Song a series of soft squeaks (virtually inaudible to human ear) followed by a long (2 seconds) thin, whining nasal descending whistle, "weeeeee".
Habitat. Grassland, wet and marshy areas, scrub, parkland; plains to 2100 m. In Venezuela, introduced population occurs in *llanos* grassland, below 300 m.
Food and Feeding. Grass seeds. Growing seeds preferred, grasps stems and climbs to fruiting head; also picks up fallen seeds on ground. Forages in pairs and small groups; also in in small or large flocks, especially in non-breeding season.
Breeding. Breeds in almost any month, mainly in monsoon season, in India; in Hispaniola (introduced) mainly Jun–Sept. Nests in small colonies, often with weavers (Ploceidae). In courtship, male holds a grass stem, and then, in upright or vertical posture, with belly feathers fluffed, he bows to female, drops grass, gives a long song and bows repeatedly (no horizontal posture or lateral pivots). Nest a ball of grass with side entrance, placed in thicket, bush, tall grass or reeds. Clutch 4–5 eggs; incubation by both parents, taking turns during day, both in nest at night, period 12–13 days; nestling skin pink, bare or with two tufts of down, gape-flange bluish-white (changing to white with age), bordered black, and gape with thick black line on inner surface above and below, palate yellowish with black bar and two black spots behind it, tongue with two spots or a black ring, black sublingual mark; nestling period c. 3 weeks.
Movements. Resident, with local movements.
Status and Conservation. Not globally threatened. Locally common in native range. Apparently fairly common in various places elsewhere in the world, where introduced. Could suffer future habitat loss though drainage of marshes, which could possibly put it at risk.
Bibliography. Anon. (2008g), Beckham (2009), Burger & Gochfeld (1988), Coates & Bishop (1997), Dickinson *et al.* (1991), Dunning (2008), Goodwin (1982), Grimmett *et al.* (1999), Güttinger (1973), Kennedy *et al.* (2000), MacKinnon (1988), MacKinnon & Phillipps (1993), Mayer (1992a, 1992b, 1993b), McCarthy (2006), Morris (1958), Nicolai & Steinbacher (2001), Payne & Sorenson (2003), Pratt *et al.* (1987), Raffaele *et al.* (2003), Rasmussen & Anderton (2005b), Restall (1995, 1996b, 2003), Restall *et al.* (2006), Ridgely & Tudor (2009), Ullrich (1998).

116. Chestnut Munia
Lonchura atricapilla

French: Capucin à tête noire **German**: Schwarzkappennonne **Spanish**: Capuchino Castaño
Other common names: Chestnut Mannikin/Nun, Black-headed Munia/Mannikin/Nun, Southern Black-headed Munia; Cream-bellied Munia ("*L. pallidiventer*")

Taxonomy. *Loxia atricapilla* Vieillot, 1807, "les Grandes-Indes" = lower Bengal, India.
May form a superspecies with *L. malacca* and *L. ferruginosa*, and sometimes considered conspecific with former or with both, the three taxa being very similar vocally. Recent study of mitochondrial phylogeny indicated that present species (nominate race and *sinensis*) and *L. ferruginosa* were more closely related to each other than either was to *L. malacca*. Formerly, hybrid zone between present species and *L. malacca* apparently existed in E peninsular India (NW Orissa S to NE Tamil Nadu); it is suggested that some apparently intermediate individuals may be plumage morphs of *L. malacca*, as they also occur in Sri Lanka, well outside range of present species. In a mixed captive group, these two species associated and paired assortatively; also, no interbreeding reported in Hong Kong, where escaped individuals of both breed in Mai Po marshes. Has apparently hybridized with *L. maja* in Malay Peninsula; proposed species *L. pallidiventer* (known only in captivity) is believed to be a hybrid. Race *brunneiceps* sometimes subsumed in *jagori*. In Borneo, proposed races *selimbauensis* (described from Selimbau, in W Kalimantan) and *obscura* (from near Sampit, in S Kalimantan) both regarded as synonyms of *jagori*. Eight subspecies currently recognized.
Subspecies and Distribution.
L. a. rubronigra (Hodgson, 1836) – foothills of N India and Nepal terai.
L. a. atricapilla (Vieillot, 1807) – N India (from Punjab E to Brahmaputra Valley, S to Bihar and N Orissa), Bangladesh, Myanmar and S China (SW Yunnan).
L. a. deignani Parkes, 1958 – Thailand (except C & NE), Indochina and SE China.
L. a. sinensis (Blyth, 1852) – Malay Peninsula and N Sumatra.
L. a. batakana (Chasen & Kloss, 1929) – NW Sumatra.
L. a. formosana (Swinhoe, 1865) – Taiwan and N Philippines (N Luzon).
L. a. jagori (C. E. Martens, 1866) – Philippines (S of N Luzon) and Borneo.
L. a. brunneiceps (Walden, 1872) – Sulawesi, Togian Is, Muna and Buton.
Introduced in Japan, Halmahera, Ambon, Palau Is, Hawaiian Is, Vanuatu, Jamaica, Martinique, and SW Ecuador (Guayas).



Descriptive notes. 11–12 cm; 10·1–15·8 g. Male nominate race has head to nape and breast glossy black, upperparts dark chestnut, rump and uppertail-coverts reddish-chestnut, tips of longest uppertail-coverts and fringes of rectrices golden-orange to pale golden-yellow; central belly to thighs and undertail-coverts black or blackish-brown; iris dark brown, eyering dark grey; bill light grey to pale blue; legs dark grey. Female is similar to male, but hood less glossy, upperparts paler chestnut, dark belly patch smaller. Juvenile is warm brown above, buff below; bill blackish, becoming dark grey soon after fledging. Race *rubronigra* has uppertail-coverts dark brown, belly and undertail-coverts black; *deignani* has uppertail-coverts chestnut, belly dark brown, undertail-coverts dusky; *sinensis* has belly brown to dark brown, undertail-coverts brown; *batakana* has rump chestnut, belly and undertail-coverts black; *formosana* has head dark brown, belly black; *jagori* has head black, nape dark brown, uppertail-coverts orange to dark brown, centre of breast and belly to undertail-coverts black; *brunneiceps* has head dark brown, uppertail-coverts orange to yellow-brown, belly and undertail-coverts dusky. Voice. Soft contact call a clear "pee" or "peet"; loud contact call "pink! pink!", female higher in pitch. Song a series of soft clicks (virtually inaudible to the human ear) followed by extended "weee..." and ending with a series of slurred notes; also described as a very quiet series of bill-snaps followed by "silent" singing and ending with faint drawn-out whistles.
Habitat. Inhabits grassland, including cogongrass (*Imperata cylindrica*), open wetlands, freshwater marshes and brackish margins of coastal mangroves, and rice paddies; also occurs in gardens. Mainly in lowlands, from sea-level up to 800 m; to 1200 m in Himalayas, to 1700 m in Borneo, and to 1150 m in Sulawesi.
Food and Feeding. Grass seeds, including rice; rice favoured food when available, taken mainly at growing milky stage. Takes seeds while perched on stem, and feeds also on the ground. Forages socially, even during breeding season; sometimes in very large flocks.
Breeding. Season mostly Jun–Sept in Indian Subcontinent and C Thailand (Bangkok area); in Malay Peninsula mid-Dec to mid-Oct (males maintain large testes for up to 53 weeks, enabling breeding in response to local surge of food supply); Mar–Aug in Singapore; breeding records all year in Borneo, Mar–Aug (and a female in laying condition in Nov) in Sabah and May–Oct in Sarawak; throughout year in Philippines. Sometimes loosely colonial. Male holds a grass stem in bill, and then, in upright or vertical posture with fluffed head, back and belly feathers, he bows head towards female, drops grass, and gives long (>10 seconds) complex song while bobbing (does not use horizontal posture or lateral pivots); courtship followed by bill-fencing and mutual preening. Nest a ball with side entrance, made from grass and leaves, lined with finer vegetation, usually 0·2–1·8 m above ground or over water in reeds, grass (including *Imperata*) or shrub (including *Melastoma malabathricum*) or in tree. Clutch 4–6 eggs in Thailand and Malay Peninsula, 5–7 in Borneo (more than one female may lay in a single nest); incubation period 12–13 days; nestling skin pink, naked, gape-flange white, bordered with black streaks on inner surface, palate white with black band, tongue with two small spots, and a sublingual chevron; nestling period c. 3 weeks (or longer in captivity); young tended by both parents, independent at 6–7 weeks of age.
Movements. Resident, with local movements; seasonal altitudinal migration noted in Borneo.
Status and Conservation. Not globally threatened. Common to locally abundant. Abundant in parts of Indian Subcontinent. Locally common in SE Asia; perhaps extirpated in Laos, where formerly common on river floodplain. Fairly common in Sumatra, mainly in E lowlands and islands, and abundant in Borneo. Common in Philippines and in Sulawesi. Outside native range, introduced populations in various parts of the world apparently doing well: e.g. in Vanuatu, now widespread on Santo (and local on Malakula, where possibly recently colonized); and first recorded on Ambon in 1980, when found to be common near the airport. Removal or elimination of fallow weed cover from intensively managed rice cultivation results in reduction of local populations of this and other munias.

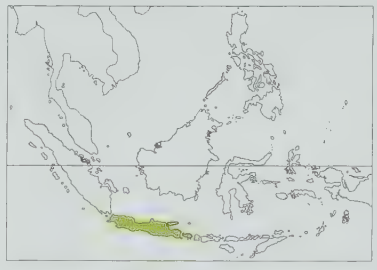
Bibliography. Coates & Bishop (1997), David & Gosselin (2002a), Dickinson (2003), Duckworth & Tizard (2003), Dunning (2008), Goodwin (1982), Hodgson (1836), LeCroy (1999), Mann (2008), Mayr (1993b), Mayr *et al.* (1968), Medway & Wells (1976), Nicolai & Steinbacher (2001), Raffaele *et al.* (2003), Rasmussen & Anderton (2005b), Restall (1995, 1996b), Restall *et al.* (2006), Robson (2000, 2002), Round (2008), Sheldon *et al.* (2001), Smythies & Davison (1999), Snow (1997), Wang Luan Keng & Hails (2007), Wells, D.R. (2007), White & Bruce (1986), Whitten, Mustafa & Henderson (1987).

117. White-capped Munia

Lonchura ferruginosa

French: Capucin marron **German**: Weißkappennonne **Spanish**: Capuchino Coroniblanco
Other common names: Black-throated Munia(!)

Taxonomy. *Loxia ferruginosa* Sparrman, 1789, "in India Orientali" = Java.
May form a superspecies with *L. malacca* and *L. atricapilla*, and sometimes considered conspecific with one or both, the three taxa being very similar vocally. Recent study of mitochondrial phylogeny indicated that present species and *L. atricapilla* (nominate race and *sinensis*) were more closely related to each other than either was to *L. malacca*. Monotypic.
Distribution. Java and Bali. Introduced in Palau Is.
Descriptive notes. 11–12 cm; 10 g. Forehead to nape and face are whitish, upperparts chestnut, edges of uppertail-coverts and central rectrices reddish to reddish-yellow; chin to breast black, flanks broadly rufous, this colour extending across lower breast to form rufous band, belly to undertail-coverts black; more rarely, entire underside from chin to vent (including flanks) black; iris dark brown, eyering dark grey; bill light grey; legs grey. Sexes alike; female sometimes with broader rufous breastband. Juvenile is warm brown above, buff below. VOICE. Call a whistled "veet veet"; song a very quiet, almost inaudible series of clicks and wheezing notes followed by long drawn-out "wheeee".



Habitat. Grasslands, wetlands with grasses, reeds and sedges (Cyperaceae), rice fields; occurs in marshy areas near Indramayu (W Java). From sea-level to 1500 m.
Food and Feeding. Seeds of grasses, seeding heads, especially rice. Climbs and hops up stems, and reaches forward to seedhead. Often forages in large flocks.
Breeding. Season Dec–Jun in W Java. Courting male, with a stem held in bill, flies around and, when female near, he drops stem, perches near her and begins a song and dance; stands erect, leaning forward slightly, with feathers of head, belly and flanks raised, and, with head pointing slightly down, he bobs up and down, feet sometimes leaving perch. Nest a ball with side entrance, made from grass stems and leaves, concealed in thicket of long grass or other dense vegetation. Clutch 4–7 eggs; incubation period 13–14 days; nestling skin pinkish, naked except for two tufts of down, no information on mouth pattern; nestling period c. 3 weeks; young fed by both parents for at least 2 weeks after fledging.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common in native range. Introduced in Singapore, apparently unsuccessfully; introduced on Babeldaob (Babelthuap), largest of Palau Is, where apparently common. Trapped for trade both in Java and in Bali, but seen only very irregularly in bird markets, always in very small numbers and always with *L. maja*. Can be a serious pest in rice fields. Continued drainage of wetlands could pose problems for this species.
Bibliography. Davison & Chew Yen Fook (1996), Goodwin (1982), Hoogerwerf (1949a), Immelmann *et al.* (1969), MacKinnon (1988), MacKinnon & Phillipps (1993), Nicolai & Steinbacher (2001), Peters (1983), Restall (1996b), Riley & Mole (2001), Robson (2000).

PLATE 27 ➤



PLATE 27

inches 2

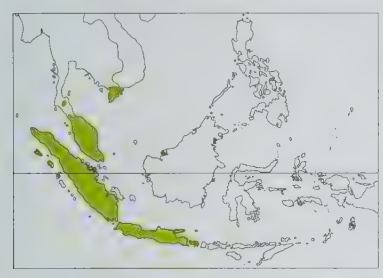
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118. White-headed Munia

Lonchura maja

French: Capucin à tête blanche **German**: Weißkopfnonne **Spanish**: Capuchino Cabeciblanco
Other common names: White-headed Mannikin/Nun, Pale-headed Munia(!)/Mannikin, Maya Munia

Taxonomy. *Loxia maja* Linnaeus, 1766, East Indies = Malacca, Peninsular Malaysia.
Has apparently hybridized with *L. atricapilla* in Malay Peninsula. Birds from Da Lat, in S Vietnam, described as race *vietnamensis*; said to be darker, with tawny head, and white restricted to region around eye, but no supporting evidence available. Monotypic.
Distribution. S Thailand, S Vietnam, Peninsular Malaysia, Singapore, Sumatra (including Simeulue I, Nias I and Batu Is), Java and Bali.
Introduced in Japan (N of Osaka) and Ryukyu Is (Okinawa).



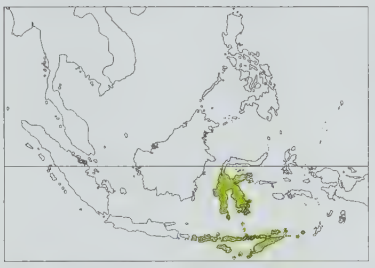
Descriptive notes. 11 cm; 11–14 g. Male has head white to smoky pinkish, nape brownish-grey, upperparts, including upperwing, dark brown, uppertail-coverts glossy coppery brown, tail dark brown, some rectrices edged copper; throat whitish, breast greyish-brown, flanks brown, belly and undertail-coverts black; iris dark brown, black orbital ring; bill light blue-grey, with whitish tip and cutting edges; legs grey. Female is very like male, often not fully separable, but crown and nape somewhat darker and underparts paler. Juvenile has head and upperparts brown, chin and throat sandy white, merging with brownish head, underparts buff, bill grey. VOICE. Call a soft "preet" or "prit", male call higher in pitch and longer than that of female; in nest, one bird coaxes another to join at roosting with a purring "wheeze, waaaaargh waaaargh". Song a series of clicks and then a drawn-out "weeeee heeheeeheeeheeeheee".
Habitat. Open grassland, rice fields, marshes and reedbeds, upland grassy areas, including fallow weeds, *Imperata* grassland, cultivation and village gardens; large flocks roost in reedbeds. From sea-level to 1500 m; in Malay Peninsula, those at higher elevations are moving through area.
Food and Feeding. Rice seeds (mainly at sub-ripe milky stage), and seeds of smaller grasses, sedges (Cyperaceae) and dicot herbs (*Amaranthus* and the like). Nestlings fed with unripe seeds. Takes seeds from the ground and while perched; climbs on stems, sometimes weighing them down in order to reach seedheads. Forages in pairs and sometimes small groups during breeding; at other times in flocks, small or large, and often mixed with other munias. May trap-line potential feeding sites.
Breeding. Season Feb–Oct in Malay Peninsula, Feb–Jul in Singapore and Feb in Java; wild-caught males maintained large testes for as long as 54 and 66 weeks, and thus (as with *L. punctulata* and *L. atricapilla*) potentially able to respond immediately to new breeding opportunity. Sometimes nests in loose colonies. In courtship, male holds grass in bill, and in upright posture, with feathers of head and body fluffed, bill held forward and open while singing, he bobs to female. Nest a ball with entrance hole beneath a shelf or with short spout, made from grass, lined with fine grass parts, built 1–7 m above ground (mostly below 4 m) in low shrub, rice, tall grass, palm or garden plant; sometimes takes over covered nest of another species. Clutch 3–7 eggs, usually 4–6; incubation period 12–13 days; nestling skin pink at hatching, naked or with tufts of down, bluish-white gape-flange bordered with black, yellow palate with black arc, and black streak on each side of palate near gape, unmarked tongue and a short mark near bill tip; nestling period 21 days.
Movements. Resident. Flocks move about after young have fledged.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common in SE Asia; fairly common and widespread in Sumatra (and islands), Java and Bali. Birds of this species in Borneo presumably of captive origin; those reported in S Vietnam (Cochinchina) might also be of captive origin. Following introduction, appears to have become established as a breeding bird on Okinawa, and may also be established N of Osaka, in Japan. Large numbers trapped for trade, especially in Java.
Bibliography. Beckham (2009), Dickinson (2003), Dunning (2008), Goodwin (1982), Holmes & Nash (1989), Lever (1987), MacKinnon (1988), MacKinnon & Phillipps (1993), Mann (2008), van Marle & Voous (1988), Mayer (1994a), McCarthy (2006), Medway & Wells (1976), Nicolai & Steinbacher (2001), Restall (1995, 1996b), Robson (2000, 2002), Wang Luan Keng & Hails (2007), Wells, D.R. (2007), Whitten, Damanik *et al.* (1987).

119. Pale-headed Munia

Lonchura pallida

French: Capucin pâle **German**: Blasskopfnonne **Spanish**: Capuchino Pálido
Other common names: Pale-headed Mannikin/Nun, Pallid Munia/Mannikin/Finch, Pale/Sunda/Celebes Munia

Taxonomy. *Munia pallida* Wallace, 1864, Lombok and Flores. Birds from Gulf of Valley, in NC Sulawesi, described as a geographical race, *subcastanea*, purportedly darker rufous in colour, but plumage no different from that of specimens from elsewhere in Sulawesi. Monotypic.
Distribution. C & S Sulawesi, Kalaotoa, Madu, and Lesser Sundas (Lombok E to Wetar, Romang, Kisar, Sermata and Babar, S to Sumba, Sawu, Ndao, Roti and Timor).
Descriptive notes. 11 cm; 12 g. Head is pale creamy white, nape greyish, mantle to back, upperwing and tail dark brown, rump and uppertail-coverts rufous-brown; throat and breast grey, belly and flanks light rufous, central belly and undertail-coverts brown; iris dark brown, eyering grey; bill pale blue-grey; legs grey. Sexes alike. Juvenile has head and back uniformly brown, wings and tail brown, belly pale buff, legs paler grey than adult's; bill blackish, soon changing to blue-grey. VOICE. Loud contact call of male "pseet!", of female "psit!". Song a chatter with high-pitched "weeeeeeeee".
Habitat. Open grassland, rice paddies and grassy scrub; sea-level to 1000 m.
Food and Feeding. Grass seeds, rice. Takes both growing seeds on stems and fallen seeds on the ground. Forages in small to large flocks, up to 200 individuals, occasionally singly or in pairs; often in mixed flocks with *L. malacca*.
Breeding. Breeds throughout year in Palu Valley, in Sulawesi. In display, male holds a straw, bows low, turns towards female, bobs up and down, he sings, stretches neck upwards and tilts head downwards and from side to side, and, when a female attracted, he takes a more upright posture, moves closer, sings, and bobs up and down; in full display he draws himself erect, head and body plumage fluffed, and head held forward when he bobs. Nest a covered structure, entrance hole with porch, made from grass and stems, lined with fine stems. Clutch 4–6 eggs; incubation period 14–16 days; nestling skin pink and naked, swollen blue gape (changing to white by day 10) bordered with black, palate pale yellow with black arc, tongue unmarked, short sublingual mark; nestling period 20–22 days; young independent 2–3 weeks after leaving nest.



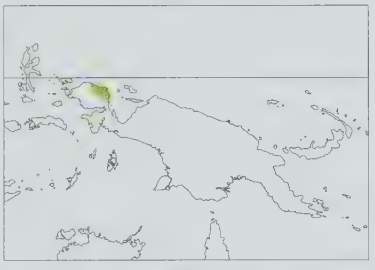
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common to abundant in much of range; uncommon and local on Sumba. Locally very common along N coast of Flores, where otherwise rather uncommon. Range probably expanding locally on Sulawesi as increasing areas of suitable habitat become available. Presence on Timor apparently overlooked for many years. Record of three individuals at Ashmore Reef (S of Roti, I, off W Timor) in Feb 2000 and unconfirmed report of two there in Jan–Feb 2003; origin uncertain, but possibly vagrants.
Bibliography. Coates & Bishop (1997), Goodwin (1982), Griffiths (1986), Higgins *et al.* (2006), Kirschke (1984), Mayer (1991b), McCarthy (2006), Nicolai & Steinbacher (2001), Peter (1979), Pfannenstein & Pfannenstein (1986), Restall (1996b), Trainor & Soares (2004), Verheijen (1964), White & Bruce (1986).

120. Grey-banded Mannikin

Lonchura vana

French: Capucin des Arfak **German**: Arfaknonne **Spanish**: Capuchino de las Arfak
Other common names: Grey-banded Munia, Arfak Mannikin/Munia

Taxonomy. *Munia vana* E. J. O. Hartert, 1930, Kofo, 2000 m, Lake Anggi Gigi, Arfak Mts, New Guinea. Previously thought, on biogeographical grounds, to form a species pair with *L. caniceps*. Recent study of mitochondrial phylogeny indicates closer relationship with *L. maja* and *L. pallida*, the three being similar also in plumage. Monotypic.
Distribution. Arfak Mts, on Vogelkop Peninsula of NW New Guinea.



Descriptive notes. 10 cm. Face from forehead and around eye to chin whitish, rest of head to nape and lower throat grey, nape tinged brown, mantle to back and upperwing dark brown, rump, uppertail-coverts straw-yellow, tail blackish-brown with broad straw-yellow fringes; breast grey-brown, separated by whitish-grey band from cinnamon belly, vent and undertail-coverts; iris dark brown; bill grey to pale blue-grey; legs dark grey. Sexes alike. Juvenile is grey-brown above, paler below, rump and uppertail-coverts rufous-brown, bill dark grey. VOICE. Call a high, thin "ts ts ts...".
Habitat. Wet grasslands and marshes and edge of cultivated land, at 1800–2100 m in Anggi Lakes area. Sometimes near human settlements.
Food and Feeding. No information on diet. Small flocks seen on low-growing weeds in recently abandoned agricultural plots.
Breeding. No information.
Movements. No information.
Status and Conservation. VULNERABLE. Restricted-range species: present in West Papuan Highlands EBA. Very poorly known. Presence confirmed at only a single location, the grasslands around L Anggi Gigi; no records from neighbouring L Anggi Gita, and only unsubstantiated reports of its occurrence in other areas of Arfak Mts (e.g. in Tamrau Mts); possible occurrence elsewhere limited by scarcity of habitat. Arfaks not well explored ornithologically, and the species could possibly be found in other parts. Estimated global population no more than 10,000 individuals. Although this species' preferred habitat is scarce and reported as suffering through drainage for conversion to agriculture, it has been observed on agricultural land and may be able to survive in this type of habitat. There is an urgent need to identify suitable habitat in NE Vogelkop region in order to gain accurate data on its current distribution and population status, and to assess its habitat requirements and existing threats; survey of Pegunungan Arfak Nature Reserve required. Areas of wet grassland and marshland, especially Anggi Gigi, need to be included in protected-areas system. If the species is found to be declining for any reason, it may have to be reclassified as Critically Endangered.
Bibliography. Anon. (2008g, 2009j), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Collar *et al.* (2001), Goodwin (1982), Nicolai & Steinbacher (2001), Rand & Gilliard (1967), Restall (1996b), Stattersfield & Capper (2000).

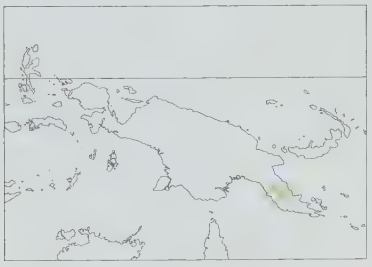
121. Alpine Mannikin

Lonchura monticola

French: Capucin des montagnes **German**: Bergnonne **Spanish**: Capuchino Alpino
Other common names: Eastern Alpine Mannikin, (Eastern) Alpine Munia

Taxonomy. *Munia monticola* De Vis, 1897, Mount Scratchley, Owen Stanley Range, New Guinea. Name *myolae* is a junior synonym of present species name. Sometimes considered conspecific with *L. montana*, but its relationships may be with another member of genus. Monotypic.
Distribution. Wharton and Owen Stanley Ranges (E to Myola grasslands), in SE New Guinea.
Descriptive notes. 11·5 cm. Forehead and face to throat are black, crown brownish-black, becoming greyish-brown on nape and sides of neck to back, upper rump chestnut, lower rump and uppertail-coverts pale yellow, tail quills blackish with pale yellow fringes; breast white, broad black band

On following pages: 122. Snow Mountain Mannikin (*Lonchura montana*); 123. Chestnut-breasted Mannikin (*Lonchura castaneothorax*); 124. Yellow-rumped Mannikin (*Lonchura flaviprymna*); 125. Five-coloured Munia (*Lonchura quinticolor*); 126. Grey-crowned Mannikin (*Lonchura nevermanni*); 127. Black-breasted Mannikin (*Lonchura teerinki*); 128. Black Mannikin (*Lonchura stygia*); 129. Hooded Mannikin (*Lonchura spectabilis*); 130. Grey-headed Mannikin (*Lonchura caniceps*); 131. Grand Mannikin (*Lonchura grandis*); 132. Thick-billed Mannikin (*Lonchura melaena*); 133. New Ireland Mannikin (*Lonchura forbesi*); 134. Hunstein's Mannikin (*Lonchura hunsteini*).



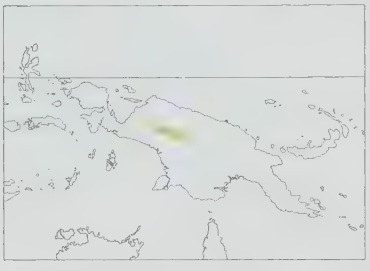
below, belly white, flanks broadly blotched and barred black, thighs, vent and undertail-coverts black; iris dark brown, eyering grey; bill pale grey; legs grey. Sexes alike. Juvenile is brown above, rump and uppertail-coverts buffy brown, face dark brown with dusky markings, breast brown, belly and undertail-coverts tawny; bill grey. Voice. Calls a thin "see see see" given in flight, and a rattling buzz.
Habitat. Alpine grasslands and rocky scree on high mountain peaks, cultivated fields, at 2700–3500 m; at lower elevations to 2100 m along trails, and on Mt Albert Edward common at 3900 m. Forages on short turf around cultivation and villages.
Food and Feeding. Seeds of grasses, bamboo and herbs. Clings to grass stems and picks seeds from heads; also hops on ground to take fallen seeds. Forages in pairs and in flocks generally of 20–50 individuals; immatures often form separate, smaller flocks. Associates with *L. caniceps*.
Breeding. Breeding records in Apr–May wet season, also in Aug. Nest woven from rushes and grasses, placed 3 m above ground in small tree. No other information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Locally common. No known threats, and not known to be trapped for trade.
Bibliography. Beehler *et al.* (1986), Coates (1990), Diamond (1972), Dickinson (2003), Goodwin (1982), Gregory-Smith & Gregory-Smith (1990), Hicks (1987), LeCroy (1999), Mayr & Rand (1937), McCarthy (2006), Nicolai & Steinbacher (2001), Restall (1995, 1996b).

122. Snow Mountain Mannikin

Lonchura montana

French: Capucin des Maoke **German**: Höhennonne **Spanish**: Capuchino Montano
Other common names: Snow Mountain Munia, Western Alpine Mannikin/Munia

Taxonomy. *Lonchura montana* Junge, 1939, Oranje Mountains, 4150 m, New Guinea.
Sometimes considered conspecific with *L. monticola*, but its relationships may be with another member of genus. Monotypic.
Distribution. Snow Mts E to Mt Cappella (in W Star Mts), in WC New Guinea.



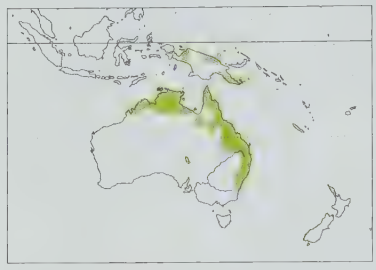
Descriptive notes. 11 cm. Male has forehead, forecrown and face to throat black, hindcrown brownish, nape to back brown, rump and uppertail-coverts pale yellow, tail feathers black with yellow edges; rear ear-coverts to lower throat and breast tawny-buff, belly white, flanks narrowly barred blackish, thighs, vent and undertail-coverts black; iris dark brown, eyering grey; bill pale grey; legs grey. Female is similar to male, but breast paler and yellower, black on top of head more restricted. Juvenile is brown above, face and throat dark brown, breast orange-tinged brown, belly and undertail-coverts whitish, bill dark grey. Voice. Call described as a series of "tyu" notes.
Habitat. Alpine grasslands and boggy grassland, edges of alpine shrubbery, mainly at 3200–3800 m; as low as 2130 m in Ilaga Valley, and as high as 4150 m in Oranje Mts.
Food and Feeding. Few data. Small seeds of grasses and herbs. Observed to forage in flocks of 6–20 individuals (in Aug–Sept).
Breeding. Nest built in grass, near water. No other information.
Movements. No information; presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Very poorly known. Probably locally common.
Bibliography. Beehler *et al.* (1986), Coates (1990, 2001), Diamond (1972), Flannery (1987), Goodwin (1982), Gregory (1994), Nicolai & Steinbacher (2001), Rand & Gilliard (1967), Restall (1996b).

123. Chestnut-breasted Mannikin

Lonchura castaneothorax

French: Capucin donacole **German**: Braunbrustnonne **Spanish**: Capuchino Pechicastaño
Other common names: Chestnut-breasted Munia/Finch, Chestnut Finch

Taxonomy. *Amadina castaneothorax* Gould, 1837, New South Wales, Australia.
Often hybridizes with *L. flaviprymna* in NW Australia; in New Guinea sometimes interbreeds with *L. caniceps*. In captivity has hybridized with 25 estrildid species, mainly other members of genus. Proposed race *assimilis*, described from Eureka (Northern Territory), in N Australia, is synonymized with nominate. Five subspecies recognized.
Subspecies and Distribution.
L. c. uropygialis Stresemann & Paludan, 1934 – NW New Guinea (E side of Geelvink Bay).
L. c. boschmai Junge, 1952 – W New Guinea (Wissel Lakes and R Araboe E into highlands).
L. c. sharpii (Madarász, 1894) – N & NE New Guinea from Humboldt Bay area E, including Manam I, to Astrolabe Bay.
L. c. ramsayi Delacour, 1943 – SE New Guinea E from Bereina area (Gulf of Papua), also D'Entrecasteaux Archipelago.
L. c. castaneothorax (Gould, 1837) – N Western Australia (from Derby and Kimberley) E to Melville I, Gulf of Carpenteria and N Queensland (Cape York Peninsula), thence S along coast to E New South Wales.
Introduced (nominate race) in SW & SE Australia (near Perth, in S Western Australia; around Melbourne, in S Victoria), New Caledonia, Vanuatu, Society Is and Marquesas Is.
Descriptive notes. 11 cm; 12–15·5 g (nominate). Nominate race has forehead to nape brown with grey chevrons, mantle, back to upper rump and upperwing warm brown, lower rump and uppertail-coverts yellowish-brown to pale golden, tail brown with yellow feather edges; face blackish with pale streaks, throat black, breast rufous-fawn with black lower border, belly white, flanks barred black and white, thighs and undertail-coverts black; iris dark brown, eyering grey; bill short, stout, pale blue-grey; legs



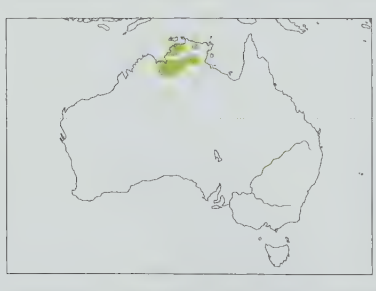
grey. Sexes similar, female perhaps duller than male. Juvenile is grey-brown above, crown indistinctly streaked dark brown, rump and uppertail-coverts paler brown, face grey-brown with pale streaks, chin and throat light grey-brown, breast warmer brown, belly buff to cream, undertail-coverts washed yellow, bill dark grey. Race *uropygialis* has face entirely black, rump and uppertail-coverts rufous; *boschmai* has rump and uppertail-coverts straw-yellow, flanks barred brown; *sharpii* has forehead to nape whitish to pale grey, uppertail-coverts rufous-chestnut; *ramsayi* has entire head to throat black, feathers on crown to hindneck brownish with pale spots or edges on tips, rump rufous becoming paler or golden-yellow on uppertail-coverts yellow. Voice. Song soft clicks followed by "weeee", a series of "twee, tchuk", and ending with bell-like "tching", entire song soft, high-pitched and wheezing. Calls the same as the elements of song.
Habitat. In New Guinea, found in grassland, savanna and old gardens, grassy areas in towns, coastal savanna; mainly in lowlands, to 1800 m in highlands of Wissel Lakes. In Australia, occupies reedbeds and tall rank grasses along rivers, swamps, grassy country and mangroves; also sugar-cane fields and cereal cropland, extending into irrigated agricultural lands. In S Pacific (where introduced), widespread in bracken-covered slopes, pastures and gardens, cultivated land and wasteland.
Food and Feeding. Seeds, mostly of grasses; occasionally green algae, also insects and dried animal faeces. Takes growing seeds directly from seedheads while clinging to grass stems; less often takes fallen seeds. Catches aerial insects by sallying, mainly during breeding season. Forages usually in small flocks of up to c. 20 individuals, sometimes in larger flocks (up to 100 or more); occasionally singly or in twos. Regularly associates with other members of family in mixed-species flocks.
Breeding. Season Nov–Mar in SE New Guinea; in Australia, Feb–Apr in Kimberley, in late dry season into wet season Feb–Mar (and nest-building in Apr) in Northern Territory, and in all months (mainly wet season) in N Queensland. Nests in dense colonies, sometimes with other species of waxbill. In first phase of courtship, male perches near female, facing her in erect posture, belly fluffed, head bowed, he sings, hops up and down, then bobs as he stretches and flexes legs, he edges towards her until the two touch and tail of each points towards the other; in second phase, while in close body contact, belly feathers fluffed, the two lean forwards until nearly horizontal, then assume upright posture. Nest a covered ovoid structure with side entrance, made from grass, lined with fine soft dry grass, placed low down in long grass or reeds, well concealed. Clutch 4–6 eggs; incubation by both sexes, period 13–14 days; nestling skin pink, bare or with one or two tufts of down, gape blue-white, slightly swollen and lined inside with black, upper mark a long teardrop and lower one a simple spot and lined with two long black bars, palate pale yellow with black bar, an elongated black spot behind the transverse bar, tongue with black ring, broad black sublingual crescent, and a spot on each side of base of lower bill; chicks brooded by both parents during day, only female at night, nestling period 16–19 days.
Movements. In New Guinea, resident with some seasonal or nomadic movements. In Australia, large numbers move to inland regions during and after rains in Nov–Jun and to more coastal areas in dry season; flocks of hundreds suddenly appear in some areas.
Status and Conservation. Not globally threatened. Widespread and locally common in much of range; uncommon to scarce in W New Guinea. In Australia, recorded densities of 0·08–2·96 birds/ha at Howards Peninsula (Northern Territory), and in Queensland mean of 0·71 birds/ha (wet season) at Townsville and 0·075 birds/ha near Tallegalla. At a site in New Guinea, population density 3·5–8 birds/10 ha in Jun–Nov, 1·1 in Dec, and 0·5–0·9 during Jan–May (indicative of seasonal/nomadic movement). In Australia, some evidence of declines during 20th century in N & E; conversely, extended its range W from Northern Territory into N Western Australia (Kimberley Division) between 1910 and 1960. No apparent threats in Australia. In New Guinea, W populations very poorly known, but appear not to be numerous; N race *sharpii* trapped in small numbers for international bird trade (in extreme W part of range), but great majority of population (in Papua New Guinea) not affected; SE race *ramsayi* common and not at any risk.
Bibliography. Baptista (1991), Beckham (2009), Beehler *et al.* (1986), Bell (1982), Blakers *et al.* (1984), Coates (1990, 2001), Diamond (1972), Fehrer (1993), Goodwin (1982), Higgins *et al.* (2006), Immelmann (1962a, 1965a, 1982), Lever (1987), Schodde & Mason (1999), Mayer (1995b), Mayr & Rand (1937), McCarthy (2006), Morris (1958), Nicolai & Steinbacher (2001), North (1909), Peckover & Filewood (1976), Pratt *et al.* (1987), Rand & Gilliard (1967), Restall (1996b), Schodde & Mason (1999), Storr (1977, 1980, 1984b), Vriends & Heming-Vriends (2002).

124. Yellow-rumped Mannikin

Lonchura flaviprymna

French: Capucin à croupion jaune **German**: Gelbbrustnonne **Spanish**: Capuchino Culiamarillo
Other common names: Yellow-rumped Munia/Finch, Yellow-tailed Mannikin/Munia/Finch

Taxonomy. *Donacola flaviprymna* Gould, 1845, Victoria River, Northern Territory, north coast of Australia. Hybridizes with *L. castaneothorax*; in Kimberley Division, in 1959 and 1960, c. 10% of nests involved mixed pairs (and half of adults of present species had some plumage markings similar to those of *L. castaneothorax*). In captivity, has hybridized with 12 other species. Monotypic.
Distribution. NE Western Australia (E Kimberley) and NW Northern Territory (N & W Top End E, discontinuously, to E Alligator R and Elsey National Park).



Descriptive notes. 12 cm; 10–13 g. Head and neck to throat are fawn-white (forming pale hood), crown and nape greyer, mantle to back and upperwing rufous-brown, rump rufous-brown with yellow tinge, uppertail-coverts more golden-yellow, rectrices brown with straw-yellow fringes; breast salmon-fawn, belly and flanks pale straw-buff, thighs and undertail-coverts black; iris dark brown, thin eyering grey; bill silvery grey; legs grey. Sexes alike. Juvenile is plain brown above and pale buff below, undertail-coverts grey-brown, bill dark grey. Voice. Contact call a bell-like "teet", also a soft "weeee"; contact calls said to differ between sexes. Song a rhythmic series of clicks and "tweek" sounds, then a long, drawn-out "weee", and ending with a short series of "tchuk, tchuk"; similar to that of *L. castaneothorax*, but differences occur between individual males.
Habitat. Grasslands along coast and inland, reedbeds, rice fields, other areas with long grasses, edges of swamps and marshes, and scrub country near water; enters gardens towards end of dry season.

Food and Feeding. Half-ripe and ripe seeds of several grasses; possibly algae. Often takes seeds from the heads while perched on stalk. Forages in small flocks, sometimes in larger flocks of several hundred individuals; commonly in mixed flocks with other estrildids.
Breeding. Breeds in Jan–Apr wet season. Sometimes in mixed colonies with *L. castaneothorax*. In courtship, male in erect posture, belly fluffed, head bowed, faces female and sings, hops and then bobs, approaches her until the two touch, the two lean forwards until nearly horizontal, then assume upright posture; display nearly identical to that of *L. castaneothorax*, but, unlike latter, present species often carries grass in bill before display. Nest a covered oval structure with entrance hole at end, built with green grasses, lined with softer fine stems and flowering heads, placed low down in tall grass or reeds. Clutch 4–5 eggs; incubation by both sexes, period in captivity 12–14 days; hatchling naked, skin pink, gape bluish-white (turning white with age), palate whitish with curved black bar, behind it two small spots, tongue has black ring, below it a broad black crescent; chicks brooded by both sexes during day, only female broods at night, nestling period 3 weeks; fledglings return to sleep at night in nest.
Movements. Nomadic or migratory. Local numbers fluctuate widely between years; moves inland with rains and growth of grasses, towards coastal areas in dry season.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northwest Australia EBA. Locally common. Estimated global population 20,000 adults. Apparently being replaced throughout its range by *L. castaneothorax*. Old report of large flock in SC Queensland (along Warrego R, near Charleville) probably referable to latter species. In Western Australia was hardly recorded before 1950, and expanded range in middle of 20th century; by 2000 restricted to far NE Kimberley, where population in Ord R Irrigation Area has increased following establishment of agriculture (especially rice fields). Formerly more widespread in Northern Territory. In the past, large numbers were trapped for avicultural trade.
Bibliography. Bielfeld (1996, 2008), Fehrer (1993), Ford (1987), Goodwin (1982), Güttinger (1973), Higgins *et al.* (2006), Immelmann (1962a, 1962b, 1965a, 1982), Mayer (2002), McCarthy (2006), Nicolai & Steinbacher (2001), North (1909), Payne & Sorenson (2003), Pizzey (1980), Restall (1996b), Schodde & Mason (1999), Serventy & Whittell (1976), Slater (1974), Storr (1973, 1977, 1980, 1984b).

125. Five-coloured Munia

Lonchura quinticolor

French: Capucin coloré **German**: Fünffarbennonne **Spanish**: Capuchino Multicolor
Other common names: Coloured Munia/Finch, Chestnut-and-white Munia/Mannikin, Lesser Sunda Munia

Taxonomy. *Loxia quinticolor* Vieillot, 1807, Timor. Proposed races *wallacii* (from Lombok) and *sumbae* (from Waingapo, on Sumba) described on basis of rump colour; but plumage varies individually or possibly clinally (mainly dark in W and pale in E), and naming of races unwarranted. In any event, name *sumbae* is invalid, as preoccupied. Treated as monotypic.
Distribution. Lesser Sunda Is: Lombok, Sumbawa, Flores, Alor, Sumba, Roti, Timor, Sermata, Babar, and Tanimbar Is (Yamdena).



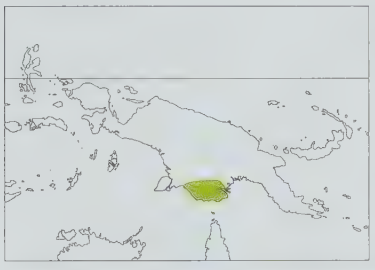
Descriptive notes. 11·5 cm. Head is dark chestnut-brown, crown and nape duller, with grey feather tips, ear-coverts with fine pale shaft streaks, upperparts chestnut, rump, uppertail-coverts and edge of tail yellow to orange or maroon; chin and throat brown to black, belly white, thighs to undertail-coverts black; iris dark brown, thin eyering dark grey; bill pale grey; legs grey. Sexes similar. Juvenile is brown above, fawn below, brightest on breast, ear-coverts with thin pale shaft streaks; moult to adult plumage complete at 3–4 months. Voice. Loud call of male a double "triprip", of female a single "peet". Song a series of soft "te te te" notes grading into two "weeee" legatos and ending in a series of soft complex notes, "pti-ti-pti-pti".
Habitat. Grassland, cultivation, especially rice fields, lightly wooded savanna, large forest clearings and mixed scrub; sea-level to 1600 m.
Food and Feeding. Seeds of wild grasses and rice. Climbs stems to reach seeding heads; feeds also on ground. Forages in pairs and in small groups, occasionally in large flocks; associates with other members of genus.
Breeding. Season Feb–May and Aug on Flores. Male displays in upright posture, feathers of head and belly fluffed, and gives soft song. Nest a ball of grasses, small and compact, built in tall grass. Clutch 5–6 eggs; incubation by both sexes during day, only female at night, period 14–16 days; nestling nearly naked (one or two tufts of down), skin pale pink, gape-flange blue (changing to white by 10 days), flange bordered black and lined with two black vertical bars, palate yellow with pair of long and narrow black lines (anterior bar incomplete in mid-line), tongue with lateral spots, black sublingual bar; nestling period 21 days; fledglings called to roost by parents.
Movements. Resident.
Status and Conservation. Not globally threatened. Generally uncommon; moderately common on Flores and Sumba. Widely distributed, but at low density; generally sparse. In early 1990s, this species was trapped in most of its native range (especially on Lombok and Timor) for the cagebird trade; by middle of that decade, however, smaller numbers caught as this munia's popularity in captivity waned and demand fell.
Bibliography. Coates & Bishop (1997), Ehmke (1980), Goodwin (1982), Green (1986), LeCroy (1999), Mayer (1984, 1986, 1995a), McCarthy (2006), Nicolai & Steinbacher (2001), Restall (1995, 1996b), Sproule (1994), Verheijen (1964), White & Bruce (1986).

126. Grey-crowned Mannikin

Lonchura nevermanni

French: Capucin de Nevermann **German**: Weißscheitelnonne **Spanish**: Capuchino Coronigrís
Other common names: Grey-crowned Munia, White-crowned Mannikin/Munia

Taxonomy. *Lonchura nevermanni* Stresemann, 1934, Merauke, New Guinea.
Monotypic.
Distribution. Trans-Fly region (S of L Daviumbu to R Fly and E to Balimo), in SC New Guinea.
Descriptive notes. 11·5 cm; 9–13·4 g. Male has forehead, crown and most of face greyish-white to buffy-white, rest of head to nape and side of neck with scaly pattern of whitish and dark grey-brown (extent of white on head variable); upperparts, including upperwing, brown, rump deep



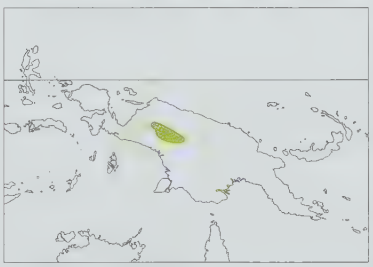
rusty orange shading to golden-yellow on uppertail-coverts, rectrices brown with yellow fringes; chin and throat to side of neck black, breast, belly and flanks orange-brown to dull chestnut-buff, thighs and undertail-coverts black (variable, sometimes black spots on upper breast or lower belly, or most of underparts black); iris dark brown, eyering dark grey; bill pale blue-grey; legs dark grey. Female is similar to male, but white on head restricted to forehead, the crown and nape feathers brown with narrow whitish edges. Juvenile is plain earth-brown above, rump and uppertail-coverts buffy brown, orange-tinged tawny below, paler on chin and throat, bill light grey; adult plumage acquired by 6 months. Voice. Within a social group, soft contact call a single-note "tseet" or "dee-t", loud or distance contact call a double syllable, "pseet!" or "dooreet"; loud contact call notes differ between male and female. Song a soft whisper, then a series of "tik" notes and a complex bell-like "wheeeeeeee" in a series of rising notes, the first one longer than 0·5 seconds, the rest repeated four times in 1 second.
Habitat. Grassy marshes in reedbeds and on riverbanks, tall grassy savanna, and floating mats of grass in flooded areas and rice fields.
Food and Feeding. Grass seeds. Takes seeds while perched on the stems and working the seeding heads, climbing up and down stems with great agility; feeds also on the ground. Forages usually in pairs and in small parties; outside breeding season may form larger flocks. Often associates with *L. stygia*.
Breeding. Details from captive birds. Courting male holds a stem in bill, he flies back and forth between two perches (in a large aviary, partners may chase in a flight display, sometimes ending at nest-site, male still with stem); in display, male perches erect, stretches head upwards and bill pointed down, erects feathers of nape, lower breast, belly and flanks, directs his attention to female by turning head and tail towards her, sometimes bobs, then bows and twists tail towards her. Male brings material and female does most of the building, nest a covered oval structure with side entrance, made from grasses and reed leaves, lined with finer grasses and fibres, placed on a firm support or in reeds. Clutch 3–6 eggs; incubation period 12–14 days; nestling skin pink, without down or with tufts of down on back (down disappears in older nestlings), gape-flange bluish-white bordered black and lined black, palate whitish with curved black bar, behind it two elongated black spots, tongue ringed black at base and has black tip; chicks brooded by both sexes in turns by day, only female at night, nestling period 20–22 days; fledglings return to roost in nest at night, feed independently 2 weeks after leaving nest.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Trans-Fly EBA. Locally common. Small numbers of this species captured for trade.
Bibliography. Baptista (1991), Baptista & Horblit (1990), Beckham (2009), Beehler *et al.* (1986), Coates (1990), Goodwin (1982), Mayer (1985b, 1996c), McCarthy (2006), Mees (1982), Meyer (1978), Neff (1979), Nicolai & Steinbacher (2001), Rand & Brass (1940), Restall (1996b), Stresemann & Paludan (1935), Ullrich (2002).

127. Black-breasted Mannikin

Lonchura teerinki

French: Capucin à poitrine noire **German**: Schwarzbrustnonne **Spanish**: Capuchino Pechinegro
Other common names: Grand Valley Mannikin/Munia, Black-breasted/Teerink's Munia

Taxonomy. *Lonchura teerinki* Rand, 1940, Bele River, 2200 m, 18 km north of Lake Habbema, New Guinea. Two subspecies recognized.
Subspecies and Distribution.
L. t. teerinki Rand, 1940 – Grand Valley (cut by R Balim and R Bele) and S slope of Mt Wilhelmina (in Oranje Mts), in WC New Guinea.
L. t. mariae Ripley, 1964 – C Snow Mts N of Balim Valley, in WC New Guinea.



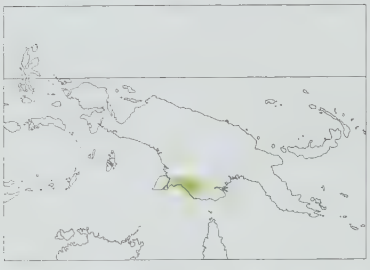
Descriptive notes. 10–11 cm. Male nominate race has forehead blackish shading to dark brown on crown and hindneck, brown to cinnamon-brown on upperparts, rump and uppertail-coverts yellow, tail dark brown with yellow feather edges; face and chin to breast black, abdomen white, side of lower breast and flanks with blotches of black or black and light brown in irregular band (black unbroken on older males), undertail-coverts and thighs black; iris dark brown, narrow eyering dark grey; bill large, blue-grey; legs dark grey. Female is similar to male, but face and breast duller black, flanks black with patches of brown and white. Juvenile is grey-brown above, more rufous on rump and uppertail-coverts, breast and flanks buff, belly and undertail-coverts whitish, bill blue-grey; adult plumage gained by 6–7 months. Race *mariae* has upperparts darker grey-brown than nominate. Voice. Contact call a soft, clear and bell-like "tseep", and a loud "tcheep", differing between sexes; group maintains a constant twittering; a rising "twy". Song includes "hueet-hueet".
Habitat. Mid-mountain grasslands, old gardens, weedy fields, cultivated fields near villages, clearings at edge of scrub-forest; at 1200–2200 m.
Food and Feeding. Seeds of grasses, weeds and small shrubs. Takes seeds while clinging to stem and seeding heads; feeds on fallen seeds on ground. Few other data. Seen to forage in flocks.
Breeding. Few data; details include observations of captives. Courting male holds grass in bill, then drops it and begins song, perches upright, bows forward towards female and ruffles flank feathers; when further aroused, he swings and fluffs, and leans over her. Nest a large covered structure of grass. Clutch 3 eggs; incubation period 14–15 days; nestling skin flesh-coloured, sparse white down on back, gape-flange blue (white at fledging) with black lining, palate pinkish-white with long black line and two black spots behind line, tongue yellowish-white with black ring and black tip, bill tip black; nestling period 21–24 days; young independent in 2–3 weeks.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Poorly known. Apparently uncommon to scarce. Trapped irregularly, in very small numbers, for cagebird trade; exported to Europe and USA.
Bibliography. Barth (1988), Beehler *et al.* (1986), Clement *et al.* (1993), Coates (2001), Goodwin (1982), Hofmann (1990b), Mayer (1990a, 1991a), McCarthy (2006), Nicolai & Steinbacher (2001), Rand (1940, 1941), Rand & Gilliard (1967), Restall (1996b), Ullrich (2002).

128. **Black Mannikin**

Lonchura stygia

French: Capucin noir **German**: Hadesnonne **Spanish**: Capuchino Negro
Other common names: Black Munia

Taxonomy. *Lonchura stygia* Stresemann, 1934, Mandum, upper Bian River, southern New Guinea.
Mitochondrial study indicated close relationship with *L. spectabilis* and *L. caniceps*. Monotypic.
Distribution. Trans-Fly region (from Mandum E to L Daviumbu), in lowland S New Guinea.



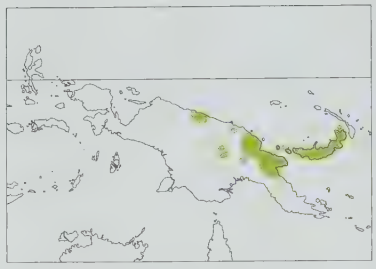
Descriptive notes. 10–11 cm; 10–12 g. Male plumage is almost entirely glossy black, wing feathers dark brown edged black, lower rump, uppertail-coverts and fringes of rectrices yellow to orange; iris dark brown, orbital ring grey; bill short, pale grey; legs grey. Female similar, but upperparts brownish-black, without gloss, rump darker chestnut-yellow. Juvenile is grey-brown above, fine white streaks on crown, whitish throat, creamy white breast and belly, bill grey; begin to show some black plumage at c. 12 weeks of age, complete adult plumage may not appear until 6 months. Voice. Contact calls a quiet "tyu tyu" and a soft "quet quet"; loud call of male "teeu! teeu!", of female "tseeu! tseeu!"; another is "quit! quit!" by male and "tuwit! tuwit!" by female. Song a quiet series of burbling notes and lacking drawn-out "weeee", duration 2–3 seconds.
Habitat. Savannas, marshes and riverine grasses, low wet grassland, tall grasses and reedbeds, often on floating mats of rice grass in lagoons and swamps; visits standing rice crops.
Food and Feeding. Seeds of grasses, including rice and *Echinochloa*. Takes both unripe and ripe seeds, on the stem or when fallen to ground. Agile, climbs stems and clings to seeding heads; sometimes clings to one stem and uses bill to pulls seeding head of another stem. Forages generally in small flocks of up to 20 birds; sometimes with other waxbill species, often in company of *L. nevermanni*.
Breeding. No information on season. In courtship display, male stands upright, bill pointing forwards or slightly downwards, bobbing up and down (sometimes feet leave perch). Nest a covered mass with entrance hole on one side, made from dry, flat grass blades, lined with dry heads of fruiting grass (with seeds removed), built low down in tall, dense grasses on floating islet of grass. Clutch 4–6 eggs; incubation period 15 days; nestling skin pink, usually without down (sometimes tufts on back), gape-flange bluish-white to white, bordered and lined black, palate pinkish-white at hatching (yellow at 10 days), palate bar incomplete at hatching (complete by day 10), two short lines behind the bar, tongue has black band and black tip; nestling period 21–23 days.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Trans-Fly EBA. Locally common to scarce. Thought to have a rather small global population, and probably declining owing to trapping and habitat degradation. Although said to be locally common, in flocks of up to 20 individuals, it is certainly less numerous than *L. nevermanni*, which is sympatric in much if range; in W (Papuan) part of range, only one was located in four months of fieldwork. Possibly threatened by destruction of reedbeds caused by introduced rusa deer (*Cervus timorensis*), also by encroachment of woodland on grasslands. In dry season, many concentrate at sources of drinking water, then susceptible to trapping for cagebird trade: in Aug 1993 total of 250 exported from Merauke Airport, and since 1998 more than 1200 imported into European Union countries. Proposed conservation measures for this munia include fieldwork to assess population size, regular monitoring at well-known sites, investigation of its comparative abundance in different habitats, and control of trade.
Bibliography. Anon. (2008g, 2009j), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Coates (1990), Goodwin (1982), Gregory (1995), Mayer (1991d, 1996d), McCarthy (2006), Mees (1982), Nicolai & Steinbacher (2001), Rand (1938), Rand & Brass (1940), Rand & Gilliard (1967), Restall (1996b), Stattersfield & Capper (2000), Stresemann & Paludan (1935), Ullrich (2002).

129. **Hooded Mannikin**

Lonchura spectabilis

French: Capucin à capuchon **German**: Prachtnonne **Spanish**: Capuchino Vistoso
Other common names: Hooded/New Guinea Munia, New Britain/Mayr's Mannikin/Munia

Taxonomy. *Donacicola spectabilis* P. L. Sclater, 1879, New Britain.
Has been suggested as forming a superspecies with *L. forbesi* and *L. hunsteini*; mitochondrial study of phylogeny indicated closer relationship with *L. stygia* and *L. caniceps*. Birds from Karimui, in Eastern Highlands, with underparts greyish-orange to dark buff (rather than white), described as race *gajduseki*, but birds with similar coloration found in other parts of New Guinea, and presence or absence of dark markings on side of breast and flanks shows similar local variability; birds with dark buff breast, from Urimo, on Sepik Plains, proposed as race *sepikensis*, but no specimen preserved and photograph indicates underparts of same colour as in *gajduseki*, while white-bellied birds also seen in same zone; both *sepikensis* and *gajduseki* provisionally included within *wahgiensis*. Three subspecies currently recognized.
Subspecies and Distribution.
L. s. mayri (E. J. O. Hartert, 1930) – N New Guinea from Cyclops Mts, L Sentani and Humboldt Bay E to W East Sepik Province.
L. s. wahgiensis Mayr & Gilliard, 1952 – NE New Guinea from Madang Province and Huon Peninsula E to Wau, S to Western Highlands (Mt Wilhelm and Wahgi Valley), Chimbu Valley (at Kup and Keglsugl), Karimui Valley and Tua Valley (from Karimui to Bomai).
L. s. spectabilis (P. L. Sclater, 1879) – Long I, Tolokiwa I, Umboi, New Britain and Watom I, in Bismarck Archipelago.
Descriptive notes. 10 cm; 10·3–12·7 g. Nominate has head to throat black, mantle, back and upperwing dark rufous-brown, lower rump and uppertail-coverts reddish-ochre, tail brown with yellowish edges; breast, belly and flanks white often washed creamy, flanks sometimes with dark bars, vent and undertail-coverts black; iris dark brown, eyering grey; bill pale blue-grey; legs grey. Sexes alike. Juvenile grey-brown above, rump and uppertail-coverts tawny, whitish below, face usually darker, sometimes fawn wash on breast, bill dark grey. Race *wahgiensis* has back dark brown, uppertail-coverts yellow, underparts white (occasionally buff); *mayri* has back brown, rump, uppertail-coverts and fringes of rectrices more golden, underparts white to buff. Voice. Soft contact call "peep" or "see", sexes similar; male loud call a clear single "seep!", female a double-noted "sileep!" or "tsilip!"; sweet tinkling sounds from flocks. Male song a series of clicks and high-pitched "weeee" notes, 20–30 in succession.



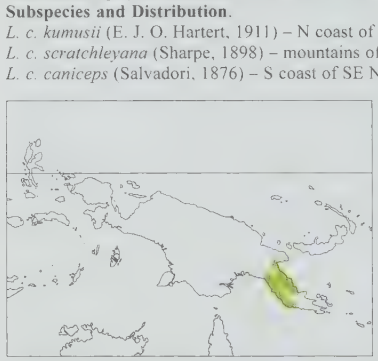
Habitat. Grassland, canegrass, gardens with tall grass, land with cereal grains and grazing cattle and water buffalo (*Bubalus bubalis*). Lowland plains to foothills and mid-montane grasslands at 2000 m, occasionally to 3000 m. Females on New Britain visit beach in breeding season to take calcium (for eggshell production).
Food and Feeding. Seeds, including those of introduced itchgrass (*Rottboellia exaltata*) the size of rice grains; also algal scum on surface water. Plucks seeds while perched on stems of growing grasses; takes fallen seeds on ground. Occurs in flocks of 30–40 individuals.
Breeding. Breeds all year, mainly between dry and rainy seasons Mar–May and Sept–Nov, in NE New Britain; in New Guinea, Sept–Oct and Apr in N, Oct in Kalam highlands, and in breeding condition in Jul–Aug in Karimui Basin. Has nested in colonies in New Britain. In display, male sometimes flies around while holding piece of grass in bill; more often he sings without a prop, body upright, head pointed towards partner and held level or slightly downwards, belly and flank feathers fluffed, and sings, stretches head upwards, holds bill open and turns head from side to side, and twists towards female as he approaches. Covered nest with short spout on entrance hole, made from dried grass blades and lined with finer stems, placed in tall grass, reeds or bush. Clutch 3–6 eggs; incubation period 14–15 days; nestling naked, skin pale pink, gape blue-white bordered black and lined with black (at fledging, gape edge white), palate pinkish with black curved bar and two black mediolateral lines, black ring around tongue and black sublingual mark; nestling period 18–21 days.
Movements. Resident; locally nomadic.
Status and Conservation. Not globally threatened. Locally common in New Guinea; local in New Britain, where most records from N coast. Popular cagebird, trapped in varying numbers for trade.
Bibliography. Archbold & Rand (1935), Baptista, L.F. (1990), Beehler *et al.* (1986), Clement *et al.* (1993), Coates (1990), Dahl (1899), Diamond (1967, 1972), Dinglestedt (1997a), Gilliard & LeCroy (1968), Goodwin (1982), Güttinger (1976), Jonkers & Roersma (1990), Mayer (1990b), Mayr & Gilliard (1952, 1954), McCarthy (2006), Meyer (1930, 1933), Nicolai & Steinbacher (2001), Restall (1996b), Schipper *et al.* (2001), Steadman (2006).

130. **Grey-headed Mannikin**

Lonchura caniceps

French: Capucin gris **German**: Graukopfnonne **Spanish**: Capuchino Canoso
Other common names: Grey-headed Munia

Taxonomy. *Munia caniceps* Salvadori, 1876, Naiabui, Hall Sound, New Guinea.
Previously thought, on biogeographical grounds, to form a species pair with *L. vana*. Study of mitochondrial phylogeny indicated close relationship with *L. stygia* and *L. spectabilis*. Has apparently hybridized with *L. castaneothorax* in lowlands near Port Moresby. Racial affinities of mid-montane populations of this species on N watershed at Garaina, Chirima Valley and Myola grasslands not determined; have been included, tentatively, with *scratchleyana*, and Myola birds (with head and breast darker grey) described as race *myolae*; further study required. Three subspecies recognized.
Subspecies and Distribution.
L. c. kumusii (E. J. O. Hartert, 1911) – N coast of SE New Guinea.
L. c. scratchleyana (Sharpe, 1898) – mountains of SE New Guinea.
L. c. caniceps (Salvadori, 1876) – S coast of SE New Guinea.



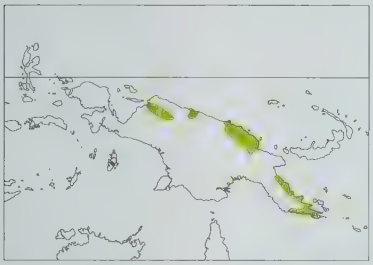
Descriptive notes. 10–11 cm; 11·5 g. Male nominate race has head to nape and throat pale grey, mantle, back and upperwing dark brown, rump orange, uppertail-coverts and edge of rectrices orange; breast and flanks dark grey, belly, vent and undertail-coverts black; iris dark brown, eyering dark grey; bill blackish, lower mandible pale blue-grey basally; legs blackish. Female is similar to male, but rump and uppertail-coverts darker, dull orange. Juvenile is grey-brown above, paler below, face dark grey, rump and uppertail-coverts rufous, some have fine black streaks on crown and face; bill black, eyering blue-grey; adult plumage gained at c. 6 months. Race *scratchleyana* has grey areas buffier, upperparts paler reddish-brown, lower rump, uppertail-coverts and fringes of rectrices more golden-yellow, less extensive black on lower underparts; *kumusii* is darker brown or russet above, rump orange. Voice. Call a repeated weak, sad nasal whistle, "teee" or "too", slight difference between male and female; in flight "pziiitt", when individuals near each other a shorter "psit".
Habitat. Grassland and moist savanna, rice fields, lawns, airstrips, roadsides, sometimes in towns. Lowlands of N coast and lowlands and hills of S coast; grassland and upland valleys at 1800 m and 2200 m in mid-montane regions.
Food and Feeding. Grass seeds. Takes seed both from seeding heads, while perched on stem, and on the ground. Forages in small parties of 2–20 individuals, also in larger flocks of up to 100 or more.
Breeding. Breeds in wet season, near Port Moresby Oct–Apr and nest-building in May, nesting peaks in Dec and in Feb; in drier savanna begins to nest in Dec. Sometimes nests in small colonies. Male in undirected song holds body erect, neck stretched and head held forward; in courtship he is upright, feathers of flanks, belly and rump fluffed, bill downwards, and head moved from side to side (much as in undirected song); when female nearby, he inclines head and points tail towards her and hops closer. Nest a rounded mass of grass leaves and fine stems, lined with fine grass and seedheads, placed at considerable height, to at least 7 m above ground, in fork of leafy shrub or tree, e.g. *Pandanus*, oil palm (*Elaeis guineensis*) or pine (*Pinus*), or in clump of grass. Clutch 4–6 eggs; no information on incubation and nestling periods; nestling undescribed.
Movements. Resident, or nomadic; one individual recaptured 9 km from ringing site, flocks seen to move along road corridor through lowland rainforest between savanna and cultivation. Near Port Moresby, fluctuations in numbers indicative of some movement.
Status and Conservation. Not globally threatened. Fairly common to locally common. Population density near Port Moresby fluctuated between 0·2 and 2·1 birds/10 ha in Nov–May, suddenly increased to 10·5 in Jun (early dry season), and then 5·3–3·1 from Jul to Oct (dry season).
Bibliography. Baptista (1991), Beehler *et al.* (1986), Bell (1982), Coates (1990, 2001), Goodwin (1982), Mayr & Rand (1937), McCarthy (2006), Nicolai & Steinbacher (2001), Peckover & Filewood (1976), Restall (1996b).

131. Grand Mannikin

Lonchura grandis

French: Grand Capucin **German**: Dickschnabelnonne **Spanish**: Capuchino Grande
Other common names: Grand Munia, Great(-billed) Munia

Taxonomy. *Munia grandis* Sharpe, 1882, Taburi, Astrolabe Mountains, south-eastern New Guinea. Four subspecies recognized.
Subspecies and Distribution.
L. g. heurni E. J. O. Hartert, 1932 – R Mamberamo basin, in NW New Guinea.
L. g. destructa (E. J. O. Hartert, 1930) – NC New Guinea in region of Humboldt Bay.
L. g. ernesti (Stresemann, 1921) – NE New Guinea from R Sepik E to Astrolabe Bay.
L. g. grandis (Sharpe, 1882) – SE New Guinea.



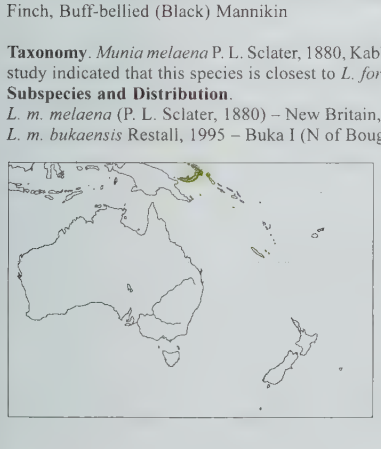
Descriptive notes. 12 cm; 11·5–14·3 g. Male nominate race is black from head and uppermost mantle to belly and undertail-coverts; upperparts, wing, tail and flanks rufous-brown, tail feathers edged golden, rump reddish-gold to yellowish-gold, grading to chrome-orange on uppertail-coverts; iris red to dark brown, eyering dark grey; bill huge, pale grey to whitish; legs grey. Female is like male in plumage, but differs in size: bill smaller, less deep, wing 51–53 mm (male wing 52–55 mm). Juvenile has head dark brown, back brown, breast grey with darker grey streaks, belly tawny, bill blackish, becoming light grey at base. Race *ernesti* has upperparts rufous, rump reddish-orange, grading to deep orange on uppertail-coverts, tail yellow, wing 50–53 mm; *destructa* has rump reddish-orange, uppertail-coverts orange, tail yellow, is larger, wing of male 56–62 mm, of female 53–56 mm; *heurni* has rump reddish-orange, uppertail-coverts orange-yellow (posterior coverts yellow), tail yellow, wing 53–57 mm. Voice. Soft call a tinkling of high-pitched notes; loud contact call of male "quip", of female higher, a metallic "tink"; when partners separated, call becomes a loud "kweer" and the two call back and forth, sexes maintaining difference in pitch. Song a quiet series with rapid "tk tk tk" notes followed by descending "wwhheeeeeeeeeee" (lasting 3–5 seconds), and "tchip" at end.
Habitat. Flooded grassland, open grassland, cane-brakes and grassy swamps, grassland along lowland rivers, lakes and landslides, floating marsh grass on lagoons, rice fields, gardens; sea-level to 1300 m.
Food and Feeding. Grass seeds, seeds of wild sugar cane (*Saccharum robustum*), and of sedges (Cyperaceae); some seeds small, and others, e.g. those of itchgrass (*Rottboellia exaltata*) as large as rice grains, green and milky. Also takes insects from manioc (*Manihot esculenta*) in gardens. Nestling diet half-ripe seeds. Sometimes grasps spikelet of a grasshead and runs bill sideways along stem, removing several soft seeds; feeds also on ground. Forages in pairs and in small to large flocks; sometimes with smaller numbers of *L. castaneothorax* and *L. tristissima*.
Breeding. Records centred on wet season: occupied nests and newly fledged young in Nov, Jan, Mar and Jun. Solitary, also in small colonies of up to ten nests. Pair-members often chase before courting, in butterfly-like ritual flight; singing to mate, male adopts upright posture, head up and bill facing her, then sways backwards and forwards, bows, then returns to upright position, repeates display a few times; after male sings, mates face each other and touch bill tips (as if kissing). Nest a flattened ball with side entrance and sometimes entrance funnel, made from broad, dead grass strips and sometimes grass roots intertwined among small stems and green leaves, lined with flowering heads of grasses, placed in shrub or in low tree, often in flooded area; one floating stump projecting c. 1 m above water held ten nests, other nests were c. 3 m apart and 3·7–9 m above ground. Clutch 3–6 eggs; incubation period 14 days; nestling naked, skin pale flesh-coloured, gape-flange white with black border, inner lining of flange has two elongate black spots, palate yellow with long black transverse arc or line and two black spots behind this, tongue with black ring; nestling period 21 days; young feed independently 2 weeks after leaving nest.
Movements. No information.
Status and Conservation. Not globally threatened. Little information. Uncommon to locally common. Trapped in comparatively small numbers for cagebird trade.
Bibliography. Baptista, L.F. (1990, 1991), Beckham (2009), Beehler *et al.* (1986), Coates (1990, 2001), Diamond (1972), Diamond & LeCroy (1979), Dinglestedt (1997b), Gilliard & LeCroy (1966, 1967b, 1968), Goodwin (1982), Mayer (2000b), Mayr & Rand (1937), McCarthy (2006), Neff (1981a), Nicolai & Steinbacher (2001), Rand (1942), Rand & Gilliard (1967), Restall (1996b), Ullrich (2002).

132. Thick-billed Mannikin

Lonchura melaena

French: Capucin de Nouvelle-Bretagne **Spanish**: Capuchino de Nueva Bretaña
German: Dickkopfnonne
Other common names: Thick-billed Munia, Bismarck Munia/Mannikin, New Britain Mannikin/Finch, Buff-bellied (Black) Mannikin

Taxonomy. *Munia melaena* P. L. Sclater, 1880, Kabbakadai, New Britain. Preliminary mitochondrial study indicated that this species is closest to *L. forbesi*. Two subspecies recognized.
Subspecies and Distribution.
L. m. melaena (P. L. Sclater, 1880) – New Britain, in Bismarck Archipelago.
L. m. bukaensis Restall, 1995 – Buka I (N of Bougainville I).



Also New Ireland, race undetermined (probably *bukaensis*).
Descriptive notes. 11 cm. Nominate race has head to breast black, blackish-brown on mantle, back and wing, with rusty tinge, especially on outer fringes of remiges, rump and uppertail-coverts rufous-buff, tail brown with rufous-buff edges; belly pinkish-buff, flanks barred black, rear belly and thighs to undertail-coverts black; iris brown, eyering grey; bill thick, black, pale base of lower mandible; legs dark grey to blackish. Sexes alike. Juvenile is brown above, paler on rump and uppertail-coverts, breast tawny-grey, belly and undertail-coverts tawny. Race *bukaensis* has mantle and back to wing dark chestnut, rump to fringes of rectrices reddish-chestnut, more exttensive rich buff below. Voice. Call short and high-pitched; no information on song.
Habitat. Grassland, swamps, airstrips, gardens, open broken forest; lowlands to 1200 m on New Britain.
Food and Feeding. Seeds, seeding heads of sugar cane; along beaches takes chalky bits. Often in small flocks.
Breeding. Active nests in Dec and Jan on Buka. Nest covered, with side entrance, made from dried grass, lined with finer grass fibres and flowers; two occupied nests were within 1 m of each other. Clutch 2–5 eggs. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA and Solomon Group EBA. Fairly common to locally common in New Britain; not seen for many years on Buka, where it may have been extirpated. Recently discovered on New Ireland (probably race *bukaensis*), where found to be very localized.
Bibliography. Beehler *et al.* (1986), Coates (1990), Diamond (1972), Goodwin (1982), Hadden (1981), LeCroy & Peckover (1983), Mayr & Diamond (2001), McCarthy (2006), Meyer (1933), Nicolai & Steinbacher (2001), Restall (1995, 1996b), Steadman (2006), Steiner (1933).

133. New Ireland Mannikin

Lonchura forbesi

French: Capucin de Nouvelle-Irlande **Spanish**: Capuchino de Nueva Irlanda
German: Forbesnonne
Other common names: New Ireland Munia/Finch, Buff-breasted Mannikin, Forbes's Mannikin/Munia

Taxonomy. *Munia forbesi* P. L. Sclater, 1879, Topia, New Ireland.
Has been thought to form a superspecies, or to be conspecific, with *L. hunsteini*. Monotypic.
Distribution. New Ireland, in Bismarck Archipelago.



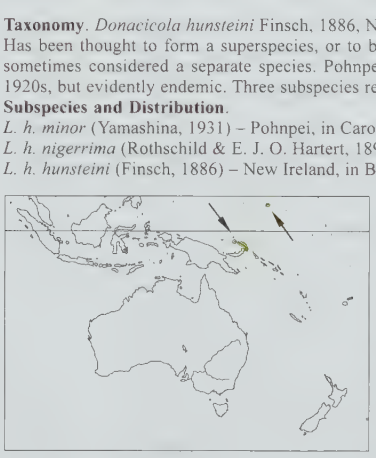
Descriptive notes. 11·5–12 cm. Head to nape and throat are black, mantle, back and upperwing rufous-brown (paler and more yellowish in worn plumage), rump buff, uppertail-coverts orange-buff, tail dark brown with orange-buff edges; breast, upper belly and flanks unmarked rufous-buff, central belly, thighs and undertail-coverts black; iris dark brown; bill black, paler at base of lower mandible; legs blackish-grey. Sexes alike. Juvenile has head brown, forehead to nape streaked dark brown and blackish, breast pale tawny-grey, belly and undertail-coverts tawny. Voice. No information.
Habitat. Grassland, including small grassy and weedy areas in forest clearings; sea-level to 1000 m.
Food and Feeding. Seeds of grasses and other plants; fragments of mussel shell. Observed in small groups or flocks.
Breeding. Birds in breeding condition in Mar. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Very poorly known. Probably scarce to uncommon; possibly locally common.
Bibliography. Beehler *et al.* (1986), Clement *et al.* (1993), Coates (1990), Goodwin (1982), Hartert (1925), Heinroth (1903), Mayr & Diamond (2001), Nicolai & Steinbacher (2001), Reichenow (1899), Restall (1996b).

134. Hunstein's Mannikin

Lonchura hunsteini

French: Capucin de Hunstein **German**: Hunsteinnonne **Spanish**: Capuchino de Hunstein
Other common names: Hunstein's/Mottled/White-cowled Munia, White-headed Mannikin/Munia, Black-breasted Munia/Weaver Finch; New Hanover Munia (*nigerrima*)

Taxonomy. *Donacicola hunsteini* Finsch, 1886, New Ireland.
Has been thought to form a superspecies, or to be conspecific, with *L. forbesi*. Race *nigerrima* sometimes considered a separate species. Pohnpei race *minor*, said to have been introduced in 1920s, but evidently endemic. Three subspecies recognized.
Subspecies and Distribution.
L. h. minor (Yamashina, 1931) – Pohnpei, in Caroline Is.
L. h. nigerrima (Rothschild & E. J. O. Hartert, 1899) – New Hanover, in Bismarck Archipelago.
L. h. hunsteini (Finsch, 1886) – New Ireland, in Bismarck Archipelago.



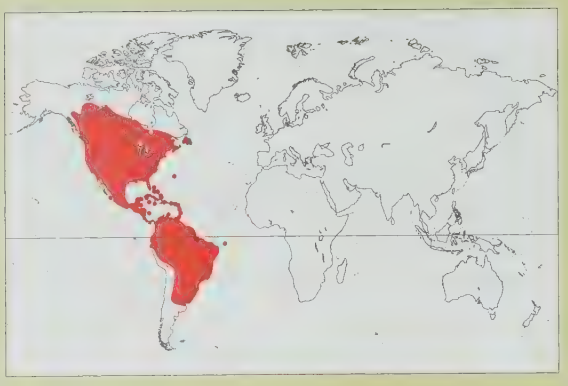
Descriptive notes. 10–11 cm. Nominate race has head to back and underparts black, crown and nape feathers with buff-grey to silver-grey edges; wing dark brown, rump, uppertail-coverts and edges of tail reddish-orange; iris dark brown; bill dark grey; legs black. Sexes alike. Juvenile has head and neck brown, crown and mantle irregularly barred darker brown, back and rump to uppertail-coverts russet-brown, breast cinnamon-brown, sometimes with blackish streaks, belly and undertail-coverts buffy cinnamon. Race *minor* has nape whiter and rump and uppertail-coverts darker than nominate; *nigerrima* has crown and nape black (no pale tips), rump and uppertail-coverts paler than nominate. Voice. Calls a high, thin "peep-peep, peep" and a flute-like "pee" or "pee-up".
Habitat. Grassy fields, roadsides, gardens and cultivated areas.
Food and Feeding. Grass seeds, also seeds of other plants. Forages in large flocks.
Breeding. No information.
Movements. Resident.
Status and Conservation. Not globally threatened. Race *nigerrima*, if treated as a full species, is a restricted-range taxon: present in New Britain and New Ireland EBA. Very poorly known. Locally common. Very common to abundant in parts of Pohnpei, where considered an agricultural pest.
Bibliography. Baker (1951), Beehler *et al.* (1986), Clement *et al.* (1993), Coates (1990), Gerdes (1993a), Goodwin (1982), Leavesley & Leavesley (2000), Mayr (1945a), Mayr & Diamond (2001), Nicolai & Steinbacher (2001), Pratt *et al.* (1987), Restall (1996b), Steadman (2006).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family VIREONIDAE (VIREOS)



- Small passerines with short and sturdy bill slightly hooked at tip.
- 9·4–18 cm.



- New World.
- Most forest types, semi-open areas with scattered trees, and scrub.
- 4 genera, 52 species, 193 taxa.
- 3 species threatened; none extinct since 1600.

Systematics

The word "vireo" is the first person singular of the Latin verb *virere*, which means "to be green", so the precise meaning of "vireo" is "I am green". The word may have been used in Classical times for birds such as the European Greenfinch (*Carduelis chloris*), but in more recent times it has been applied to a group of small, generally greenish birds that were initially also called "greenlets", a term which is now restricted to members of the Neotropical genus *Hylophilus*. Vireonidae includes some 52 species of mostly small, extensively greenish birds confined to the New World, although there are a few records of wandering migrants outside this large region. Moreover, the family may soon have to be expanded to include two genera from eastern Asia, as detailed later in this section. Vireos confused early European ornithologists, who described different subspecies of the Red-eyed Vireo (*Vireo olivaceus*) as Old World warblers (Sylviidae) or Old World flycatchers (Muscicapidae), and the Flat-billed Vireo (*Vireo nanus*) of Hispaniola was for a time included among the suboscine tyrant-flycatchers (Tyrannidae). Unlike many other American bird lineages, however, the question of their true relationships has taken far longer to resolve. Only in recent years has it been realized that the original home of the vireos lies on the other side of the world from their current distribution.

The family as currently constituted comprises four genera. Three of these, *Cyclarhis*, containing the two peppershrikes, *Vireolanius*, with the four shrike-vireos, and *Hylophilus*, incorporating the 15 greenlet species, are largely confined to the Neotropics, reaching no farther north than central Mexico. Only two of the 15 greenlets extend north of Costa Rica. The fourth genus, *Vireo*, made up of 31 species of vireo (also referred to as "greenlets" in some early literature), has its centre of diversity in North and Middle America, particularly in Mexico and the southwest USA. Only a single species, the recently discovered Choco Vireo (*Vireo masteri*), is restricted to the South American mainland. Vireo species in combination have a distribution ranging from Alaska south to Paraguay, and including the Caribbean region and the Brazilian island of Fernando de Noronha, the latter the exclusive home of the Noronha Vireo (*Vireo gracilirostris*).

On the basis primarily of the structure of the bill, nineteenth-century ornithologists such as S. F. Baird, H. F. Gadow and E. Coues allied the vireos with the shrikes (Laniidae), either including them in that family or placing them in a closely related Vireonidae. Gadow's Laniidae, besides including the vireos, encompassed a number of Australasian taxa, including Australian magpies and butcherbirds (Cracticidae), shrike-tits and whistlers (Pachycephalidae); this arrangement was, as C. G. Sibley and J. E. Ahlquist noted, "closer to the mark than [those of] the many later taxonomists who allied the vireos to the wood warblers".

W. P. Pycraft allied *Cyclarhis* with the shrikes, *Vireolanius* with the woodswallows (Artamidae) and *Vireo* with the Old World flycatchers. In 1930, A. Wetmore placed the peppershrikes and the shrike-vireos in separate families, respectively Cyclarhidae and Vireolaniidae, near the shrikes, but he allied the typical vireos with the largely American "nine-primaried oscines", particularly the New World warblers (Parulidae). Wetmore continued to support the maintaining of Cyclarhidae and Vireolaniidae as separate families, a stance based in part on differences in pterylosis patterns, despite J. T. Zimmer's conclusion that their members were no more than "heavy-billed, heavy-footed vireos".

After Wetmore, ornithologists looked for the allies of the vireos among the nine-primaried oscines. They seemed to fit there both geographically and because of the tendency of some vireo species to have the outermost, tenth primary reduced. E. Mayr and D. Amadon placed vireos, shrike-vireos and peppershrikes in an assemblage that included the finches (Fringillidae) and other nine-primaried groups. H. B. Tordoff considered the vireos to be derived from "primitive finches". W. J. Beecher, on the other hand, considered that they constituted a subfamily of the largely Australasian Monarchidae, but he also viewed them as ancestral to the entire nine-primaried assemblage. He considered *Vireolanius*, rather oddly, to be "an endemic American shrike arising from the vireos".

Evidence, however, began to accumulate that vireos might not, after all, belong with the nine-primaried assemblage. A second fossa in the head of the humerus is a feature of the latter assemblage, but W. J. Bock noted that vireos have only the beginnings of this, and R. J. Raikow found that vireos and nine-primaried oscines also differed in appendicular musculature.

Sibley and Ahlquist concluded, on the basis of DNA–DNA hybridization, that vireos, greenlets, peppershrikes and shrike-vireos formed part of what they termed the "corvine assemblage" and that they were not closely related to the New World nine-primaried oscines. The corvine assemblage as defined by these authors included the shrikes, which were favoured as vireo relatives by nineteenth-century ornithologists, along with a wide range of taxa endemic, or nearly so, to the Australasian Region. Recent molecular studies have shown, however, that Sibley and Ahlquist's



The peppershrikes have in the past been allied with the shrikes, or placed in a family or subfamily of their own. But anatomical, genetic and behavioural evidence supports the view that they are "heavy-billed, heavy footed vireos". They are larger birds than the rest of the family, with a deep, laterally compressed, muscular bill; all vireonids have more or less hooked bills. The ***Black-billed Peppershrike*** *is confined to a limited range in Colombia and Ecuador, but the Rufous-browed Peppershrike* (Cyclarhis gujanensis) *is much more widespread in Central and South America.*

[*Cyclarhis nigrirostris nigrirostris*, San Isidro Lodge and Reserve, Ecuador. Photo: Theodoulos Poullis]

corvine assemblage is paraphyletic, but that a monophyletic "core Corvoidea" does, indeed, include the vireonids.

What, then, are the vireos' real kin or, in other words, where do they fit within the broader core Corvoidea, and how did a family of suspected Australasian origin end up isolated in the Americas? A partial answer to both questions came with the remarkable discovery that vireos have unsuspected relatives in tropical Asia. The Asian genera *Erpornis*, containing the White-bellied Erpornis (*Erpornis zantholeuca*), and *Pteruthius*, the shrike-babblers, have traditionally been placed in the babbler family (Timaliidae), but studies of mitochondrial DNA by A. Cibois and her colleagues, and more recently by S. Reddy and J. Cracraft, have indicated that both genera are so closely allied with the vireos that they should probably be included in Vireonidae, despite the fact that the striking sexual plumage dimorphism in *Pteruthius* represents a condition quite unlike that found in almost all New World vireonids. Their presence in Asia suggests that the ancestors of the vireonid lineage reached the Americas from a suspected originating point in Australasia via the Asian landmass and the Bering land-bridge, rather than by a southern route through the once united continents of Australasia, Antarctica and South America.

Estimated dates for the separation of the vireo lineage from the other core Corvoidea also support a northern dispersal route. Reddy and Cracraft found that *Vireo*, *Erpornis* and *Pteruthius* cluster together on a long, deeply isolated branch within the core Corvoidea, from the rest of which they estimate that this "vireonid clade" diverged 33·97 million years ago, making it one of the earliest groups in the corvoid lineage to reach Asia. The New World vireos apparently split from their Asian cousins 22·5 million years ago. If correct, these dates, which are closer to the present day than previous estimates for the same events, are presumably too recent for an original dispersal via the Antarctic.

Before the discovery of the vireonid affinities of *Erpornis* and *Pteruthius*, C. Cicero and N. K. Johnson had found that mitochondrial-DNA evidence did not support alliances between vireos and the shrikes, the whistlers or the monarchids. They concluded that a quest for a vireonid sister lineage "may prove elusive because of the age of the group"; the sister lineage may now be extinct. A 2008 study based on nuclear DNA, undertaken by S. Treplin and her colleagues, suggested a possible affinity with the Old World orioles (Oriolidae), but for the moment the exact position of the vireos and their relatives within the core Corvoidea remains unclear.

Returning to the taxonomy of the Vireonidae as presently constituted, anatomical, behavioural and genetic evidence has supported the view that *Cyclarhis* and *Vireolanius* are close allies of *Vireo* and *Hylophilus*. In 1988, Johnson and colleagues concluded that even subfamilial rankings were not warranted, arguing that the placing of the peppershrikes and the shrike-vireos in subfamilies of their own would require that even some species groups within the genus *Vireo* be elevated to the same level. Sibley and Ahlquist agreed, although they did not examine *Vireolanius*, and so also does the American Ornithologists' Union in recent editions of its *Check-list of North American Birds*.

B. W. Murray and his colleagues, in a 1994 study of cytochrome *b* sequences in vireonids, found the Slaty-capped Shrike-vireo (*Vireolanius leucotis*) to be the most divergent of those members of the family that they examined, with the Rufous-browed Peppershrike (*Cyclarhis gujanensis*) apparently closer to *Vireo*. Cicero and Johnson, in their more recent molecular study, found that the genera *Cyclarhis* and *Vireolanius* emerged as basal to *Vireo* and *Hylophilus*. They concluded that this supported an origin and radiation of the existing genera in the Neotropics, following colonization of the New World via the Bering land-bridge, with a subsequent reinvasion of the north temperate zone by the genus *Vireo*.

At the genus level, *Cyclarhis* has always been regarded as both distinctive and monophyletic. The shrike-vireos were for a long time split into two genera, with the Green (*Vireolanius pulchellus*), Yellow-browed (*Vireolanius eximius*) and Slaty-capped Shrike-vireos separated as *Smaragdolanius*, leaving the larger Chestnut-sided Shrike-vireo (*Vireolanius melitophrys*) as the sole member of its genus. E. R. Blake, in his 1968 treatment for J. L. Peters's *Check-List of Birds of the World*, merged the two genera, and most authorities since then have followed suit.

Although R. S. Ridgely and G. Tudor divided *Hylophilus* into three species groups, this genus, of which the old name *Pachysylvia* is a junior synonym, has never formally been split. The first of these groups, comprising seven pale-eyed species inhabiting scrub or edge habitats and having simple repetitive songs, consisted of the Rufous-crowned (*Hylophilus poicilotis*), Scrub (*Hylophilus flavipes*), Olivaceous (*Hylophilus olivaceus*), Grey-chested (*Hylophilus semicinereus*), Lemon-chested (*Hylophilus thoracicus*), Ashy-headed (*Hylophilus pectoralis*) and Tepui Greenlets (*Hylophilus sclateri*). The second of Ridgely and Tudor's groups was formed by six dark-eyed, mainly forest-canopy species whose songs, where known, consist of a single, more complex phrase: these are the Golden-fronted (*Hylophilus aurantiifrons*), Dusky-capped (*Hylophilus hypoxanthus*), Brown-headed (*Hylophilus brunneiceps*), Buff-cheeked (*Hylophilus muscicapinus*), Rufous-naped (*Hylophilus semibrunneus*) and

Lesser Greenlets (*Hylophilus decurtatus*). The distinctive Tawny-crowned Greenlet (*Hylophilus ochraceiceps*), which inhabits humid-forest understorey and has a loud, penetrating song reminiscent of those of a number of other, unrelated birds living in similar habitats, was the sole representative of the third group. K. J. Zimmer and S. L. Hilty later discovered that the Brown-headed Greenlet has pale irides and pink legs, and should presumably be transferred to the pale-eyed group. The taxonomic significance, if any, of these groupings remains unclear.

Johnson and colleagues, who examined about half of the species in the genus, suggested, however, that *Hylophilus* was polyphyletic, with some species closer to *Vireo*. They argued particularly for the generic separation of the Rufous-crowned Greenlet, presumably including the recently split Grey-eyed Greenlet (*Hylophilus amaurocephalus*), and the Lemon-chested Greenlet, possibly with a separate genus for each. Although these suggestions have not been taken up, Cicero and Johnson's more recent study did find that *Hylophilus* emerged as sister-group to the "eyeringed" clade of vireos, rather than to the genus *Vireo* as a whole. The authors allow that this may be the result of a sampling artefact, and the relationships between *Hylophilus* and *Vireo* remain unclarified.

Vireo has been split into as many as six genera: *Neochloe*, *Lawrencia*, *Laletes*, *Lanivireo*, *Vireosylva*, and *Vireo* itself. Johnson and colleagues argued that Bell's Vireo (*Vireo bellii*) represented an old lineage possibly worthy of generic rank, but other studies have supported its close relationship to the White-eyed Vireo (*Vireo griseus*). With regard to the three proposed monotypic genera, namely *Neochloe* for the distinctively coloured Slaty Vireo (*Vireo brevipennis*) of Mexico, *Lawrencia* for the Flat-billed Vireo of Hispaniola and *Laletes* for the Blue Mountain Vireo (*Vireo osburni*) of Jamaica, J. Bond concluded in 1934 that the two West Indian taxa were derived island representatives of a *Vireo* species group that included the White-eyed, Thick-billed (*Vireo crassirostris*), Mangrove (*Vireo pallens*), Cozumel (*Vireo bairdi*), Jamaican (*Vireo modestus*), Cuban (*Vireo gundlachii*) and Puerto Rican Vireos (*Vireo latimeri*), and should therefore be included in *Vireo*, although *osburni* may be closer to the "*V. solitarius* complex" (see below). Later, A. R. Phillips merged *Neochloe*, too, with *Vireo*, a conclusion subsequently supported by anatomical and behavioural evidence.

The taxa *Vireo*, *Lanivireo* and *Vireosylva* have sometimes been recognized as subgenera, but some authorities have argued that such an arrangement is not justified. The validity of, in particular, *Lanivireo*, incorporating the Grey (*Vireo vicinior*), Blue Mountain, Yellow-throated (*Vireo flavifrons*), Plumbeous (*Vireo plumbeus*), Cassin's (*Vireo cassinii*), Blue-headed (*Vireo solitarius*), Yellow-winged (*Vireo carmioli*), Choco and Hutton's Vireos (*Vireo huttoni*), has been questioned. Molecular evidence suggests that this "*Lanivireo* complex" may be paraphyletic with regard to the other "eyeringed" vireos. The Grey Vireo, for example, may be closer to the White-eyed Vireo than to the Blue-headed Vireo, and the Black-capped Vireo (*Vireo atricapilla*) may be closer to the Blue-headed Vireo than to the White-eyed Vireo.

Evidence derived from studies of behaviour and jaw musculature and data on cytochrome *b* sequences do support monophyly of the "eyelined" *Vireosylva* group, comprising the Golden (*Vireo hypochryseus*), Warbling (*Vireo gilvus*), Brown-capped (*Vireo leucophrys*), Philadelphia (*Vireo philadelphicus*), Red-eyed, Noronha, Yellow-green (*Vireo flavoviridis*), Black-whiskered (*Vireo altiloquus*) and Yucatan Vireos (*Vireo magister*). The Golden Vireo of western Mexico, which shares with the "*Vireo* group" the tendency for both sexes to assist in nest-building, may be the most basal member of the "*Vireosylva* complex". Aside from the Golden Vireo, genetic evidence supports the existence of two clades within this *Vireosylva* group, one including the Warbling, Brown-capped and Philadelphia Vireos, and the other, the "Red-eyed Vireo group", containing the remaining species.

J. C. Avise and his colleagues have found that, in general, genetic distances within the genus *Vireo* are exceptionally large, on average about four to ten times greater than the mean values between congeners of many other avian genera. This possibly indicates that species divergences in this genus are relatively ancient. Within species, continental White-eyed Vireos are genetically more diverse than are their island counterparts the Puerto Rican and Jamaican Vireos.

Species-level taxonomy has presented few problems among the Vireonidae, but some taxa have been the subject of recent debate. The Yellow-browed and Green Shrike-vireos were formerly considered conspecific, and Ridgely and P. J. Greenfield have suggested that the Slaty-capped Shrike-vireo may likewise have to be split. Within *Hylophilus*, the four northern races of the





The peppershrikes and shrike-vireos are more strikingly patterned and coloured than other members of the family. The male ***Chestnut-sided Shrike-vireo*** *has a bluish-grey crown and forehead, a golden supercilium and a black eyestripe; the female is similar but duller. Measuring up to 18 cm and weighing up to 35 g, this species is similar in size to the peppershrikes. The smaller* ***Green Shrike-vireo*** *is a glowing emerald-green; the race* viridiceps *has a sky-blue nape, but in the nominate, forehead, crown and nape are all deep sky-blue.*

[Left: *Vireolanius melitophrys crossini*, Colima, Mexico. Photo: Pete Morris.

Right: *Vireolanius pulchellus viridiceps*, Canopy Tower, Soberanía National Park, Panama. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]



"Anyone unable to tell a Vireo from a [Tennessee] Warbler is hardly ready to recognize this species", wrote Roger Tory Peterson of the ***Philadelphia Vireo*** *in* A Field Guide to the Birds. *Many observers would agree that the this species is challenging to identify, and even the experienced may have trouble separating it from the Red-eyed Vireo* (Vireo olivaceus), *with which it often occurs. Breeding further north than any other vireo species, it was named from a specimen collected on migration towards Central America, and is not otherwise found in the Philadelphia area.*

[*Vireo philadelphicus*, Galveston County, Texas, USA. Photo: Brian E. Small]

Lesser Greenlet, those occurring from Mexico south to the Canal Zone of Panama, were formerly treated as forming a separate species, the "Grey-headed Greenlet", but this has now been lumped with the two southern subspecies on the basis of an intermediate population, *darienensis*, in Panama. In contrast, E. O. Willis has shown that the Rufous-crowned and Grey-eyed Greenlets, formerly regarded as conspecific, are instead two monotypic sibling species, southerly *poicilotis* and northerly *amaurocephalus*. This finding has been supported by recent studies of vocal and morphological characters of birds from the zone of overlap, and has been further corroborated by differences in habitat preferences.

Within the genus *Vireo*, Hutton's Vireo seems, on the basis of biochemical evidence, to be on the cusp of differentiating into two species, one confined to the Pacific coast of south-west Canada and the USA and the other found in the south-western interior and Middle America. Similarly, there are behavioural, vocal, genetic and ecological grounds for splitting the Warbling Vireo into at least two species, with the eastern nominate race treated as a monotypic species and the western races combined as a separate, polytypic species, *swainsonii*; moreover, Sibley recognized the race *victoriae* of south Baja California as a third species, but it appears that this view has not been followed by any other taxonomists. The American Ornithologists' Union *Check-list*, however, continues to recognize only a single species, *V. gilvus*, which forms a superspecies with the Brown-capped Vireo of Middle and South America.

The "*Vireo solitarius* complex" consists of a group of allopatric North American taxa originally described as a number of separate species, later lumped together into one, known as the "Solitary Vireo", and, still later, divided again into three, namely the Blue-headed Vireo, Cassin's Vireo and the Plumbeous Vireo. Molecular studies by Johnson and Cicero have shown that, although genetic diversity within each of these populations is surprisingly low, genetic differences between *cassinii* and *plumbeus* are comparable to those separating some other avian taxa as full species. While *cassinii* and *solitarius* are genetically similar, they differ in the number of mitochondrial-DNA base-pair substitutions and, despite some vocal overlap in northern British Columbia and north-western Alberta, in song.

Johnson and R. M. Zink called the status of the Red-eyed Vireo complex of taxa "one of the most enduring puzzles in the systematics of New World birds". The problem is that South American populations, sometimes separated as *V. chivi*, the "Chivi Vireo", are far more similar to the North American, nominate race than either is to the intervening Yellow-green Vireo of Middle America. Is this a case involving three separate species or a single species, or should the North American *olivaceus* and the South American races be recognized as forming a single species, separate from the Yellow-green Vireo?

The distinctness of *flavoviridis*, which differs from the others in its advertising song, its colour and its wing formula, seems to be more or less accepted by modern taxonomists. Although early on J. T. Zimmer proposed including the Neotropical taxa within the North American *V. olivaceus*, W. E. C. Todd found this idea "so absolutely opposed to the conceptions of most American ornithologists... that I fail to see how it can be seriously entertained". E. Eisenmann also supported the granting of full species status to *chivi*, noting that it was as distinct from *flavoviridis* as was the latter from *olivaceus*. This arrangement was followed in the 1957 American Ornithologists' Union *Check-list*, but the 1983 edition opted for the opposite course, including all three groups within a single species, *Vireo olivaceus*.

Johnson and Zink found that the genetic distance between *olivaceus* and *chivi* was considerably less than that between either taxon and *flavoviridis*. They proposed that the complex arose in Middle America, *flavoviridis* representing the ancestral form. Subsequently, at approximately 4·6 million years ago, *flavoviridis* stock invading North America differentiated to become *olivaceus*. Later still, only some 370,000 years ago, some migrant stocks of *olivaceus* wintering in South America failed to return to their breeding grounds and became the ancestors of *chivi*. Johnson and Zink noted that adult *chivi* have brown irides, as do immatures of *olivaceus*, suggesting that *chivi*'s iris colour was a paedomorphic derivative from the condition in *olivaceus*, and they included *olivaceus* and *chivi* as components of a single species while retaining *flavoviridis* as a separate species on its own.

This arrangement has been followed in subsequent editions of the American Ornithologists' Union *Check-list* and in other publications. The Noronha Vireo, however, generally regarded



Most species in the genus Vireo *have either an eyeline or, like this* ***Grey Vireo****, an eyering. A short-distance migrant, the Grey Vireo's wings are relatively short and rounded when compared with long-distance migrants. Its tail, however, is the longest in its genus, and helps distinguish it from the Plumbeous Vireo* (V. plumbeus)*, another mostly grey, eyeringed species. Although habitat preferences usually keep these species apart, they are frequently confused with one another on migration.*

[*Vireo vicinior*, San Diego County, California, USA. Photo: Brian E. Small]

as derived from *olivaceus/chivi* stock, has been recognized in recent decades as representing a valid species. Nevertheless, the problem surrounding the true taxonomic status of *V. olivaceus* and the related South American subspecies may yet be unsettled. Ridgely and Greenfield, discussing the complicated situation in Ecuador, where three to five subspecies occur, suggested that including all of the Neotropical races in a single species, *V. chivi*, was likely to be an oversimplification.

Morphological Aspects

For a group of birds that has, until comparatively recently, been split into three different families, vireonids are remarkably similar to each other in general size, structure and morphology. Even the peppershrikes and shrike-vireos differ from the others only in being somewhat larger, more heavily set, thicker-billed and more brightly coloured. Vireos usually appear to be rather solid, and indeed stolid, birds. The most gracile member of the family, the Noronha Vireo, is said to resemble an Old World warbler.

Among the smallest members of the family are those of the genus *Hylophilus*, ranging from 6·6 g in the Lesser Greenlet up to 14 g in the Scrub Greenlet. The equivalent range in *Vireo* is from 7·4 g in Bell's Vireo to 26·2 g in the Black-whiskered Vireo. The two genera of larger-sized birds both show a range of about 22–35 g. However, one member of *Vireolanius* is notably larger than its congeners: whereas mean weights for the Green and Slaty-capped Shrike-vireos are of 24 g and 26 g, respectively, the available data for the Chestnut-sided Shrike-vireo form the top end of the range for this genus. Both members of *Cyclarhis* are fairly hefty birds, with averages of 28·8 g for the Rufous-browed Peppershrike and 31·9 g for the Black-billed Peppershrike (*Cyclarhis nigrirostris*).

Vireonid bills are more or less hooked at the tip, this being least marked in the bills of the greenlets. They have a tomial notch on the upper mandible and, particularly in the case of the heavier-billed species, a smaller tomial notch on the lower mandible, with a tendency for the tip of the latter to be produced into an ascending point. Although no vireo is particularly long-billed, the bill being always shorter than the head, the members of this family vary considerably in the length, depth and breadth of the bill. As their vernacular names suggest, peppershrikes and shrike-vireos have bills that are particularly like those of shrikes, being deep and laterally compressed, especially so in the peppershrikes. Shrike-vireo bills have a straighter culmen than those of peppershrikes, and with a more obvious hook at the tip. The bills of greenlets are more pointed and warbler-like, with a fairly straight culmen that is only slightly decurved at its tip. In the genus *Vireo*, the relatively longest bills are found within the "*Vireosylva* complex" (see Systematics). The extremes in this genus are the long, unusually slender bill of the Noronha Vireo, the heavy, deep bill of the Blue Mountain Vireo of Jamaica, and the broad-based, flycatcher-like bill of the Flat-billed Vireo of



With its atypically rounded tail and highly distinctive plumage, the ***Slaty Vireo*** *is quite unlike all other vireo species, and has sometimes been placed in a genus of its own,* Neochloe*. The white iris is another striking feature of this species, one which it shares with the White-eyed Vireo* (Vireo griseus)*. In other species, such as the Red-eyed Vireo* (V. olivaceus)*, the iris may be red, or reddish, as in the Black-capped Vireo* (V. atricapilla)*. However, iris colour may vary between races and populations, and indeed the race* chivi *of the Red-eyed Vireo has a brown iris. The iris of immature vireonids is brownish or greyish.*

[*Vireo brevipennis brevipennis*, Monte Albán, Oaxaca, Mexico. Photo: Johannes Ferdinand]







Like the peppershrikes and shrike-vireos, the greenlets (Hylophilus) *are largely confined to Central and South America, with only two species found north of Costa Rica. Members of the genus are the smallest of the Vireonidae, ranging in size from the smallest individuals of the* ***Lesser Greenlet*** *at 9·4 cm and 6·6 g, to a more typical 12·5 cm and 9–12 g for the* ***Rufous-crowned Greenlet****, with one of the heaviest on record being a* ***Lemon-chested Greenlet*** *that weighed 13·8 g. Greenlets have bills that are more slender and warbler-like than those of the other members of the family. They also have weaker adductor muscles, but expanded depressor muscles, an adaptive combination usually found in species that feed by open-bill probing. At present it is not known whether or not greenlets use such a feeding system. Greenlets are non-migrants, and their wings are rounded, with a well-developed tenth primary.*

[Top: *Hylophilus decurtatus decurtatus*, Sarapiqui, Costa Rica. Photo: Julio Sánchez.

Middle: *Hylophilus poicilotis*, Parque Estadual Intervales, Ribeirão Grande, São Paulo, Brazil. Photo: Edson Endrigo.

Bottom: *Hylophilus thoracicus thoracicus*, Angelim Farm, Ubatuba, São Paulo, Brazil. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



*Where confusion arises between vireos and similarly-plumaged warblers, it is usually easy to separate them by their behaviour. The Vireonidae are generally slower and more methodical in their movements. The degree of activity varies among genera: while greenlets are busy, shrike-vireos and peppershrikes, like this **Rufous-browed Peppershrike**, have been described as sluggish. Little is known about the roosting habits of vireonids, but adults appear to roost alone. The posture shown here—head drawn into shoulders and body squat over the legs—may be fairly typical in a number of species.*

[*Cyclarhis gujanensis flavipectus*,
Arima Valley, Trinidad.
Photo: Kevin Schafer/
VIREO]

Hispaniola. All three of these species are island endemics. Increased niche breadth on islands, the result of reduced competition, may explain these differences, as sedentary island subspecies of the Black-whiskered Vireo tend to have a longer bill than that of migratory populations of this species.

In a study of variation in the jaw musculature of vireonids, R. Orenstein and J. C. Barlow found that, although the basic muscle patterns differed little, species in the genus *Vireo* varied in muscle-fibre length and number. The "*Vireosylva* group" (see Systematics), including the Golden Vireo, had significantly longer muscle fibres than did other vireos. Heavier-billed species, including the peppershrikes and the shrike-vireos, tended to have more fibre mass and increased levels of pinnateness in the major adductors. One of these, M. pterygoideus dorsalis lateralis, is particularly complex in the Grey and Blue Mountain Vireos and in the subspecies *caymanensis* of the Yucatan Vireo, although not in the nominate race of the latter, and is similarly complex in *Cyclarhis* and *Vireolanius*. In these birds, the tendon of origin is greatly expanded internally, giving rise to a large number of additional fibres inserting on a secondary tendon of insertion, and presumably greatly increasing the strength of the muscle. *Hylophilus* species have comparatively weaker adductor musculature than the other genera, but they do have expanded depressor musculature. This is an adaptation usually exhibited by avian species that open the bill against resistance, as in open-bill probing, or "gaping", but it is not known whether greenlets forage in this manner.



The nostrils of vireonids range in shape from oval to circular, and are overhung by a membranous operculum. The rictal bristles are poorly marked, with only one or two well developed on each side, and even these are reduced to no more than bristly points in *Vireolanius*. An exception is the flycatcher-like Flat-billed Vireo, the rictal bristles of which were described by R. Ridgway as being "strong". The feathers of the frontal antiae, the two projecting angles of the forehead, have well-developed, bristle-like tips directed anteriorly and, at least in *Vireo*, sometimes extending past the nasal opening.

Not surprisingly, the wing shape of vireos tends to vary according to migratory habit. Long-distance migrants, such as the Blue-headed Vireo, tend to have long, pointed wings with a reduced or vestigial outermost, tenth primary. The near-complete loss of the tenth primary appears to have evolved independently in the "*V. solitarius* complex", the "*V. olivaceus* complex" and the "*V. gilvus* complex" (see Systematics). Resident vireos, along with members of other genera within the family, tend to have broad, rounded wings. The resident Baja California subspecies *lucasanus* of Cassin's Vireo, for example, has a more rounded wing than that of the migratory nominate race. Island endemic species, such as the Noronha and Flat-billed Vireos, tend to have the most rounded wings of all *Vireo* species. In general, the longer the migration distance, the shorter is the outermost primary and the more pointed the wing. Greenlets, peppershrikes and shrike-

*As it stretches its wing, this **Blue-headed Vireo** reveals the long, pointed wing-shape characteristic of the long-distance migrant. Vireos devote a lot of time to feather maintenance, with evening preening sessions increasing as they prepare for migration, which takes place at night. Although they may mix with their own and other species on migration, vireos are not generally gregarious. They are usually found alone, in pairs, or in post-breeding family groups. Blue-headed Vireos often join mixed-species foraging flocks, but do not associate with their own species on their wintering grounds, where they are mildly territorial.*

[*Vireo solitarius solitarius*,
Point Pelee National Park,
Canada.
Photo: Rob Curtis/
The Early Birder]



Two characteristic white wingbars can be clearly seen on the closed wing of this bathing ***Cassin's Vireo****. Vireos bathe in open water when available. Several species, including Hutton's* (Vireo huttoni) *and the Red-eyed* (V. olivaceus) *Vireos, have been observed dropping in from overhanging branches. There is a report from the 1920s of Cassin's Vireos dipping into the water while on the wing, skimming the surface "swallow-like", and sometimes plunging in. Elsewhere, vireonids make use of leaves wet with rain or dew, rubbing their feathers against the foliage.*

[*Vireo cassinii cassinii*, Crooked River Ranch, Oregon, USA. Photo: Kevin Smith/VIREO]

vireos, all of which are apparently resident, have rounded wings and a well-developed tenth primary, the latter being about half the length of the ninth primary or, in the case of some shrike-vireos, even longer.

A possible exception is provided by the Blue-headed Vireo subspecies *alticola*, a comparatively short-distance migrant, which T. H. Hamilton found to have a more pointed wing than would be expected. Further, migratory populations of Red-eyed Vireos have less pointed wings than those of Blue-headed Vireos, a condition that has been explained as being the result of genetic mixing between migrant and resident populations of Red-eyed Vireos on their wintering grounds in South America.

Vireo tails are relatively short, always shorter than the wing, with fairly narrow rectrices. Island populations of the Black-whiskered Vireo tend to have a longer tail, as well as a longer bill and wings, than those of individuals of the same species from southern Florida. The Noronha Vireo has a relatively much longer tail than that of the Red-eyed Vireo, its presumed closest relative. This species frequently gleans insects from leaves while hanging upside-down, a posture rarely assumed by other vireos; it is one of only two resident passerines on Fernando de Noronha, and has presumably experienced ecological release as a consequence. S. L. Olson has suggested that its elongated tail may serve as a counterbalance.

The tarsi of vireos are of moderate length, the proportionately longest legs being possessed by the unusually acrobatic Noronha Vireo. Tarsal scutellation of most vireonids follows a pattern widespread among the oscine passerines. The tarsus is acutiplantar, being triangular in cross-section, with the front surface, the acrotarsium, covered by a single series of clearly separated scutes and the rear by two plantar plates, one on the outer surface and one on the inner surface, meeting posteriorly to form a ridge. A. L. Rand found that a number of greenlets exhibit a variation on this common condition. The Lesser Greenlet has a more or less typically acutiplantar tarsus, with two plantar plates meeting at a steep angle. In the Tawny-crowned Greenlet, however, the scutes on the acrotarsium are only lightly indicated, and the inner plantar plate appears to be missing; the outer plantar plate is fused to the acrotarsium at its leading edge, and wraps around the back of the tarsus until it meets a groove, broad proximally and narrow distally, that separates it from the acrotarsium at its inner edge, this groove possibly lined with the remnant of the inner plantar plate. This peculiar feature resembles the latiplantar condition found in larks (Alaudidae) and some tyrant-flycatchers, and would have led Rand to the conclusion that the Tawny-crowned Greenlet was not a vireo, nor even an oscine, had he not found an intermediate state in the Scrub, Lemon-chested, Rufous-crowned and Ashy-headed Greenlets.

The outer lateral toe, digit II, is longer than the inner one, digit IV, there are shortened basal phalanges on digits II–IV, especially on digit III, and the hallux including its claw is of about the same length as digit IV excluding the claw. The toes of vireos show a high degree of fusion, with the anterior digits fused for the whole length of the basal phalanx of digit III, a condition which, as G. Clark has pointed out, is unlike that found in the nine-primaried oscines, which tend to have a lower degree of fusion.

Vireos are, by and large, rather plain birds, variously coloured in shades of olive-green, brownish or grey, with whitish or yellowish underparts. Some species are marked with rufous, particularly on the head. Although no member of the family is streaked, spotted or barred in any plumage, most species in the genus *Vireo* are marked with a thin eyeline, this being a feature primarily of the *Vireosylva* complex (see Systematics), or with a combination of eyerings and wingbars. The Yellow-winged and Choco Vireos, presumably each other's closest relatives, uniquely combine superciliary lines, particularly well marked on the Choco Vireo, and wingbars. The plainest member of the family is the Blue Mountain Vireo, a largely greyish-olive, yellowish-bellied bird with just the faintest hint of an eyering, but otherwise lacking conspicuous markings of any kind.

Disregarding the Asian shrike-babblers of the genus *Pteruthius*, which probably belong in this family (see Systematics), the most colourful vireonids are the shrike-vireos. The Green and Yellow-browed Shrike-vireos are primarily bright emerald-green, with brilliant blue on the head, colours not found in any other member of the family. The Cozumel Vireo is cinnamon-brown above, with bright cinnamon on the sides of the breast, and the Golden Vireo is mostly bright golden-yellow. The most unusual colour pattern in the family is that of the Slaty Vireo, a mostly grey bird but with bright olive-green on the crown, wings and tail.

Most of the coloration of vireos, and also, presumably, of other vireonids, results from varying concentrations of black or grey melanin pigments and yellow carotenoids, or lipochromes, in different parts of the plumage, with melanin concentrations highest



*A study of a population of **White-eyed Vireos** of the nominate race in Florida found that neighbouring males had more dissimilar song repertoires than more distant males. Individuals used from one to 14 song "motifs", composed of multiple song elements. Each motif was audible to human listeners as a single utterance, lasting about a second, and sung with pauses of a few seconds between them. This study followed a much wider survey of song variation in White-eyed Vireos, which revealed a more or less continuous pattern of geographical variation, rather than the discontinuous mosaic of song "dialects" found in some bird species. Although the songs of the southern races of the White-eyed Vireo are quite different to, and much shorter than, those of the northern races, all races respond to playback of other races' songs. This species also mimics the calls and notes of a wide variety of other species, including the Downy Woodpecker* (Picoides pubescens), *the Carolina Chickadee* (Poecile carolinensis) *and the Eastern Towhee* (Pipilo erythrophthalmus). *As well as the primary song, sung by the males on the breeding grounds, the White-eyed Vireo has a second song type, a continuous warbling of harsh and squeaky notes which can go on for a minute or more. This "rambling song", rarer than the primary song, is produced by both adult and immature males. Female White-eyed Vireos also sing on the wintering grounds.*

[*Vireo griseus noveboracensis*, Wichita Mountains Wildlife Refuge, Oklahoma, USA. Photo: Greg Lasley/VIREO]



Most vireo songs are similar in structure, consisting of short phrases made up of several elements, lasting around a second, and separated by longer pauses. The song of the ***Warbling Vireo*** *is very different: a continuous warbling, lasting for 2·5–3 seconds. Both sexes sing, and the species sings on migration. The male sings on the nest, but when close to the female he is normally silent, singing only sporadically, except when engaged in a song duel with another male. The Brown-capped Vireo* (Vireo leucophrys)*, with which the Warbling Vireo forms a superspecies, has a song that is similar but shorter.*

[*Vireo gilvus gilvus*, Quebec, Canada. Photo: Alain Hogue]

in the wing, head and tail feathers. White represents an absence of both pigment types, and yellow indicates an absence of melanins. North American vireos tend, as do many of the continent's birds, to show ecogeographical variation in pigment intensity, being darker in wetter areas such as the Pacific Northwest, an illustration of Gloger's Rule. An example of this, noted as long ago as 1893, is the dark Vancouver Island subspecies *insularis* of Hutton's Vireo. The phenomenon of Gloger's Rule has been explained, with the illustration of Song Sparrows (*Melospiza melodia*), as being an adaptation to the higher risk of exposure to feather-degrading bacteria in wetter areas, because higher melanin loads may increase the feathers' resistance to the effects of such bacteria.

The adult plumage of a number of members of this family is set off by reddish or whitish irides. As discussed above (see Systematics), several greenlets, including Ridgely and Tudor's "pale-eyed group", along with the Brown-headed Greenlet and, with the exception of the Amazonian "*rubrifrons* group", the Tawny-crowned Greenlet, have pale irides. The irides of North American populations of the Red-eyed Vireo are, of course, red, varying in brightness among individuals, as are those of Yellow-green Vireos. Golden, Black-capped and Dwarf Vireos (*Vireo nelsoni*) have reddish irides, copper-coloured in some male Black-capped Vireos. The iris of the Slaty Vireo is white, making the eye stand out strikingly against this species' grey plumage. White or whitish irides, sometimes flecked with brown, are a feature also of the White-eyed and Jamaican Vireos and, rarely, of the closely related Mangrove Vireo. These eye colours are characteristics of the adults. The irides of immature vireos are brownish or greyish until the first winter of the individual's life, changing by about November in the case of the White-eyed Vireo, December in the Black-capped Vireo and March in the Red-eyed Vireo.

With the exception of the Black-capped Vireo (and the shrike-babblers, if they belong here), sexual plumage dimorphism is absent among the Vireonidae. Morphological differences between the sexes do, however, exist in some species. Male Black-whiskered Vireos tend to have a longer bill, a longer wing and a longer tail than those of females. Male Lesser Greenlets of the nominate race from southern Veracruz, in Mexico, were found to have a significantly longer bill than that of the female.

Moult patterns of vireonids have been described in detail only for the temperate-zone North American species, all members of the genus *Vireo*. Little or nothing is known about the moult strategies of most tropical vireos, greenlets, peppershrikes and shrike-vireos, although L. Wolf reported on a Slaty Vireo specimen in active moult, in which the old feathers are actively pushed out by the incoming ones. J. T. Zimmer recorded moult data for specimens of the Yellow-green Vireo and of the subspecies *chivi* and *vividior* of the Red-eyed Vireo from Peru, but he found it difficult to determine a clear picture of their moult cycles. M. Foster found that three Lesser Greenlet males with variously swollen testes, taken in August in Costa Rica, were in various stages of moult. Two were replacing primaries P1–P3, one of them also renewing secondaries 8–9, and the third, the male with the largest testes, exhibited light body moult. This suggests that Lesser Greenlets, like a number of other tropical birds, are able to undergo moult while still in the process of breeding.

The juvenile plumage is succeeded in the first year by a first-winter plumage, followed in year two and subsequently by an annual series of post-breeding moults into non-breeding plumage. In some cases, the post-breeding moults alternate with at least partial pre-breeding moults to produce the adult breeding plumage, the first pre-breeding moult replacing the first-winter plumage. Most vireos appear to replace their flight-feathers in the same way as other passerine birds. The primaries are renewed from the innermost feather outwards, and the secondaries are replaced in sequence from the outer ones inwards; the tertials are moulted separately. The first tail feathers to be moulted are normally the central pair, the moult then proceeding outwards.

Variations in moult pattern among vireos include the retention of buffy secondary wing-coverts during the juvenile moult into first-winter plumage by western Warbling Vireos and Hutton's Vireo, but not by eastern Warbling Vireos, which replace all of their secondary coverts. Grey Vireos replace some of these covert feathers. No vireo is known to have a complete pre-breeding moult, but partial moults are known to be undertaken by the Black-capped Vireo, in which at least the head feathers are replaced, the "*V. solitarius* complex", some individual Grey Vireos, and the Warbling Vireo. The Yellow-throated Vireo, too, may have a partial pre-breeding moult. In some vireos, including the White-eyed and Hutton's Vireos, feather wear, rather than moult, produces changes in appearance by the onset of the breeding season.

Northern migratory populations of the Red-eyed Vireo undergo a moult on their non-breeding grounds, but it is unclear whether this is simply a delayed completion of the post-breeding



*A study of **Rufous-browed Peppershrike** songs from Mexico south to Argentina indicated that songs from equatorial areas are shorter; have a higher maximum frequency and more syllables; and are less repetitive than those from temperate areas. This species inhabits a variety of habitats, including moist and semi-arid forest edges, coffee plantations and mangroves, and even uses isolated trees in gardens. These habitats have different acoustic properties, and the study found that songs from open and mixed areas had a narrower band width, and lower maximum and minimum frequencies than those from closed sites.*

[*Cyclarhis gujanensis ochrocephala*, São Carlos, São Paulo, Brazil. Photo: Haroldo Palo Jr.]

moult or a new, partial pre-breeding moult. Unlike most other North American passerines, adult Red-eyed Vireos have only a partial moult on their breeding grounds after the breeding season, this involving most of the body feathers, some secondary wing-coverts, up to three tertials and one or more pairs of rectrices, a pattern resembling the first moult of immatures in other passerine species. Moult of the remaining remiges and rectrices is apparently put on hold until 3–4 months after the birds arrive on their wintering grounds. R. S. Mulvihill and C. Rimmer found no moult in eight specimens taken on the wintering grounds between late August and December, but eleven specimens from the period January–April appeared to be replacing their remiges and rectrices, as well as undergoing some scattered moult of the body feathers and, in some, of secondary S8. An abbreviated moult on the breeding grounds may allow these birds, which switch to a largely frugivorous diet in winter (see Food and Feeding), to arrive on the wintering grounds in time to take advantage of early-fruiting plants.

The White-eyed Vireo differs from all other eastern North American species in that the juvenile replaces most or all of its flight-feathers during its very first moult, that resulting in first-winter plumage. W. G. George found that juvenile White-eyed Vireos in southern Illinois, in the east-central USA, typically replace most or all of their remiges while undertaking a synchronous or near-synchronous moult of the rectrices, a rare phenomenon among songbirds. Some individuals in the middle-western prairies may retain some or all of their flight-feathers until after their first breeding season, replacing them only as part of their second-year post-breeding moult; the same appears to be true of juveniles of this species in Massachusetts. George suggested that juveniles may need to have a greater wing area available for dispersal or migration. T. L. Lloyd-Evans, however, pointed out that the same would apply to other eastern migratory vireos that do not moult their flight-feathers in the first year. White-eyed Vireos, which nest in low, dense shrubs, may suffer more feather wear as juveniles than tree-nesting species and may, therefore, benefit from an earlier moult, and they may need to acquire an adult wing earlier in order to escape from snakes and other predators.

Moult migration, defined as the shift to a moulting area that is neither the breeding grounds nor the wintering grounds, is a rare phenomenon among vireos. In the western USA, Cassin's Vireos in Washington shift altitudinally, moving some 300 m upslope from their breeding areas, before moulting. The only known long-distance moult migrants in the family are the western populations, subspecies *swainsoni*, of the Warbling Vireo, studied by G. Voelker and S. Rohwer. Many adult western Warbling Vireos breeding north of the Mexican border apparently migrate to north-western Mexico before replacing their flight-feathers, and only then do they proceed east and south to their non-breeding grounds in Mexico and El Salvador. By doing so they avoid late-summer droughts on their breeding grounds, and are able to take advantage of the flush of food accompanying late-summer monsoons in the far south-west. Because they have already completed most



*The song of the **Slaty-capped Shrike-vireo** follows a pattern typical of many vireonids: a single descending whistle of less than a second, repeated monotonously at intervals of around two seconds. The song is loud and persistent, given from a perch, which is usually concealed in the treetops; it may also be given during foraging. A study of the Chestnut-sided Shrike-vireo* (Vireolanius melitophrys) *found that its call was clearly audible at 400 m. The male sings while accompanying the female during foraging and nest-building. This may enable a pair to keep track of one another where fog and dense vegetation can greatly reduce visibility.*

[*Vireolanius leucotis simplex*, Cristalino Jungle Lodge, Alta Floresta, Mato Grosso, Brazil. Photo: Edson Endrigo]

of their migration, they can also take more time to moult; adult *swainsoni* take about 55 days to replace their flight-feathers, whereas adults of the nominate race, which moult on the breeding grounds, complete this replacement in about 38 days. Western Warbling Vireos are also the only vireos that renew the body feathers during migration.

A recent study by L. K. Butler and colleagues has demonstrated that the timing of the moult by vireos can be influenced by changes in precipitation caused by the El Niño-Southern Oscillation (ENSO). Black-capped and White-eyed Vireos in Texas, in common with most other vireos, do not begin their post-breeding moult until after the completion of breeding activity. Unlike western Warbling Vireos and a number of other western North American passerines, but in similar manner to that of most eastern species, both of these vireos complete the entire moult on their breeding grounds. In 2006, a dry El Niño year, both species began the moult significantly earlier than they did in 2007, a wet La Niña year, probably because higher precipitation in 2007 led to greater production of insect food. As a result, the birds were more likely to renest, thereby extending the breeding season. There seems, however, to be a selective advantage in ending the moult by a particular time, no matter when breeding ends. In 2006, Black-capped Vireos at two different sites started the moult two weeks apart, but they completed the process by about the same time. A shorter moult period can result in the production of poor-quality feathers, and is more energetically costly on a daily basis. Black-capped Vireos become secretive during the middle of the moult, when the tail is mostly missing, suggesting that the act of responding to disturbances, whether human-caused or otherwise, may be costly. The authors suggest that climate change, especially when coupled with other disturbances, may have an impact on the survival abilities of these and other birds during the moult period in a way that conservation-managers have yet to assess.

Habitat

Vireos and their allies occupy diverse habitats over a wide range, extending from temperate through to tropical latitudes. Although not found in grassland, moorland or high-altitude *páramo*, members of this family occur in a wide variety of habitats which have at least bush cover and in various types of woodland or forest. In addition, migratory species occupy different habitats at opposite ends of their journeys, with stopovers in some cases made in yet more habitats.

The nominate race of the Red-eyed Vireo is a good example of a taxon which has a wide breeding distribution, ranging from almost the Arctic Circle in western Canada southwards to south-central Florida, and is highly migratory, wintering in the Amazon Basin of South America. Within its extensive breeding area this vireo is found in various types of woodland, so long as there is a major deciduous component. A further requirement is that there be a good understorey of bushes and shrubs; where this is lacking or sparse, the vireo is absent. In a study conducted in southern Ontario, in south Canada, Red-eyed Vireos, although exploiting a wide variety of hardwood species, seemed to prefer woodland with sugar maple (*Acer saccharum*) over other hardwoods, while spending relatively little time in spruce (*Picea glauca*) or cedar (*Thuja occidentalis*). When foraging in the understorey, they again used sugar maple extensively. In large stands of deciduous bush, Red-eyed Vireos were more abundant in the interior than near the edge, but they also occur near small openings in the forest canopy. In northern Canada, where conifers are largely predominant, Red-eyed Vireos are associated with groves of aspen (*Populus*) and alder (*Alnus*) thickets. In successional forest in Saskatchewan, they showed a significant preference for stands aged about 80–90 years or younger. In the south-eastern USA, another area where conifers often dominate, these vireos are most abundant in riparian hardwood stands. In the Rocky Mountains, they occupy deciduous habitat at elevations of up to 2000 m. Red-eyed Vireos can adapt to areas much modified by human usage, such as city parks or cemeteries, provided that there is a good cover of deciduous trees.

When on migration, Red-eyed Vireos have no choice but to use a wider variety of habitats, while still exhibiting a preference for deciduous trees. They may visit citrus groves, beach oak (*Quercus*) scrub, pine (*Pinus*) forest with a dense understorey, or relatively open areas with scattered trees. In Central America, passage migrants use second growth and forest edge.

On the wintering grounds, the birds may utilize a wide variety of forest types, at elevations ranging from sea-level up to 3000 m. In the lowlands, Red-eyed Vireos winter in seasonally flooded forest (*várzea*) or non-flooded forest (*terra firme*), and river-island forest, as well as in plantations and areas with large



Song played an important part in recognizing that the ***Grey-eyed Greenlet*** *was distinct from the sympatric Rufous-crowned Greenlet* (Hylophilus poicilotis). *In 1982, near São Paulo, E. O. Willis heard a "simple" song from a greenlet with a rufous cap, which he recognized as a bird that normally sang a complex song. He found that the simple song was confined to birds with a blackish ear patch, and the complex song to birds with greyish faces. A return to the museum trays confirmed constant differences in plumage, eye and bill colour, and bill length.*

[*Hylophilus amaurocephalus*, Mucuge, Bahia, Brazil. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



*Vireos show a great similarity of diet, the **Red-eyed Vireo** being typical. From April to October, its food consists mainly of arthropods, particularly caterpillars. Plant matter, mainly fruit, steadily increases in proportion through the autumn, and eventually makes up the majority of the winter diet. Red-eyed Vireos search for invertebrates on leaves in the outer parts of trees, frequently hovering as they take their prey. Male Red-eyed Vireos often forage higher in the trees than females, though this species will also look for food in the shrubby understorey and, more rarely, on the ground.*

[*Vireo olivaceus olivaceus*, Texas, USA. Photo: Rob Curtis/VIREO]

shade trees, and, in some cases, in mangroves and xerophytic bushland. The South American populations of the same species are found in habitats from sea-level to at least 1800 m. In such countries as Ecuador, there is considerable geographical overlap between boreal migrants and austral migrants, as well as resident populations of this species.

Although in eastern North America it is not uncommon to find more than one vireo species breeding at a location, there does seem to be a degree of specialization in habitat selection. As an example, the Yellow-throated Vireo differs to some extent from the syntopic Red-eyed Vireo in that it tends to avoid forest interior, unless gaps are opened by human activity or treefall; in addition, it has a preference for more mature forest. Again, the presence of deciduous trees such as oak, ash (*Fraxinus*), cottonwood (*Populus*) and maple is essential; some admixture of conifers is acceptable, so long as there is a significant deciduous component. When the Yellow-throated Vireo is present sympatrically with the Blue-headed Vireo, the latter is more likely to be found in denser, taller stands with an understorey, whereas Yellow-throated Vireos may nest in habitat lacking an understorey. Over most of its breeding range in Canada, the Philadelphia Vireo is sympatric with the Red-eyed Vireo. The two frequently occur together, defending territories against each other when necessary (see General Habits), although the smaller Philadelphia Vireo seems apparently to avoid confrontation with its more powerful congener. Philadelphia Vireos tend to occur in the earlier successional stages of deciduous woodland, with such species as birch (*Betula*), alder, ash and aspen, although coniferous woodland is also used provided that deciduous species are present as well. Unlike the Red-eyed Vireo, the Philadelphia Vireo rarely adapts to human settlement and generally avoids towns.

Over the eastern part of their range, Warbling Vireos are sympatric with Red-eyed Vireos and, again, the two species frequently occupy adjacent or overlapping territories. The Warbling Vireo is more likely than the Red-eyed Vireo to be found in the later successional stages of deciduous forest and, unlike that species, appears not to demand significant understorey. It occurs also, at least in southern Ontario, in small belts of large mature trees such as maples along rural roadsides and on farms. Successional woodland is the preferred habitat also of the White-eyed Vireo, which has benefited from the appearance of suitable areas in abandoned farmland; the ideal conditions for this vireo appear to be found in the period 20–50 years after cessation of agriculture, with extensive undergrowth, saplings and shrubs interspersed with scattered larger trees.

All of the vireos breeding in temperate eastern North America must, of necessity, have a tolerance on their non-breeding grounds of habitats with a totally different mix of tree species. Yellow-throated Vireos spend the winter months in a wide variety of habitats, ranging from shade coffee plantations, mangrove swamps, tropical evergreen forest and cloudforest to thorny scrubland and dry forest with pine–oak woodland associations. In its non-breeding range in Middle America the Blue-headed Vireo is similarly catholic in its habitat choice, occurring in coffee plantations as well as in undisturbed rainforest and cloudforest. Philadelphia Vireos prefer second-growth forest, but, in contrast to the breeding-season habitat, winter also in gardens and in plantations of cacao and coffee; Warbling Vireos are equally diverse, occurring in coconut (*Cocos nucifera*) plantations, mangrove swamps, pine–oak woodland, dry arroyos and tropical evergreen and deciduous forests, from sea-level to 3000 m. The White-eyed Vireo is again a generalist, using middle and late stages of successional habitats such as overgrown fields and second growth of various ages, as well as mangroves and forest of various types.

In western North America, numerous mountain ranges, with variable amounts of precipitation, give rise to varying, highly diverse habitats, often changing within a few kilometres. Vireos have exploited most of these, although they are largely absent from true desert. In Arizona, where differing altitudinal "life zones" create habitats equivalent to those encountered on a journey from lowland Mexico northwards to Canada, all within a very short distance of each other, different species of vireo have specialized in different vegetation types. Thus, Bell's Vireo occurs in dense low brush up to the top of the Lower Sonoran zone, and higher up, in junipers (*Juniperus*) in the Upper Sonoran, is the Grey Vireo, while higher still, in denser live-oak brush, is Hutton's Vireo; in the mixed deciduous forests of the Transition zone is the Plumbeous Vireo, while Warbling Vireos occupy the willows (*Salix*), maples and aspens of the Hudsonian zone. Farther north, the Plumbeous Vireo is unusual in the genus in occurring also in pure coniferous stands, in this case of ponderosa pine (*Pinus ponderosa*) and pinyon–juniper (*Pinus–Juniperus*). Its



Vireos are methodical gleaners, hopping or flying briefly between branches as they investigate leaves and twigs, and, in some species, bark crevices. ***Cassin's Vireo****, like a number of other vireo species, has also been seen hawking at flying insects, or hovering to pick up prey. This species occurs in both deciduous and coniferous forests, as well as in mixed forests such as pine–oak, but during migration it can be found in a much wider variety of habitats, including mangroves, scrubland and secondary growth.*

[*Vireo cassinii cassinii*, Joshua Tree National Park, California, USA. Photo: Joe Fuhrman/ VIREO]

close relative, Cassin's Vireo, likewise occurs in coniferous forest, but it is more usual in open mixed stands with a major deciduous component, especially oak. The globally threatened Black-capped Vireo is relatively specific in its habitat demands; it requires low scrubby growth, mostly deciduous but with spaces between small thickets and clumps, and with vegetation to ground level. This is an early successional stage. The disruption of natural succession by deliberate fire-suppression management policies results in a shortage of prime habitat, one of the factors causing the decline of this species.

In tropical regions members of the family Vireonidae are generally sedentary, and consequently inhabit much the same biotope throughout the year. Some species are quite general in their habitat requirements. The Rufous-browed Peppershrike, for example, occurs in a wide variety of moist and dry forest edge, scrubby secondary growth, river-edge forest, semi-open areas with scattered trees and wet pre-montane forest, from sea-level to 2500 m or occasionally higher. This tolerance of habitat types has allowed the species to be very successful, because it can take advantage of highly modified areas such as cacao plantations. In contrast, the Black-billed Peppershrike is much more demanding in its requirements, needing humid montane forest at subtropical elevations, usually between 1300 m and 2700 m. As a consequence, it is generally less common and much more restricted in its geographical distribution than its congener.

The genus *Vireolanius*, containing the shrike-vireos, is distributed from central Mexico south to Bolivia. Within this geographical range, the four species, all inhabiting forest, tend to be canopy specialists. Three of them, the Green, Yellow-browed and Slaty-capped Shrike-vireos, occur in humid forest, mostly at lower elevations. The most northerly species, the Chestnut-sided Shrike-vireo, is found in evergreen forest and relatively arid pine–oak woodland from 1200 m to 3500 m.

Some resident Neotropical vireos are more specialized than are others in their habitat requirements. For example, the Choco Vireo, a globally Endangered species of very limited range, requires, in Colombia at least, wet primary cloudforest, typically on steeply sloping terrain, with a broken canopy and natural treefall gaps. Abundant epiphytes, palms, mosses and ferns at elevations of between 1100 m and 1600 m apparently provide optimal conditions. In the Ecuadorian part of its range, this species seems to be more tolerant of habitats somewhat modified by human activity, occurring also in forest edge along roads and in regrowth forest. In contrast, the Brown-capped Vireo is found in humid forest, edges of clearings and second growth, and it has a much wider distribution throughout mountainous regions from Mexico southwards to Bolivia.

Two island endemics, the San Andres Vireo (*Vireo caribaeus*) and the Noronha Vireo, are restricted to islands having relatively impoverished faunas. The latter species is the only member of the present family on Fernando de Noronha, lying about 345 km off the north-east coast of Brazil, and the San Andres Vireo is



Having a relatively powerful bill, the ***Yellow-throated Vireo*** *can take large insects and even snails. Slow and deliberate, it does much of its gleaning from perches, and spends less time hovering and hawking. It overlaps in range and habitat with a number of other vireo species, including the Red-eyed Vireo* (Vireo olivaceus) *and the Blue-headed Vireo* (V. solitarius)*. The Yellow-throated spends more time foraging on tree trunks and large branches than these species. In line with this, it takes more moths, which spend the day resting against the dark background of the bark.*

[*Vireo flavifrons*, Captain Daniel Wright Woods Forest Preserve, Illinois, USA. Photo: Rob Curtis/ The Early Birder]



Confined to the Brazilian island of Fernando de Noronha, the ***Noronha Vireo*** *is thought to derive from the race* chivi *of the Red-eyed Vireo* (Vireo olivaceus). *In the absence of competitors, this species forages from the canopy to the ground, but it has become more specialized in its feeding habits than its congeners. It spends much of its time exploring the undersides of leaves for tiny insects with its long, slender bill, grasping the edges of the leaves with its feet, and often hanging upside-down. The long, counterbalancing tail and elongated tarsi may be adaptations to this mode of foraging.*

[*Vireo gracilirostris*, Fernando de Noronha, Brazil.
Photos: Manuel Marín]

one of only two vireonids present on the south-west Caribbean island after which it is named, the other being the Black-whiskered Vireo. Not only do these two islands have few breeding passerine species, but whole families, such as typical antbirds (Thamnophilidae), ground-antbirds (Formicariidae) and ovenbirds (Furnariidae), are lacking. In the absence of much competition, the insular species are more catholic in their habitat use than similar mainland species. The San Andres Vireo is found in cocoa plantations, dry woodland, brushy pastures and inland mangrove swamps. The Noronha Vireo exploits all levels of vegetation, both feeding in the canopy and, unusually for a vireo, hopping around on the ground.

Finally, the greenlets, constituting the genus *Hylophilus*, form a large assemblage of confusing small, warbler-like vireos whose distribution is concentrated in northern and central South America, only three of the 15 species extending northwards into Central America. In terms of habitat, they fall roughly into two main groups. One, consisting of the Rufous-crowned, Grey-eyed, Scrub, Olivaceous, Grey-chested, Lemon-chested, Ashy-headed and Tepui Greenlets, inhabits forest, forest edge or scrub, tending to forage mostly at lower or medium levels; those in the second group, including the Golden-fronted, Dusky-capped, Brown-headed, Buff-cheeked, Lesser and Rufous-naped Greenlets, tend to be forest-canopy species. One species, the Tawny-crowned Greenlet, which differs in several features from other members of the genus, is an inhabitant of the understorey of humid tropical forest. Greenlets occur mainly at lower elevations, from sea-level to 1800 m, with many species found only below 600 m. The Rufous-naped Greenlet, however, inhabits mostly the lower subtropical zone, up to 2100 m, while the Tepui Greenlet, as its name suggests, is found on the extraordinary tepui mountains of southern Venezuela, Guyana and adjacent north Brazil.

General Habits

The majority of vireo species spend most of their time foraging in the upper levels of woods and forests, when their rather slow, deliberate actions are themselves fairly characteristic. For birdwatchers, the greatest identification problems, at least in North America, tend to come with some of the less well-marked parulid warblers such as the Tennessee Warbler (*Vermivora peregrina*), especially when these are in the more confusing non-breeding plumages. Frequently, however, the two groups are easily separable by behaviour, the warblers being constantly, even frenetically, active, whereas a vireo is typically methodical, deliberate and slow in its movements. In the Rocky Mountains, Hutton's Vireo and the Ruby-crowned Kinglet (*Regulus calendula*) bear an extraordinary resemblance to each other, but, once again, the kinglet is incessantly and restlessly in motion, frequently hovering near the underside of leaves, while the vireo is notably less active. Greenlets as a group are smaller and more active than typical vireos. In fact, they are more akin to the New World warblers, which several of them rather resemble in plumage. In contrast, the peppershrikes and shrike-vireos have been described in the literature as being "sluggish" or "lethargic", typically sitting or foraging in a leisurely manner in the forest canopy, and often passing undetected except by song.

On the breeding grounds vireos are strongly territorial. They frequently attack intruding conspecifics vigorously, often flying at the intruder and making bodily contact, the two sometimes locking bills and feet while falling together to the ground. In the case of the Philadelphia and Red-eyed Vireos, interspecific territoriality is much in evidence; the smaller Philadelphia Vireo will defend its territory both against others of its species and against Red-eyed Vireos, although it does seem to avoid confrontation with its larger relative far more than it does with its own species. The two tend to forage at different levels in the canopy, this possibly being a mechanism designed to minimize conflict. The Black-capped Vireo is the sole North American member of the family in which the male has a distinctive subadult plumage, yearlings having a much less pronounced facial pattern than that of adult males and somewhat resembling the females. Such immature-plumaged males are frequently ignored by territorial males in full adult plumage. A similar situation is found in several other, unrelated groups of birds, including the New World orioles in the family Icteridae.

Vireos have a repertoire of visual displays, used in different circumstances. Male Red-eyed Vireos, when faced with intruding males of their own species, will raise the crest feathers, and both males and females of this species may use the same threat in the presence of predators. Other aggressive displays involve the spreading and lowering of the tail, and gaping with the open bill so as to show the colours of the inside of the mouth.

While all vireos are territorial during the breeding season, the situation is more complex for migrant species on the wintering grounds. Some species, such as the Grey and White-eyed Vireos, hold territories in the non-breeding quarters; indeed, in Mexico, the latter species will display interspecific aggression, chasing the resident Mangrove Vireos away from food sources in fruiting trees. On the other hand, some species, such as the Warbling and Philadelphia Vireos, routinely participate in mixed flocks, those peripatetic assemblages of numerous, often unrelated species so characteristic of tropical forests, without showing any obvious aggression to other flock-members, either of their

own or of other species. The generally accepted explanation for the existence of these mixed-species flocks is that they give better protection from predators, by means of early detection, while at the same time not greatly increasing competition for resources, since many of the species involved have specialized feeding techniques, differing from those of other flock-members, and hence exploit different ecological niches within the habitat. Plumbeous, Cassin's and Blue-headed Vireos may be found on their own, but they frequently flock with other species; in contrast, the Yellow-throated Vireo is reported as being solitary on the wintering grounds. On migration, in eastern North America, vireos of several species are frequently found in loose flocks, in the company of other migrant birds such as parulid warblers, without obvious aggressive behaviour.

Hutton's Vireo, which unlike other North American species is largely non-migratory, is found in winter loosely associated with other passerine species, including the Ruby-crowned Kinglet. However, vireonids cannot be truly described as gregarious in the sense of many other passerine species, such as finches or starlings, which occur in dense assemblages of conspecifics, often to the exclusion of other species. Rather, the associations are more casual and fluid, typically involving fairly few individuals in a loose, open and changing assemblage, notwithstanding the fact that on migration the exploitation of a food resource may result in temporary local concentrations of such species as the Red-eyed Vireo. The Black-whiskered Vireo has been said to "migrate in flocks", but given that vireo migration is largely nocturnal and unobservable, the reliability of this statement is perhaps dubious; the presence, in the morning, of a large "fall" of a species does not in itself prove that there was other than incidental association during the actual flight.

Vireonids resident in the tropics are likewise frequent members of mixed flocks. This is true especially of some greenlet species, such as the Tawny-crowned Greenlet, which is usually to be found in pairs or family groups in the company of other flocking species. In Honduras, between March and July, Tawny-crowned Greenlets are frequent companions of Red-crowned Ant-tanagers (*Habia rubica*), remaining with them for one to three hours, following them as they forage higher or lower through the forest, and even bathing and preening with them.

Territoriality among resident tropical vireonids appears to have been little studied. Green Shrike-vireos are known to be territorial throughout the year, but few details are available. In Mexico, Chestnut-sided Shrike-vireos have been seen at the same location in both May and December, although it is not known if the species maintained exclusive territories throughout this period.

Maintaining plumage in a clean and efficient condition is essential for birds, and preening and feather-care is a major activity. Vireos invest a good deal of effort in preening and related behaviour. During preening sessions the body feathers are raised while the body itself is shaken, then the contour feathers are lowered back into position; the same process typically takes place after defecation. Feathers are cleaned with the bill, the longer feathers being run lengthways through the bill. Head-scratching is done in the "indirect" manner, with the leg brought over rather than under the wing, rather in the way of a dog scratching its ear. Some authorities have ascribed taxonomic significance to the method of head-scratching, but it should be noted that in some families, such as Parulidae, both techniques have been seen. Head-scratching is important in removing ectoparasites from those parts of the head and neck which are inaccessible to the bird's bill; injured or one-legged birds that are unable to scratch often suffer from severe infestations in the head region. Allopreening, the preening of one bird by another, which forms such a prominent part of the behaviour of, for example, parrots, has not been reported in the Vireonidae. Vireos keep the bill clean, especially after dealing with glutinous prey, by vigorous wiping against small branches and twigs. For many species, hard and indigestible parts of arthropod prey are cast up as small hard pellets.

When water is available, most vireonids bathe. Frequently this involves using leaves wet with rain or dew, the bird rubbing itself against the foliage. Some species have been observed to bathe actively in bodies of water; Hutton's Vireo has been seen to drop into a shallow stream from a branch 1·5 m above the surface, and a Warbling Vireo was observed to "strike the water of a stream forcibly." There appear to be no records of any vireonid dust-bathing, nor "anting".

Little has been published about the roosting behaviour of vireos. Adult birds appear to roost solitarily on a branch. During the nesting period the female sleeps on the nest when it contains eggs or small young, with the male nearby. Recently fledged Blue-headed Vireos have been seen to sleep in a hunched posture, with the head drawn down into the shoulders, the bill pointing straight ahead, and the body squatted down over the legs.



In central Oaxaca, the ***Golden Vireo*** *is mostly found in arroyos and riparian scrub from May to August, but, in common with many species that breed in this habitat, it is rare or absent for the rest of the year. In western Mexico, this species has been recorded only in tropical deciduous forest in winter, a habitat it shares with other vireos. Migrant vireos that move into the ranges of resident species find ways of partitioning resources: wintering White-eyed Vireos* (Vireo griseus) *feed higher up and in taller trees than resident Mangrove Vireos* (V. pallens)*, and depend more on fruit, while the Mangrove Vireos take a higher proportion of arthropods.*

[*Vireo hypochryseus hypochryseus*, Monte Albán, Oaxaca, Mexico. Photos: Nick Athanas]



*Like a true shrike (Laniidae) the **Rufous-browed Peppershrike** is capable of dealing with large arthropods or even, as here, frogs; it has also been observed killing lizards. However, a study of the stomach contents of this and other Neotropical passerines, compiled from various sources, indicates that consumption of vertebrates is relatively rare: of 131 vireonid stomachs, only two contained vertebrate remains. Vireonids use their feet to hold down large prey while dismembering it with the bill.*

[*Cyclarhis gujanensis gujanensis*, Bolívar, Venezuela. Photo: David Southall]

Voice

In terms of their ability as songbirds, most vireos are noted more for perseverance than for musical accomplishment. Indeed, in the USA, a local nickname for the Red-eyed Vireo in the nineteenth century was "The Preacher", from this species' monotonous, persistent and constantly repeated notes, an accolade that does not speak too highly for the entertainment value of Victorian sermons.

The song of the Red-eyed Vireo is in several ways typical of that of many members of its genus. It consists of short sequences of a few notes, each sequence lasting less than a half-second, interspersed with slightly longer gaps without notes; a common verbal interpretation is "Here I am...where are you?...here I am... where are you?" Detailed sonographic analysis reveals that much subtle variation exists in the phrases, most of which are too fast to enable this to be detected by the unaided human ear. Within each phrase there are several elements, often beginning with an upward slur, followed by other notes which can be of higher or lower pitch. The number of elements in a phrase is very variable, and individuals possess a wide vocabulary, in one study ranging between 19 and more than 100 phrase types among different singing males. Most birds use two or more elements, sometimes up to five, per phrase. There is some geographical variation in song type, but this is not so clearly defined as to allow the distinguishing of genuine dialects.

Only male Red-eyed Vireos are known to sing. This they do mostly during the early morning, but, in contrast to many forest birds in North America, they will persist throughout the day; on hot, sultry June afternoons, the song of the Red-eyed Vireo and the calls of Eastern Wood-pewees (*Contopus virens*) are often the only sounds to be heard in a patch of Ontario woodland. Individuals will sing to a limited extent also when on migration, but much less so than, for example, most migrating parulid warblers. Sometimes they mimic other species, and occasionally they may sing completely aberrant songs. Presumably, as with many oscine passerines, Red-eyed Vireo songs are to some degree the result of learning or experience. For several other species, such as the White-eyed Vireo, there is strong evidence for the early learning of song in the first few months of life.

In addition to territorial singing, the Red-eyed Vireo has several other types of vocalization, often given in specific circumstances. During aggressive encounters, or in response to predators, both sexes emit a "myaah" call like that of a Grey Catbird (*Dumetella carolinensis*). The male utters a harsh "tcheeer" during territorial flights, and the sexes give a greeting call, "aerrr", when they meet. Various calls are given during the soliciting of food or copulation. Nestling Red-eyed Vireos are able to make begging calls, represented as "tchirt tchirt tchirt", from about five days of age.

The songs of several other members of the genus follow the same pattern as that of the Red-eyed Vireo, consisting of a series of short, discrete phrases, at regular intervals, interspersed with rather longer pauses. In the Yellow-throated Vireo's song, the phrases are typically about a third of a second in duration, and the pauses about one second; the notes uttered by this species have a diagnostically buzzy quality, reminiscent of the song of the Scarlet Tanager (*Piranga olivacea*). The Blue-headed Vireo in eastern North America shares parts of its breeding range with the Yellow-throated Vireo, and its song, again a typical series of disconnected phrases separated by longer pauses, consists of purer notes which are easily distinguishable; this may help to isolate it from the latter species in syntopic populations. Cassin's and Plumbeous Vireos are closely related to the Blue-headed Vireo, but, unlike that species, are not sympatric with the Yellow-throated Vireo in any part of the breeding-range; their songs lack the clear pure notes of eastern Blue-headed Vireos.

Philadelphia Vireos are syntopic with Red-eyed Vireos in parts of the breeding range, and the two species are frequently interspecifically territorial. Since the Philadelphia Vireo is substantially the smaller of the two, it has an obvious incentive to avoid physical hostilities. It has several song types, and it will sometimes imitate the song of the Red-eyed Vireo; unlike the latter, however, it appears to be able to distinguish between songs of its own species and those of its larger congener. The closest relative of the Philadelphia Vireo, on the basis of behavioural, morphological, allozyme and cytochrome *b* characters, is probably the Warbling Vireo. It is possibly significant, in a species-isolation context, that the song of the Warbling Vireo diverges widely from the classic vireo pattern; instead of short, discrete phrases separated by longer silences, it is a complex modulated series of warbling notes, continuing for two to five seconds without intervening pauses. The Warbling Vireo is an extremely persistent singer, incubating males even singing from the nest. Females, too, sing, although to a lesser extent than males.



Fruiting from late summer onwards, and high in fat, elderberries (Sambucus) *are a valuable food source for birds like this* ***Red-eyed Vireo*** *as they prepare for their southward migration. These and other berries are taken by stretching from a perch or by hovering. Small fruit is swallowed whole; with slightly larger fruits, the bird may jerk its head up and down with a gulping motion. Large, hard seeds may be regurgitated. Vireos will also peck the pulp of fruit that is too big to swallow. Several species of vireo have been observed defending fruiting trees and bushes against conspecifics and other species on their wintering grounds. Some vireonids are frugivorous the year round. Fruit makes up more than half of the food the San Andres Vireo* (Vireo caribaeus) *brings to its nestlings. Breeding Yellow-green Vireos* (V. flavoviridis) *also take a lot of fruit, although in this case it is the adults that take advantage of the abundant fruit available on their return to their breeding grounds; they feed their young on a more normal diet of arthropods.*

[*Vireo olivaceus olivaceus*, Chicago, Illinois, USA. Photo: Rob Curtis/ The Early Birder]



*This **Noronha Vireo** is taking nectar from the flowers of* Erythrina velutina. *During the dry season on the Brazilian island of Fernando de Noronha, this diluted nectar is one of the few sources of water. Other Neotropical vireos are occasional nectar feeders. Vireonids will eat a variety of other non-fruit vegetable matter. Hutton's Vireo* (Vireo huttoni) *has been seen to drink fresh sap from holes created by sapsuckers* (Sphyrapicus), *and Red-eyed Vireos* (V. olivaceus) *eat flower and leaf buds.*

[*Vireo gracilirostris*, Fernando de Noronha, Brazil.
Photo: Haroldo Palo Jr.]

Several other vireos have relatively complex songs. The Thick-billed Vireo's song is described as bubbly and variable, resembling that of the White-eyed Vireo but slower, while the Flat-billed Vireo's song is a chattering, high-pitched series of "weet" notes. The Blue Mountain Vireo sings a bubbling trill, descending in pitch somewhat towards the end, not closely resembling any other vireo song.

A number of vireo species have more than one type of song. Bell's Vireo, for example, in order to maintain territory, delivers a loud, emphatic song consisting of about ten harsh, unmusical notes in a sequence lasting about one-and-a-half seconds. During pair formation, nest building and egg-laying, however, it uses a second type of song, which is much quieter and more squeaky. The female of Bell's Vireo sings only rarely and, when she does, her song is feeble.

Among some vireo species, the various races have differentiated songs. The northern races of the White-eyed Vireo, namely the nominate and *noveboracensis*, have longer songs with more notes than those of the southern *maynardi* and *micrus*. Nevertheless, all races respond to the recording of the songs of other races. There is a similar differentiation in many areas between the eastern, nominate race and the western subspecies *swainsoni* of the Warbling Vireo.

The Rufous-browed Peppershrike is a widely distributed species, ranging from southern Mexico south to Argentina, over which area more than twenty subspecies occur. The species as a whole is a persistent singer, having a repertoire of up to seven song types. The song is a loud, melodious warble, somewhat like that of a grosbeak (*Pheucticus*), with up to seven notes per phrase. A study of several different races, well separated geographically, revealed interesting variation between their songs, and between individuals from different habitat types. Birds from the equatorial parts of the species' range had songs that were shorter in duration, with less repetition, a higher maximum frequency and a larger number of syllables, when compared with races from more temperate latitudes. The frequency differences may be explicable in terms of Bergmann's Rule; in any one species, individuals from temperate latitudes tend to be larger than those from the tropics, and song frequency may be correlated with body size. In addition, there was a differentiation between birds from open and mixed habitat and those from closed forest. The former's songs had a narrower band width and lower maximum, minimum and emphasized frequencies than those found in the latter.

Shrike-vireos are frequently first detected by their loud and persistent songs, since the birds themselves are often concealed in the forest canopy. The primary song of the Chestnut-sided Shrike-vireo has been described as a short, ascending, whining moan which becomes a descending, wailing whistle, terminating abruptly. These phrases are repeated continuously, with gaps in between, in typical vireo manner.

Songs of greenlets exhibit quite a lot of variation among species. The forest-dwelling Tawny-crowned Greenlet utters a single high, clear, whistling, somewhat ventriloqual note, typical of the calls of many bird species of the forest understorey, whereas most other members of the genus, which prefer edge, scrub or forest canopy, have relatively complex multi-note songs. E. S. Morton correlated the differences among the songs of four Panamanian greenlets, including the Tawny-crowned, with the acoustic properties of the forest interior, as opposed to forest-edge and canopy habitats. In Panama, Lesser and Golden-fronted Greenlets have similar songs; Morton has suggested that the more stereotyped timing of song elements by the Golden-fronted Greenlet may reflect this species' more open habitat. Lesser Greenlet females may sing a shorter version of the male's song.

Food and Feeding

Most of the detailed information available on the diet of vireonids has come from the examination of stomach contents of collected specimens, a process which, while raising ethical concerns in some quarters, does, at least, allow the accurate and quantitative identification of food items. In some cases, field observations provide some data, although they can, by their very nature, give only generic information on food identification; in certain instances, examination of faeces of captured individuals enables the qualitative identification of diet items. As is the case in many other areas of ornithological study, far more data are available

for North American species than for tropical ones. For many of the latter, information may be lacking or, not infrequently, be limited to rather unhelpful comments on specimen labels such as "stomach contents insect-parts". In the early years of the twentieth century, several very extensive studies were conducted on North American vireos in the breeding season. Given the very large numbers of specimens taken, in one study 653 Red-eyed Vireos, 329 Blue-headed Vireos, 221 White-eyed Vireos and 160 Yellow-throated Vireos, to name only a few species, it is unlikely that any similar study would, should, or could, be repeated today. As a result, the data gathered in those studies are likely to constitute the most complete picture of vireo diet for the foreseeable future.

There is a great degree of similarity in diet among the North American vireos, with relatively minor variations according to the resources available to the individual species. Broadly speaking, all species rely heavily or almost exclusively on arthropods during the breeding season, while vegetable matter starts to play a more important role later in the year and on the wintering grounds. To take a typical, well-studied example, the diet of the Red-eyed Vireo from April to October is reported as consisting of 85% animal and 15% vegetable items. The animal matter seems to be comprised entirely of arthropods, with caterpillars an important part. The percentage of caterpillars increases as the season progresses, doubtless as a result of their availability, from 15% in spring to 50% in summer, dropping to 20% in the autumn. Other recorded prey include bugs, plant-bugs and aphids (Hemiptera), beetles (Coleoptera), bees, wasps and ants (Hymenoptera), flies (Diptera), grasshoppers and crickets (Orthoptera), adult moths and butterflies (Lepidoptera), various other insects, and spiders (Araneae). Vegetable matter taken is mostly in the form of small fruits, such as blackberries (*Rubus*), elderberries (*Sambucus*), dogwood (*Cornus*), sassafras (*Sassafras*) and wild grapes (*Vitis*). One author noted as many as 50 migrating Red-eyed Vireos in one magnolia (*Magnolia*) tree, where the birds were seen to be eating the bright red seeds. Other vegetable matter in the diet includes flower and leaf buds. The percentage of vegetable matter increases as the season proceeds. Faecal samples of Red-eyed Vireos captured on autumn migration in Rhode Island always contained fruit remains, frequently along with insect matter; in this study, it was estimated that fruit accounted for 74% by volume of the species' diet at that time of the year. On the wintering grounds vegetable matter is stated to be the major component of the diet, although little detail is given.

Other North American vireos follow an essentially familiar pattern. The diet consists predominantly of arthropods during the breeding season; in various studies, figures of 99%, 98%, 96%, 95%, 94% and 93% have been quoted for, respectively, Bell's, Hutton's, Blue-headed, Warbling, Black-capped and Philadelphia Vireos. Again, caterpillars are a major proportion of the diet and, for most species, they form an important percentage of the food given to the nestlings. Some species, such as the Plumbeous Vireo, appear able to tolerate and exploit hairy caterpillars, including those possessing irritating spines. The Black-whiskered Vireo seems to be something of an exception to the general dietary pattern, being more frugivorous than its relatives; proportions of vegetable matter in its diet have ranged from 13% to 58% in various studies. Occasionally, rather odd items appear on the vireo menu. The White-eyed Vireo has been seen to take a small lizard, and Hutton's Vireo has been observed drinking sap from holes recently made by the Red-breasted Sapsucker (*Sphyrapicus ruber*). Yellow-throated Vireos, with a relatively powerful bill, will take large insects, as well as snails. Vireos have been seen to drink water from dewy leaves, as well as from larger sources, although arid-country species may be able to obtain sufficient water from their food.

An interesting adaptation is found in the Yellow-green Vireo, a migratory species which is absent from its breeding grounds in Panama from late September to early January and, in Costa Rica, to early February. It starts nesting immediately upon its arrival on the breeding grounds from its South American non-breeding quarters. At this time vegetable food, in the form principally of fleshy fruits, is abundant. The adults seem to subsist largely on such food, while at the same time feeding their young on arthropods. It is hypothesized that this strategy allows them to maintain their energy requirements on easily found fruits, giving them time to search out the scarcer high-protein animal food required for the rapidly growing young.

Although vireos may swallow smaller prey whole, they frequently macerate larger items, sometimes by smashing them on a convenient branch. Large, hard-bodied prey items, such as crickets, are dismembered piecemeal by holding down the item with a foot while using the bill to rip bits off; for this, the terminal hook on the bill (see Morphological Aspects) is ideal.

Quantitative information on the food preferences of North American vireos in their non-breeding quarters is largely lacking, but fleshy, arillate fruits are a major component. Populations of the Grey Vireo wintering in Sonora, in north-west Mexico,



Just as when bathing, vireonids make use of whatever source of water is available for drinking. Like this ***Cuban Vireo****, they will make use of standing water if they can find it. Otherwise they will drink dew or raindrops from leaves. It is possible that arid-country species obtain enough water from their food, although some species of predominantly dry habitats, such as Bell's Vireo* (Vireo bellii) *and the Golden Vireo* (V. hypochryseus)*, are often found not far from water.*

[*Vireo gundlachii gundlachii*, Cayo Coco, Ciego de Ávila, Cuba. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



Males of the northern, nominate race of the ***Plumbeous Vireo*** *arrive on the breeding grounds ahead of the females. A male selects a nest-site, usually a fork in the lower branches of a tree or in the understorey, and displays it to the female by attaching spider webs and other materials, while singing constantly. If the female rejects this site, the male will repeat his display at another. Unmated males may build incomplete nests, which they abandon on pairing, though they may use them as a source of building material.*

[*Vireo plumbeus plumbeus*, Madera Canyon, Arizona, USA. Photo: Rob Curtis/ The Early Birder]

make major use of the fruit of the elephant tree (*Bursera*), but members of this vireo species spending the winter months farther east appear not to do so.

In the Yucatán Peninsula, an interesting situation exists with regard to resource division between two species of vireo. The Mangrove Vireo is a sedentary resident which maintains a year-round territory, mostly in scrub, while individuals of the closely related White-eyed Vireo, a winter visitor with a more varied habitat occupancy, also defend territories. Within this area, White-eyed Vireos regularly forage higher up and in taller trees than Mangrove Vireos, and they chase the latter out of fruiting elephant trees; the resident Mangrove Vireos depend more on arthropods and less on fruit than their wintering congeners, allowing the co-existence of the two species in one area.

The diets of Middle and South American vireonids have been much less studied, and most of the information available comes from scanty comments regarding stomach contents on the labels of museum specimens. Thus, the Mangrove Vireo is stated to eat "spiders and small beetles", the Yellow-winged Vireo "insects and spiders", and so on. In Jamaica, both the Black-whiskered and the Jamaican Vireos have been reported as consuming small berries and seeds, the Black-whiskered Vireo being particularly attracted to old fustic (*Maclura tinctoria*) and bird pepper (*Capsicum*). The peppershrikes have a more massive bill than other members of the family. The dietary items of the Rufous-browed Peppershrike include large insects, which the bird holds down with its foot while ripping them apart; this species consumes spiders and spider cocoons, too. The Green Shrike-vireo has been seen to take relatively large insects, as well as spiders and beetles, along with fleshy fruit. Stomach contents of the Slaty-crowned Shrike-vireo include true bugs, as well as crickets and grasshoppers. Greenlets seem to be mainly insectivorous, with caterpillars, beetles, spiders, ants, bugs and crickets noted in the stomach contents of several species; for many, however, there appear to be no recorded data. Vegetable matter in the form of berries has been recovered from the Tawny-crowned and Lesser Greenlets, while berries of mistletoes (Loranthaceae) have been specifically identified as being taken by the Ashy-headed Greenlet. Similarly, Rufous-crowned Greenlets in south-east Brazil are known to feed on fruits.

Generally, the foraging methods of this family involve the exploration of foliage in a series of leaps or short flights between twigs and leaf clusters. Vireos are opportunistic gleaners, mostly from leaves but also from twigs, and occasionally from crevices in the bark. Several species, such as the Red-eyed and Black-capped Vireos, exhibit differences between the sexes in preferred foraging heights, the males tending to search at greater heights than those chosen by the females. For most of the time vireos remain roughly upright when foraging, but they will on occasion hang upside-down, in the manner of a chickadee (Paridae), while pecking at food items. Aerial flycatching is practised by this family, but prey caught on the wing seems to form a relatively minor percentage of food items. Some species, the Philadelphia Vireo being one example, catch much of their prey by fluttering in front of foliage while picking off items, but most species obtain the bulk of their prey from a perched position.

In a ten-year study in several localities in Atlantic forest in south-east Brazil, R. Parrini and colleagues made a number of observations on the diet and foraging behaviour of the Rufous-crowned Greenlet. They found that, although arthropods were the principal items in the diet of this species, fruits were taken more frequently than had previously been suspected. This greenlet foraged from near ground level up to the canopy, and was observed singly, in pairs or, more rarely, in groups of up to four individuals. It was present fairly often in mixed flocks of insectivores. The team documented a total of 442 feeding events, of which about 60% involved the capturing of small arthropods in foliage. Nevertheless, 66 feeding attempts, about 15% of the total, were directed at fruits. These concerned the consumption of fruits mainly of the mistletoe genus *Struthanthus*, with a few observations of the taking of berries of *Miconia pusilliflora*, as well as drupes of *Rapania* (Myrsinaceae) and capsules of *Alchornea triplinervia* (Euphorbiaceae) and *Clusia* (Clusiaceae). The birds sometimes used acrobatic postures, clinging sideways to slender vertical branches of trees, bamboos, creepers, lianas or other plants, and they sometimes hung upside-down from twigs and foliage. In this study, the predominant foraging technique was that of gleaning, but other documented methods were sally-pouncing and, more rarely, sally-striking. On two occasions, individuals were seen to catch small flies in the air by sally-hovering.



*The nest of **Cassin's Vireo** is looser and bulkier than those of other vireos, but it follows the usual pattern: a pensile (hanging) cup built in a lateral fork in the thinner branches of a tree or shrub. The nest is usually attached at the rim by spiders' webs. The outer part is made of plant fibres, strips of bark and coarse grasses, with a lining of finer grasses, rootlets and animal hair. There is evidence that some Cassin's Vireos which breed in Canada or the western USA later migrate to southern Baja California, Mexico, where they breed again in the same year.*

[*Vireo cassinii cassinii*, Stevens Creek County Park, California, USA. Photo: Peter LaTourrette/ VIREO]

Breeding

The breeding behaviour of those vireonids that nest in Canada and the USA has generally been well studied and documented. For those breeding in Mexico and in Central and South America, on the other hand, there are major gaps in knowledge, with even the nests and eggs of a substantial number of species yet to be described.

The Red-eyed Vireo, probably the most thoroughly investigated species in the family, is in most ways typical of the genus *Vireo* in its breeding behaviour. In the case of the migratory northern population, as with many migrant passerines, the males arrive back on the breeding grounds ahead of the females and immediately begin to establish a territory. The females appear three to fifteen days later, and pair formation occurs very shortly thereafter. The choice of nest-site appears to be made by the female, which inspects potential sites while the male sings nearby. Nests are usually located 2·5–4·3 m above ground level, although sites from as low as 0·4 m and up to 19 m have been observed. Red-eyed Vireo nests are most frequently built in a lateral fork of a branch, generally where the branches are quite fine, and they are typically placed in a position where they are concealed from above but give the incubating bird a good 360-degree view of the surroundings. On one occasion, a female was seen to pull down nearby leaves in order to give better cover from above, and to fix them into position by using spider webs. Deciduous trees provide the great majority of this species' nest-sites. The shape of the nest is very characteristic; it is an open pensile cup held by "basket handles" to the supporting tree branches, which may be little more than thick twigs. Nest-building is done by the female, although the male may collect and pass material to her and may also feed her during the construction period. Typically, the building of a nest takes four to five days. The female starts at the narrow end where the branch forks, using spider webs to attach the first materials. From here, more material is fastened to these supports until the main body of the nest, including the cup, is formed; the bulk of the material used at this stage consists of fine bark strips and plant fibres. Then, a lining of fine plant fibres, grass, pine needles and sometimes animal hair is added to the cup. Finally, the outside of the nest is added. Materials for this, such as tree bark, lichens and the like, are perhaps chosen with a view to camouflage, as lighter-coloured tree bark may be used for nests exposed to sunlight. The nests, despite a somewhat flimsy appearance, are remarkably durable and can last for a couple of years without disintegrating. Nevertheless, it appears that they are not used in subsequent years, although they may be utilized to provide material for new nests.

Egg-laying starts one to four days after completion of the nest. In the case of nests replacing earlier ones that failed owing to predation, laying usually begins only one day after the build-

*In common with many other vireo species, the male **Yellow-throated Vireo** does most of the initial work on the nest, but the later stages are performed almost entirely by the female. The lining is added by the female alone. The exterior of the nest may be decorated with lichen, cocoons and plant down, and Cassin's Vireos* (Vireo cassinii) *use paper from hornets' nests. This decoration may be intended to serve as camouflage, and in sites exposed to sunlight the birds sometimes use paler materials. Nests are usually well concealed, perhaps because of the very high levels of nest parasitism which vireos suffer.*

[*Vireo flavifrons*, Hamilton County, Ohio, USA. Photo: Dave Maslowski/ Maslowski Productions]





*The **Blue-headed Vireo** is the earliest of the migratory vireos to return to North America in spring. It arrives in North Carolina by early March, and reaches central Quebec by mid-May. Despite this early start, it is probably single-brooded, though double-brooding sometimes occurs in southern populations. The nest is a typical rounded cup, suspended by its rim from a fork in a slender branch. Nest-building takes around eight days, the male doing most of the work at first but ceasing his efforts around the sixth day, leaving the lining of the nest to the female. Egg-laying in this and other vireo species begins one to four days after the nest is completed, at the rate of one egg a day, usually laid in the morning. Both sexes incubate, although the female sleeps alone on the nest at night. Blue-headed Vireos lay three to four eggs, which is typical of vireos of temperate regions, where the breeding season is relatively short and intense because of the limited period when insect larvae are abundant. In Central and South America, where high-energy food such as insects may be available all year, but nest predation is high, a different strategy is common: more broods, spread out over a longer season, but smaller clutches.*

[*Vireo solitarius solitarius*, Michigan, USA. Photo: Marie Read]



*The female **Red-eyed Vireo** takes the lead in nest-building. She may hold nesting material in her bill when soliciting copulation, and she selects the site and does the work, although the male may help provide material. She also incubates alone, taking frequent breaks to feed. She spends longer on the nest on colder days—and perhaps also when it is raining, as in this picture. The southernmost race,* diversus, *is thought to migrate north after breeding, to spend the austral winter in Amazonia and southern Venezuela.*

[*Vireo olivaceus diversus*, Juquia, São Paulo, Brazil. Photo: Fabio Colombini]

ing work is completed. Eggs are laid at the rate of one per day, usually in the morning. Red-eyed Vireo clutches vary from one to five eggs, with an average of 3·3 in Ontario and 3·1 in Michigan. The eggs are dull white, with sepia speckles concentrated at the blunt end. Incubation is by the female alone, although the male may, on rare occasions, settle briefly on a nest in the female's absence. It commences with the first egg, but fully effective incubation may not begin until the clutch is nearly complete. The female takes frequent breaks from sitting, no doubt in order to feed. The length of these breaks depends upon the temperature; on colder days, when the eggs might presumably become chilled more quickly, they are shorter. During the night the female remains on the nest.

Young Red-eyed Vireos are typical of an altricial bird. New hatchlings are pinkish, with white or flesh-coloured gape-flanges and an orange or yellow mouth-lining. They are small, generally no more than 1·5–1·8 g in weight, and largely naked but with small tracts of sparse down; for about the first six days of life they are blind and incapable of regulating their body heat without being brooded, a task carried out by the female alone. The nestlings develop rapidly, their weights reported as increasing from about 2·7 g to 8·6 g between the ages of one day and four days. Feather tracts start to appear in the first few days, the sheaths of the primaries emerging at three days and bursting at six days. By the time the chick reaches nine days of age, its body is largely feathered. From the time of hatching, Red-eyed Vireos are able to beg for food, holding the head raised and the mouth open. The young are able to move the posterior of the body towards the rim of the nest in order to defecate. Faeces are deposited in faecal sacs, which are removed by the adults, mostly by the female. In the early stages, adults will eat the faecal sacs, but later on they carry them away and drop them or deposit them on branches away from the nest-site.

Food for the nestlings is carried in the beak, rather than being regurgitated, and the adult usually feeds only one nestling at each visit to the nest. The parents tend to make more frequent visits in the first few days after the young hatch, but they compensate for the fewer visits at later stages by bringing larger prey. The young leave the nest at around ten to twelve days of age, usually all nestlings leaving quite rapidly over a short period of time. The fledglings associate with the parents for some time after leaving the nest, and they are fed by them regularly for up to 15 days, after which, despite begging, they are fed less frequently. In the northern part of the breeding range Red-eyed Vireos are single-brooded, but in southern locations, such as in Louisiana, two broods appear to be normal.

It is typical of passerines nesting in temperate climates to have short, sharply delimited breeding seasons, with few broods but relatively large clutch sizes. This is probably an adaptation, in a seasonally changing climate, to the scarcity of arthropod life followed by a rapid explosion of the same; because there is only a limited amount of time when high-energy food is available in quantity for the young, the breeding strategy is that of maximizing production within this period. In the tropics, where food may be available all year but nest predation is high, a different strategy is common, with more broods, spread out over a greater time period, but smaller clutches. The Red-eyed Vireo is interesting in that it has two broad populations, one migratory and breeding in temperate regions and the other sedentary in the tropical zone. The breeding strategies of the two populations are quite different. In mainland South America, the local races of this species lay only two eggs, and in Trinidad three is the norm, whereas Red-eyed Vireos in North America lay clutches commonly of three to five eggs. In Canada, nesting pairs first lay within a few weeks of each other. While there is a lack of data on laying dates of Red-eyed Vireos in South America, the closely related Yellow-green Vireo can be found nesting in Panama at any time between February and August, giving time for more than one brood to be reared. Recent isotope studies suggest that some of the population of Cassin's Vireos nesting in western North America migrate further south to southern Baja California and there breed again. Several other species, including the Yellow-billed Cuckoo (*Coccyzus americanus*) and Orchard Oriole (*Icterus spurius*) seem to do the same thing, having a second breeding season in Mexico. So far, Cassin's Vireo has only been found to do this in Baja California, where the total area of suitable breeding habitat is very small in comparison to the conventional breeding areas in the north.

Vireos are very prone to brood parasitism by cowbirds, in North America largely by the Brown-headed Cowbird (*Molothrus*

ater). Although Red-eyed Vireos can be very aggressive toward cowbirds, chasing and striking them, they generally tolerate the presence in their nests of cowbird eggs. On occasion, a vireo nest may contain only cowbird eggs, laid by several different females, yet the vireos still incubate these. Although parasitized nests may in some cases be abandoned, Red-eyed Vireos, especially later in the season, usually prove to be excellent hosts.

In terms of general breeding strategy and habits, the other species of vireo that nest in North America are similar to the Red-eyed Vireo, with relatively minor variations. The nest type is remarkably uniform throughout the genus. It is an open cup located in a fork of a tree branch, being suspended from the neighbouring twigs by strips of material resembling basket handles. The males of several species have been seen to construct what could be termed "bachelor pads", building the rudimentary beginnings of up to five nests. Unlike the situation found among wrens (Troglodytidae), in which nests started by the male are often finished and then occupied by the female, bachelor pads of vireos do not form the base of an actual nest, although they may be utilized later as a source of building materials. Their function may be purely for display.

Vireo eggs are typically white, off-white or dull grey, with small black or brown spots or speckles, which are concentrated around the blunt end. Eggs of the Black-capped Vireo are of a plain, unmarked white, and other vireo species occasionally lay immaculate eggs, whereas the eggs of the Yellow-throated Vireo are more heavily and more prominently marked than are those of other species. Clutch sizes are usually in the range of three to five eggs, with a typical average of just under four for most species. The Bermuda subspecies of the White-eyed Vireo produces a significantly smaller clutch, on average 2·5 eggs, than that of its mainland counterpart, which lays three to five eggs, with a mean of about four. It is not known whether the Bermuda population is more prone to double-brooding than the mainland breeders, as a means of compensating for this apparent lack of productivity. Individuals of island populations of small birds do, however, tend to have greater longevity compared with those on the mainland.

Partitioning of incubation duties varies among species. Generally, the bulk falls to the female, the male doing less of the work and often contributing much less than 50%. Males of some species may feed the incubating female on the nest. Incubation periods are typically in the range 13–15 days, and the young usually fledge in about 10–14 days.

Although most vireos breeding in temperate regions are single-brooded, some individual pairs of several of the species may produce a second brood. Interpretation of observations can be complicated, however, by the fact that pairs which fail in their first attempt often renest, such behaviour involving a second breeding attempt, rather than genuine double-brooding. In the case of the Warbling Vireo, double-brooding seems to be quite frequent in western populations but is unknown in the east. In migratory and more boreal species, such as the Philadelphia Vireo, breeding may be highly synchronized within the population as a result of the constraints of a short period of abundance of insect prey for the young; in one study of Philadelphia Vireos in north-eastern Ontario, all instances of hatching occurred within a single three-week period. In contrast, in California, nests of the non-migratory Hutton's Vireo can be found at any time between February and August.

Some species will occasionally indulge in polygyny or polyandry. Black-capped Vireo pairs, for example, may be monogamous, or the males sequentially polygynous, or the females sequentially polyandrous. Females sometimes change mates after a nesting attempt, whether successful or unsuccessful, or they may remain faithful; the care of the brood may be left entirely to the abandoned male, or some of the young may move into the new territory. Some females may be polyandrous, remating with a second male in his territory while still attending the young fathered by the first male in the original territory. On the other hand, Cassin's and Blue-headed Vireos seem to be entirely monogamous, although, since these species are, over much of their ranges, single-brooded, there is no opportunity for sequential polygyny or polyandry.

Cowbird parasitism is a major factor in the reproduction success of all vireo species (see Status and Conservation). In North America, the relevant species is the Brown-headed Cowbird, but in studies in St Lucia and Puerto Rico, in some cases, more than 80% of the nests of Black-whiskered Vireos were parasitized by the Shiny Cowbird (*Molothrus bonariensis*). In Guánica Forest, in Puerto Rico, Shiny Cowbirds were found to have laid in 73–83% of the nests of the Puerto Rican Vireo, although in Maricao



*The male **Red-eyed Vireo** brings food to the female while she is incubating, and sometimes also when she is building the nest. In other species where the female alone incubates, males may or may not bring food to them. For example, the male Black-whiskered Vireo* (Vireo altiloquus) *does so rarely. In the White-eyed Vireo* (V. griseus) *both sexes usually incubate, but when the female does so alone she is fed by the male. Black-capped Vireos* (V. atricapilla) *share incubation, but the female may incubate the second brood alone if the male is occupied with feeding the first brood.*

[*Vireo olivaceus olivaceus*, Ithaca, New York, USA. Photo: Marie Read]



*The eggs of the **Blue-headed Vireo** hatch after 13–14 days, though they may take a day or so longer if the weather is cold. Both parents feed the young, mostly bringing whole prey in the bill, and only rarely by regurgitation. The food is mainly caterpillars at first, but becomes more varied as the young grow; the bird here is delivering a chrysalis. There is a report of a dragonfly delivered whole to nestlings, although such large prey is normally smashed or dismembered first. The young are brooded by both parents (though only the female at night) for the first five or six days. A. C. Bent records six instances of Blue-headed Vireos nesting in the same tract of pines as Cooper's Hawks* (Accipiter cooperii), *apparently unmolested. He adds that he had never found their nests near those of the smaller Sharp-shinned Hawk* (A. striatus).

[*Vireo solitarius alticola*, Tennessee, USA. Photo: Ron Austing/VIREO]

State Forest, an upland area less suitable as a habitat for cowbirds, the rate of parasitism was zero.

In the three other genera of the family, there is a considerable uniformity in nests and breeding behaviour, notwithstanding wide morphological differences among the groups (see Morphological Aspects). Thus, the nest of the Rufous-browed Peppershrike is described as a flimsy hammock slung in a lateral fork of a tree; all of the few described nests of greenlets have been a deep cup, suspended by the rim from the twigs of a lateral tree fork; and the Chestnut-sided Shrike-vireo builds a nest of "typical vireo pensile construction". The eggs, typically two or three, of greenlets, peppershrikes and shrike-vireos seem in each case to conform to the standard vireo pattern of a white or pinkish-white background with spots or speckles of brown. There are, however, large gaps in the present knowledge of many of the species in these three genera. It appears that there are no detailed descriptions, and frequently no data at all, regarding the nidification of nine of the 15 species of greenlet, most of the shrike-vireos and one of the two peppershrikes.

Movements

Within the Vireonidae there is a great diversity of migratory behaviour, a characteristic that this family has in common with many other families of primarily insectivorous birds with a breeding range encompassing both temperate and tropical areas, of which, in the Americas, the parulid warblers and the wrens immediately spring to mind. On the one hand, many species found in the tropical areas of Central and South America seem to show little, if any, movement during the course of the year. In contrast, most species breeding in the temperate areas of North America are migratory, and often highly so. A combination of short, hot summers, which result in an explosive but relatively brief proliferation of invertebrate life, and ensuing severe winters, during which the availability of high-protein prey is largely restricted, necessitates a markedly migratory lifestyle for those species.

In common with members of several other insectivorous passerine families, those vireos which breed primarily in temperate eastern North America tend to be longer-distance migrants than are those in the west. For example, the North American populations of the Red-eyed Vireo, which breed in deciduous forest all the way from the southern shores of James Bay, in Canada, south to the Gulf Coast of the USA, have the longest migratory displacement of any vireo species; there is no overlap at all between the breeding and wintering ranges, which are largely on opposite sides of the Caribbean, a latitudinal divide of some 18 degrees, while the distance between the northern points of the breeding range and the southernmost part of the winter range covers about 80 degrees of latitude. The South American populations of this species, which are sometimes separated as a distinct species, the "Chivi Vireo" (see Systematics), are for the most part sedentary, although the southernmost parts of the breeding range are vacated during the southern winter. This is, in fact, the only example of a vireo known to have an austral migration, which is not surprising when one considers that the species breeds much farther south than any other vireo in South America. For several other eastern species a similar situation exists. Philadelphia Vireos, with a breeding range mostly in Canada east of the Rockies and extending a little into the northeastern USA, leave North America completely, wintering from southern Mexico south to Panama. The Yellow-throated Vireo, which is virtually confined as a breeding bird to the eastern USA from Florida northwards, very small numbers spilling across the Canadian border into the most southerly parts of Manitoba, Ontario and Quebec, spends the non-breeding season from Veracruz and Oaxaca, in Mexico, south throughout Central America, on some islands in the Caribbean Sea and in South



*Uniquely among vireos, the **Black-capped Vireo** has some degree of sexual dimorphism in its plumage. The male, shown here, has a black cap. The female is generally duller, and her cap is slate-grey. Both parents feed the young, but 70–80% of food items are brought by the male. If the female goes on to incubate a second brood, the male may be left to feed the first brood entirely alone. However, he may not be the father of the second brood. Black-capped Vireo breeding territories tend to be clustered in areas of suitable habitat, and females may mate with a second male while still attending the young in the first nest. The male may also seek a second mate. Some pairs, however, remain together throughout the season. After a nestling period of 10–12 days, the fledglings may be looked after for a further 35 to 45 days, and by some reports up to 52 days, which is far longer than for most passerines. They may be attended by the male alone, the female alone, or by both parents; or the parents may split the brood, in which case the female may wander out of the male's territory. At the opposite extreme from the Black-capped Vireo is the Blue-headed Vireo* (Vireo solitarius), *which has been shown to have unusually low rates of extra-pair mating for a passerine. More typical is the Red-eyed Vireo* (V. olivaceus), *a "socially" though not "genetically" monogamous species, in which paired females habitually mate with other males, producing broods of mixed paternity.*

[*Vireo atricapilla*, SW Texas, USA. Photo: Sid & Shirley Rucker/DRK]



When the nestlings are small, parent vireonids will eat the faecal sacs, but as they grow, the adults will carry them away and drop them at a safe distance from the nest. The ***Rufous-browed Peppershrike****, typically for a tropical vireonid species, has two to three young, which are fed by both parents. The nest of this species, the customary cup suspended from a fork in a slender branch, is often described as flimsy and so thin-walled that the eggs can be seen from below. However, vireonid nests are surprisingly robust, and often survive to the next season. They are not used again, except as a source of material.*

[*Cyclarhis gujanensis cearensis*, Camaçari, Bahia, Brazil. Photo: Pedro Lima]

America as far south as central Colombia; the bulk of the population seems to winter in the mountain areas of northern Colombia and in southern Central America. Blue-headed Vireos prefer breeding areas with a cooler or more boreal aspect, nesting across Canada from British Columbia east to the Atlantic Provinces and at fairly high altitude in the eastern USA. The wintering range of this species is completely disjunct from the nesting areas, being along the Atlantic seaboard from south-eastern Virginia southwards through the Gulf Coast and eastern Mexico to north-western Nicaragua.

The only vireo species in eastern North America that is not wholly migratory and with entirely disjunct wintering and breeding areas is the White-eyed Vireo. This species' nesting range extends across the eastern USA, south of the Great Lakes, southwards into north-eastern Mexico. In winter, the greater part of the breeding range in the USA is vacated, and the species then appears in the Yucatán Peninsula and in parts of the Bahamas, and more rarely in other parts of the Caribbean. It is, however, present throughout the year in the area from North Carolina southwards throughout the Gulf Coast and in Mexico south to southern Veracruz. In fact, the southernmost three subspecies of the White-eyed Vireo, *perquisitor*, *micrus* and *maynardi*, as well as the insular *bermudianus*, are sedentary. In contrast, the northernmost race, *noveboracensis*, ranging over much of the eastern USA, vacates the breeding range completely, leap-frogging the sedentary races farther south and spending the winter period in the Yucatán and adjacent areas; one individual ringed during the breeding season in Maryland was recovered in winter in northern Belize. This phenomenon of northern populations overflying the less mobile or even fully sedentary populations farther south is known to be characteristic of several species belonging to different families.

Vireos in western North America tend to be shorter-distance migrants than are those in the east. One species, Hutton's Vireo, the range of which extends from southern British Columbia and Vancouver Island, in south-west Canada, down through California and, discontinuously, in the mountains of Mexico and Guatemala, is essentially sedentary, with evidence only of relatively minor movements in some parts of its range. Probably the longest-distance migrant in the west is the Warbling Vireo, which nests into the Northwest Territories, north of the sixtieth parallel, and entirely quits Canada and the USA in winter. In the mountains of the Sierra Madre Occidental, in Mexico, however, the local race of the same species seems either to be sedentary or to be subject only to short-distance altitudinal movements. Most of the other western vireos are migratory, but with relatively smaller latitudinal displacements than those made by eastern populations. For example, the Grey Vireo, which breeds in arid areas of Arizona and several nearby states, winters no farther south than the adjacent Mexican state of Sonora and in Baja California. The globally threatened Black-capped Vireo, breeding now largely in Texas and Coahuila, winters on the Pacific slope in Mexico, principally in the coastal states of Sinaloa, Nayarit, Jalisco and Colima. Generally speaking, the farther north a vireo species breeds, the farther it migrates. This is illustrated by two sibling, or very closely related, species of the "Solitary Vireo complex". Cassin's Vireo is the more northerly nester of the two, with a breeding range extending up into the Canadian provinces of British Columbia and Alberta, while the Plumbeous Vireo breeds mostly in the US Rocky Mountain states from Nevada and Colorado southwards through Arizona and New Mexico, and south through the mountains of western Mexico. In the case of the former species, the breeding and wintering ranges are totally discrete, apart from a small wintering population in southern California, and are separated by several hundred kilometres, or about five degrees of latitude; in the southern part of the total range of the Plumbeous Vireo, however, the breeding and wintering areas are contiguous, the local resident population and the migrant population from farther north not being widely separated geographically. Recent isotope-ratio work suggests that some Cassin's Vireos from western North America breed for a second time, later in the same year, further south, in southern Baja California; whether these birds then proceed onwards to wintering areas still further south, as do several other species of double-breeding Neotropical migrant birds, is unclear. In both Cassin's and Plumbeous Vireos there are isolated, non-migratory populations in southern mountain habitats, Cassin's Vireo at higher altitudes in southern Baja California and the Plumbeous Vireo from the Sierra Madre of Mexico south to the mountains of Guatemala and Honduras.



In North America, the nests of ***Red-eyed Vireos*** *are parasitized by Brown-headed Cowbirds* (Molothrus ater). *In the southern USA their place is taken by Bronzed Cowbirds* (M. aeneus), *and in South America by Shiny Cowbirds* (M. bonariensis). *Red-eyed Vireos sometimes abandon nests in which cowbird eggs have been laid, but more often they raise the interlopers, even when their entire clutch has been replaced. Despite this, the Red-eyed Vireo remains abundant, and Breeding Bird Surveys from 1966 to 2005 reveal an annual increase of 1·2% in its numbers.*

[*Vireo olivaceus olivaceus*, Manitoba, Canada. Photo: Christian Artuso]

Many passerine species in the Caribbean, a region of relatively small seasonal climate change, are resident. Some of populations of the Black-whiskered Vireo, however, are highly migratory. The northern subspecies *barbatulus*, which breeds in southern Florida, the Bahama Islands, Cuba and the Caymans, is totally migratory, wintering in the Amazon Basin. Most populations of the nominate race, the breeding range of which includes Jamaica, Hispaniola and Puerto Rico, winter in northern South America, although analysis of feather chemistry suggests that some eastern populations are only partially migratory. The remaining subspecies are sedentary, although some populations in the Lesser Antilles may be partially migratory. Thus, there is again the phenomenon of northern populations of a species leap-frogging the sedentary southern populations, the most northerly subspecies making the longest flight to the most southerly part of the species' wintering range.

The majority of the vireos and their allies which occur in the tropics seem to be non-migratory. A study of the Puerto Rican Vireo in the Guánica Forest revealed that the median distance for dispersal of young when setting up their own territories after fledging was less than 500 m, while adults were even less mobile. Vagrant or extralimital occurrences of several species usually regarded as resident would suggest, however, that some movement does occur. The Yucatan Vireo, for example, has been recorded in Texas, in the southern USA, following a period of abnormally strong southerly winds, and Thick-billed Vireos have occurred several times in Florida. For virtually all the other species found in Middle and South America, or in the Caribbean, there is no evidence of migratory movement. In some cases, this may be due to a lack of observations; local movements in response to rainfall, or small altitudinal movements of montane species, may simply not have been noticed.

The strongly migratory species which nest in temperate North America produce, as may be expected, a good number of extralimital occurrences in totally unexpected locations. The champion vagrant of the family is the Red-eyed Vireo, which has the distinction of being the Nearctic landbird species most frequently recorded in Europe. There have been occurrences of this species in Greenland and throughout the eastern seaboard of the Atlantic, from Iceland south to Morocco, and even as far east as Malta, in the central Mediterranean Sea, and as far south as Gabon, in West Africa. In Britain and Ireland there have been well over one hundred records of Red-eyed Vireos, mostly in late September or the first three weeks of October, although some have appeared as late as November, well after the bulk of these birds have left their North American breeding areas. A wide variation is evident from one year to another in the number of occurrences in the western Palearctic, this doubtless due to differing weather patterns and the effects of winds on offshore migrants. Thus, there were 21 records of Red-eyed Vireos in Britain and Ireland in 1995, whereas the previous year produced only one. The first record of the species in the western Palearctic was made as relatively recently as in 1951, when a specimen was found dead on Tuskar Rock, in County Wexford, in Ireland. The large numbers of records since then are obviously in large part the result of vastly increased levels of human observation, especially in such locations as the Isles of Scilly, off south-western England; whether this completely explains the increase, however, is an interesting and now probably unanswerable question.

Other vireo species have turned up as vagrants in the western Palearctic, some in September and most in October. To date, there have been four records of the Yellow-throated Vireo, one in south-west England, one in Germany and two in the Azores; two of the White-eyed Vireo, both in the Azores; and four of the Philadelphia Vireo, two in south-western Ireland, one on the Isles of Scilly, in south-west England, and one in the Azores. It is perhaps surprising that, given that it is highly migratory and a northerly nester, there have been so few records of the last species in comparison with number of Red-eyed Vireos observed in Europe.

Most of the other migrant vireo species of North America do produce vagrant records, sometimes in very unexpected locations. The Black-capped Vireo, a relatively short-distance migrant, has occurred in places as varied as Nebraska, Louisiana and, bizarrely, Ontario, where one trapped and ringed at Long Point in April 1991 caused a major sensation among the Canadian ornithological community; a second, equally unexpected individual was recorded in British Columbia, in south-west Canada, in September 2008. Another short-distance migrant, the Grey Vireo, which breeds in the south-western parts of the USA, has nevertheless occurred as far afield as Wisconsin, in the north of the country. As would be expected, however, it is the more highly migratory species that tend to provide the most, and the most diverse, extralimital records. Thus, Cassin's Vireo has occurred in such scattered locations as Alaska, New York, New Jersey, Oklahoma

and Quebec, while the Plumbeous Vireo has cropped up in Nova Scotia, Ontario, Massachusetts, New Jersey and Louisiana. If it were not for confusion with the Blue-headed Vireo, there would undoubtedly be more records of both of these species in eastern North America. The Warbling Vireo has occurred in Bermuda, although not, as yet, in Europe, and there are at least three records of the Philadelphia Vireo in South America, all in Colombia. Records of vagrant Black-whiskered Vireos, in Virginia, North Carolina, Bermuda, Costa Rica, Tobago and Suriname, must surely refer to one of the migratory races. In fact, the Suriname individual was identified by specimen evidence as being of the nominate race, the migratory subspecies breeding in Jamaica, Hispaniola and Puerto Rico. The same race has occurred as a spring overshoot on the US Gulf Coast, where it has been recorded in western Florida and Louisiana.

Most vireos are nocturnal migrants. This allows them to feed during daylight hours, replenishing the vital fat reserves that provide the required fuel for the further onward flights. Much of the available information comes from the records of birds killed by flying into radio towers and other similar obstructions. Vireos frequently migrate in the company of some other species, but apparently not in true flocks; on nights suitable for migration, a wide variety of species will move together, but not, so far as can be determined, in "deliberate" association with each other. There is some evidence that the Yellow-throated Vireo, which is predominantly a nocturnal migrant, may migrate during the day on flights across the Gulf of Mexico, while the Red-eyed Vireo has been observed to make short, low-altitude flights in the early hours of the morning.

The best-studied member of the family with regard to migratory behaviour is the Red-eyed Vireo. This is in many ways an ideal subject, as it is abundant, it undertakes long journeys, and it can be captured in large numbers at coastal observatories. Some studies have used captive Red-eyed Vireos in cages, which allow the orientation of what is termed "migratory restlessness" to be determined, a technique much employed in many fundamental studies of bird migration. In effect, a bird which is held in captivity during the period of its migration will, if it has a view of the sky, flutter in an appropriate direction in its cage. In autumn, Red-eyed Vireos captured on the Gulf Coast of the USA have different orientations according to their fat-reserve status: the fatter individuals tend to orientate southwards, across the Gulf, while the more lean ones orientate to the north or west. This is logical if viewed in terms of the use of fat as a fuel reserve, for to set off on a long over-water journey with insufficient fuel reserves is obviously not a good strategy for a long and productive life. In spring, the behaviour of individuals arriving on the Gulf Coast is determined by their fat reserves; those with low levels of stored fat linger, as shown by recaptures at coastal sites, whereas fatter individuals apparently waste little time in proceeding farther north. Orientation by this species is also affected by weather conditions. In spring, Red-eyed Vireos on the Gulf Coast tend to orientate northwards under clear skies and westwards in overcast conditions; in autumn, the directions are south and west under clear skies, but west under overcast. Fat reserves are, as may be expected, clearly depleted in birds which have recently undertaken long over-water journeys. On the Gulf Coast, the mean body weight of Red-eyed Vireos captured on migration in spring was 15·9 g, which is 1·3 g above the fat-free weight, and in autumn it was 19·7 g, which included 5·1 g of body fat.

Determining the actual migration routes of individuals of particular species is not easy. It relies mostly upon deductions made from observations of birds seen during the migration period. It would appear that the Blue-headed Vireo reaches its Central American wintering grounds by using a more westerly route than that which a simple examination of the map would indicate as the shortest route. The paucity of records in the islands of the Caribbean Sea suggests that the bulk of the population moves on a broad front southwards through the USA and then heads through eastern Mexico to Central America. Eastern populations of the Warbling Vireo seem to follow a similar pattern, this species being uncommon as a migrant in Florida and only a vagrant in Cuba, Jamaica and Bermuda, strongly suggesting a largely overland, if somewhat longer, route to the wintering grounds in Central America. The western populations of the same species appear to pause in north-western Mexico to complete a moult, before proceeding to the wintering grounds.

The breeding range of the Red-eyed Vireo extends very far west, into British Columbia almost to the Pacific coast. Nevertheless, the migratory route of these western populations seems



Seen here raiding the nest of a ***Red-eyed Vireo****, the Common or White-tufted-ear Marmoset* (Callithrix jacchus)*, although native elsewhere in Brazil, is a recent introduction to northern Bahia. Introduced mammalian predators such as mongooses (Herpestidae), rats* (Rattus) *and feral cats* (Felis) *are a threat to the Puerto Rican Vireo* (Vireo latimeri)*, and alien invasive fire ants are a significant nest predator of the Black-capped Vireo* (V. atricapilla)*. The leading predators of this last and at least one other vireo species, however, are native rat snakes* (Elaphe obsoleta)*, which tend to attack just before the young leave the nest.*

[*Vireo olivaceus agilis*, Camaçari, Bahia, Brazil. Photo: Pedro Lima]



*With a global range of just 4200 km², the **Yellow-winged Vireo** is confined to the mountains of Costa Rica and the adjacent Chiriquí highlands of west Panama. Much of the highland forest has been logged or converted to agriculture, but this vireo is still relatively common in what remains. Fortunately this habitat is well represented in the public and private protected areas of Costa Rica. However, apart from La Amistad National Park, which is shared between the two countries, and Volcán Barú National Park, highland forest in Panama has little protection.*

[*Vireo carmioli*,
Costa Rica.
Photo: Roland Seitre]

to start off with a trans-continental movement into eastern North America, followed by a change of direction to the south; hence, this vireo is relatively scarce on migration in California, the number of records clearly being insufficient to account for the populations breeding in areas almost due north of this state. A similar phenomenon is found with Blackpoll Warblers (*Dendroica striata*) and Swainson's Thrushes (*Catharus ustulatus*), species breeding across much of Canada and wintering in South America. On the basis of occurrences in Cuba, Jamaica and other islands, it would appear that Red-eyed Vireos reach South America by both trans-Caribbean routes and the longer circum-Caribbean routes via Mexico and Central America.

Some species exhibit a marked difference between the routes used in the spring and those followed in the autumn. In the eastern Caribbean, Red-eyed Vireos are far more frequent in autumn than they are in spring. In Bermuda, for example, they are regular and often common from late August to early October, but this is not the case in spring, and it is interesting to note that vagrant records of this species in the Palearctic are always in the autumn. In contrast, on the Massachusetts coast of the eastern USA, the Warbling Vireo is a common spring migrant but an uncommon autumn one. As with many migratory songbirds, the males appear on their territories in spring several days earlier than the females arrive.

So far as the autumn migration is concerned, there is also a differentiation in routes between young and old vireos, at least in coastal sites. At Point Reyes, on the Californian coast, the ratio of young to adult Warbling Vireos captured in autumn was 19 to 1, far too large to be explained by demographics, which would predict a disparity of no more than 4 to 1. On the offshore Farallon Islands, the ratio was even more skewed in favour of immatures. This phenomenon is widespread among migratory passerines on both coasts of North America and also in western Europe. In an attempt to explain these observations, several hypotheses have been advanced, not all of them satisfactory, and the truth may be found in a mix of more than one of them. The most plausible theories suggest that the individuals which survive into adulthood are those that inherit a tendency to move along courses that keep them over mainland areas, while the largely immature migrants which are exposed to the additional hazards of long over-water flights may not have inherited these abilities.

A very small number of species undertake what is known as moult migration, which involves a movement to an area away from both the breeding grounds and the non-breeding grounds in order to moult. This phenomenon, which is characteristic of some populations of the Warbling Vireo, has been discussed earlier (see Morphological Aspects).

Relationship with Man

In broad terms, vireos and humans have little direct interaction. No vireo species has any immediate impact on agriculture, for



*Just 18 km from the coast of Yucatán, Mexico, the island of Cozumel is home to three endemic species. Two, including the **Cozumel Vireo**, are of Least Concern, whereas the Cozumel Thrasher* (Toxostoma guttatum) *has plummeted to Critically Endangered since the late 1980s, for no clear reason. Introduced feral cats and boa constrictors may be to blame, but if so, have had no apparent impact on the vireo. There is still undisturbed forest on the island, and the Cozumel Vireo thrives on abandoned farms and in second-growth forest. Hurricanes have become more frequent and violent, but like the thrasher, the vireo evolved in such an environment.*

[*Vireo bairdi*,
San Gervasio Ruins,
Cozumel Island, Mexico.
Photo: John McKean/
VIREO]

good or ill, since vireo habitat and human agricultural activity are essentially mutually exclusive, always, of course, to the detriment of the birds. Vireos do have a significant role in forest ecology, and hence have an effect on man's economy in some areas. The maple-sugar industry of eastern Canada alone has an estimated annual value of C$180 million, and "sugar bush", the term used for a forest stand exploited for maple syrup, is prime habitat for Red-eyes Vireos, but it appears that no studies to quantify the effect of vireos specifically on the industry have been carried out. Sugar maples are notoriously subject to stress, whether it be caused by drought, by acid rain or by defoliation due to insect attack, and one can merely surmise that the caterpillar-eating vireo must play a substantial role in maintaining a productive sugar bush.

In some cases, a very modest contribution to the local economy is provided by visiting birdwatchers who have come to certain areas to see particular species. An obvious attraction is the globally threatened Black-capped Vireo, which, along with the sympatric Golden-cheeked Warbler (*Dendroica chrysoparia*), does result in a significant number of visits to the central-southern USA by birdwatchers, who contribute to the local economy by purchasing goods and services. Such effects, however, will never be more than modest, and would pale in comparison with the contributions that would be made if, let us prophesy, a viable and observable population of Ivory-billed Woodpeckers (*Campephilus principalis*) were to be discovered.

For zoologists, vireos have provided a fertile field of study. They have offered, among other things, valuable insights into the role of avian song and the interactive ecology of closely related sympatric species.

In contrast to wrens, which are, like vireonids, unspectacular in appearance but notable for having loud and persistent songs, the vireos seem to have made little contribution to any aboriginal folklore in the Americas. Nevertheless, their obvious vocalizations have earned them numerous local and dialect names. Examples include *Juan Chiví*, *Bien-te-veo* and *Cien Chavos Por El* for the Black-whiskered Vireo in Spanish-speaking areas of the Caribbean and "Tom Kelly" and "John Phillip" in English-speaking areas, "Sweet Bridget" for the Yucatan Vireo, and so on. In Jamaica, the Jamaican Vireo's song, a repeated brief phrase, has given rise to the species' local name of "Sewi-sewi".

Status and Conservation

Many vireos have adapted quite well to man-made habitat changes and have apparently healthy populations. Migratory species are, of course, dependent upon the maintenance of suitable habitat on both the breeding grounds and the wintering grounds, as well as in suitable stopovers along the route, and therefore have an increased potential vulnerability in terms of habitat loss or degradation. For several species, the total area of the wintering range is much less than that of the breeding area. For example, the Philadelphia Vireo nests in a huge band of territory across the forest zone of Canada, extending from the foothills of the Rocky Mountains eastwards to New Brunswick, on the Atlantic coast; yet the same population in winter is restricted to an area from extreme southern Mexico south to western Panama, with a size less than 20% of that of the breeding area. Any destruction of habitat on the wintering grounds, therefore, has the potential to cause far more damage to the species' total population than would an equivalent change in its breeding range, and, unfortunately, it is indeed in tropical areas where habitat destruction is most rampant. An even more extreme example involves the northern populations of the Warbling Vireo, the wintering area of which has been estimated as having an extent only 8% of the size of the breeding range.

Nevertheless, the number of vireonid taxa which are current causes for concern is quite small. Island populations, especially those confined to small islands, are always vulnerable, and the number of recently extirpated bird species is heavily weighted towards endemic insular taxa. Of 85 avian species known to have become extinct in historic times, no fewer than 60 were restricted to small islands, while several more were found only on larger islands such as Cuba or New Zealand. There are two extant vireo species, the San Andres and Noronha Vireos, which are restricted to small islands. They are listed as Vulnerable and Near-threatened, respectively. The first is found only on San Andrés, a low coral island measuring 13 km by 4 km in the south-west Caribbean. The human population on this small island is quite dense, some 30,000 souls, and much of the island is heavily developed. San Andrés has been visited by ornithologists only rarely. In 1948, the species was described as being common over much of the island, but by 1972 the area of suitable vireo habitat had contracted to about 17 km². The vireo seems, however, to be tolerant



Over much of its range, ***Bell's Vireo*** *is in decline, and it is regarded as globally Near-threatened. In the north-east of its range it is slowly increasing, and in some locations it is still fairly common. But the race* pusillus, *known as the Least Bell's Vireo, is classed as "endangered" in the USA. Loss of riparian scrub is blamed for its near-disappearance from the northern half of its range in California and from the lower Colorado Valley, and cowbirds* (Molothrus) *have drastically reduced its breeding success. Conservation efforts are concentrated on controlling cowbirds and restoring habitat, for example in the San Dieguito River Valley, and Ventura River watershed.*

[*Vireo bellii pusillus*, San Diego, California, USA. Photo: Alex Navarro]



*Blue Mountain coffee plantations are eating into the habitat of the **Blue Mountain Vireo**, and charcoal burning and settlement are taking their toll. Confined to wet limestone and montane forest on the island of Jamaica, this species seems never to have been common, although it is secretive and easily overlooked. It is now considered Near-threatened. To some extent it is protected by the ruggedness of the terrain, and by the 800 km² Blue and John Crow Mountains National Park. It has been found in secondary woods and shade-grown coffee, suggesting some tolerance of degraded habitat.*

[*Vireo osburni*, Hardwar Gap, Jamaica. Photo: Mike Read]

of significant habitat modification, and is one of the commoner bird species on San Andrés. Its breeding territories may be as small as 0·5 ha, and estimates of its total population, which is regarded as stable, are between the lower and upper limits of 2500 and 9999 individuals. Another recent estimate sets the population limits as 8200 and 14,800.

The island of Fernando de Noronha is situated in the Atlantic, some 345 km east of the north-east Brazilian coast. When Charles Darwin visited it briefly in February 1832, on the epic voyage of HMS Beagle, the island, which has an area of 18·4 km², along with some smaller islets, was apparently largely forested. By 1912, when the noted seabird biologist R. C. Murphy visited, most of the forest had gone. The island was used by the Brazilian government as a place of exile for criminals – indeed, the first two inhabitants that Murphy met revealed, ingenuously, that they were murderers! – and the forest was removed lest the convicts used the trees to build rafts in order to escape back to mainland Brazil. This is a rather novel episode in the history of habitat destruction.

Currently, the Noronha Vireo has a population estimated at perhaps 1000 individuals. It may well have been more numerous before the deforestation of the island, but it still seems to have adapted well to secondary growth, being absent only from largely cleared parts such as open fields and the airport area. The species is notably tame, and is frequently killed by local children for food or for sheer devilment, although this is unlikely to be a significant drain on the population; the potential for bush wildfires or further habitat destruction associated with tourism is far more likely to be troublesome. Fernando de Noronha is now a major tourist destination. In the 1950s, a large lizard, the Argentine black-and-white tegu (*Tupinambis merianae*), was introduced in the vain hope that it would control rats (*Rattus*), a not very probable outcome, since the lizard is diurnal and rats are usually nocturnal. The lizard itself is now considered a pest, as it preys on bird eggs. Whether it is a significant predator on vireo nests, however, is presently unclear.

The third island endemic of concern is the Blue Mountain Vireo, found only on Jamaica. There are no recent population estimates for this species, but it is generally believed to have declined, resulting in its being classed as Near-threatened. The major threats to this vireo are forest clearance for small-scale farming, and development and the replacement of native forest with coffee and pine plantations. The species is still quite widespread on the island, and its range has not yet been fragmented. Proposed conservation measures include the more effective protection of existing national parks and reserves, the creation of a new park in the rugged inland region known as the Cockpit Country, and encouragement of coffee-production methods which allow the preservation of shade trees.

Caribbean vireos are, or may soon be, facing a new threat from the continuing colonization of the area by the Shiny Cowbird. This essentially Neotropical nest parasite, which can have a devastating effect on naive populations of songbirds, has been spread-



*The 18 km² Brazilian island of Fernando de Noronha was once covered by primary forest. Although all the big trees are long gone, the **Noronha Vireo** seems to thrive in secondary woodland and scrub, and in gardens, although it is absent from cleared areas where it presumably once occurred. The population is stable at over 1000 birds, and there are no major threats. But the species is classified as Near-threatened because of the potential impact of an event such as a wildfire on such a small population, confined to such a tiny area.*

[*Vireo gracilirostris*, Fernando de Noronha, Brazil. Photo: Robson Silva e Silva]



*The **Black-capped Vireo** of the southern USA and northern Mexico is currently listed as Vulnerable. In 1987, its population was estimated at only 256–525 pairs. Its historical range was noted to have contracted in the north, although Mexican numbers were, and still are, highly uncertain. The main problems afflicting this species appear to be habitat deterioration, notably through fire-suppression measures, and nest parasitism by the Brown-headed Cowbird* (Molothrus ater). *Management to address these problems has produced fine results, and breeding populations in several areas have increased almost tenfold since 1996. The 2009 population was estimated at some 8000 birds.*

[*Vireo atricapilla*, Burnet County, Texas, USA. Photo: Brian E. Small]

ing northwards across the region, aided by the provision of suitable habitat from cattle-rearing and, in some cases, deliberate introductions. It is now widespread, having extended its range from South America throughout the Lesser and Greater Antilles to as far north as southern Florida and the Bahamas. Declines in populations of such species as the Puerto Rican Vireo have been linked to the local appearance of the cowbird. The vireos may respond to the presence of cowbird eggs by attempting to eject them, but this is made difficult by the small size of the host's bill. Unlike many other species, however, the Puerto Rican Vireo appears not to abandon its nest when it discovers the parasite's eggs, a naivety that makes it an excellent host for the cowbird.

The recently described Choco Vireo has an extremely small range, being found at just two locations in Colombia and one in northern Ecuador. Population estimates of the species in these areas, which have about 3100 km² of suitable habitat, are in the range 14,200–17,000 individuals. A potential world population of approximately 78,000 adults has been suggested, this figure being based upon the amount of apparently suitable habitat; the two Colombian sites, however, are 520 km apart, and areas in between appear to hold no birds of this species. This vireo seems to be quite demanding in its habitat requirements, needing wet primary cloudforest with a rather broken canopy and gaps created by natural treefall, although the Ecuadorian population appears to be more tolerant of human activity. The main threat to the Choco Vireo is habitat destruction caused by logging, both legal and illegal, and small-scale clearances for agriculture and for coca production. One method of countering the problem would be the creation of viable, protected reserves the existence of which has the support of the local human population. For this purpose, a substantial portion of forest at Río Ñambí was obtained as a nature reserve, this being achieved just in the nick of time, as logging contractors were at that very moment casting acquisitive eyes upon the land. Funding for the maintenance of the area was obtained by the process of naming the new species after a major benefactor, an action slightly controversial at the time, but highly effective. The protected area has a very high level of endemism. Some fifty bird species and numerous subspecies are found only in the Chocó Endemic Bird Area. The Choco Vireo is classified as Endangered.

In North America, one species, the Black-capped Vireo, which has always been of restricted range, is the source of major concern and the target of vigorous conservation efforts. Its breeding range has contracted alarmingly since the middle of the twentieth century, and the species is now considered Vulnerable. Until the 1930s, it nested from Kansas southwards to the Mexican states of Coahuila, Tamaulipas and Nuevo León. Today, it is totally absent from Kansas, is restricted to a few locations in Oklahoma, and is declining in northern Texas; only in southern Texas and in the Mexican part of its breeding range does it appear to be holding its own. Population estimates for this species are in the region of 6000–10,000 individuals, although there has been some dispute over the size of the population in the Mexican portion of the range.

The main reason for this decline seems to be habitat modification. This has involved either destruction of woodland for urban development or for the creation of pasture, or, more subtly, changes in the nature of the shrubby deciduous growth on which the vireo depends caused by fire-suppression programmes. In addition, rising numbers of the parasitic Brown-headed Cowbird and, less commonly, the Bronzed Cowbird (*Molothrus aeneus*), a result of increased stock-raising in the region, have a negative influence. In areas where there is no cowbird control, parasitism rates can be very high. In one study in Oklahoma, for instance, 57% of Black-capped Vireo nests were parasitized; as that vireo population declined over the years, the rate of parasitism increased, to 93%. Cowbird parasitism does not invariably mean total nesting failure, and about 60% of affected vireo nests were still able to produce at least one young vireo. Nevertheless, the average fledging rate from parasitized nests is much lower than that from unaffected nests. Figures vary among different studies, but the observed fledging rate at parasitized nests has been quoted as being from 0·2 to 0·9 young per nest, as against 2·7–3·78 for unparasitized nests. The lower figures are obviously insufficient to maintain a viable vireo population. In addition, there is a significant abandonment rate by vireos owning nests with cowbird eggs. In one study, 60% of such nests were abandoned, leaving the vireos a single option, that of restarting the nesting process after having lost a considerable amount of the prime time for most advantageous breeding. Finally, cowbirds will in many cases remove or puncture the host's eggs, or even kill small chicks.

Interestingly, in one study in Texas, the rate of cowbird parasitism was related to the presence of other species, notably the Northern Cardinal (*Cardinalis cardinalis*). It appears that Brown-headed Cowbirds are attracted to such conspicuous species as cardinals, and hence a high density of such species in the vireos' nesting areas may indirectly be disadvantageous to the vireos.



The island of San Andrés lies within UNESCO's Seaflower Biosphere Reserve. The island is densely populated, and the endemic ***San Andres Vireo*** *occupies an area of just 17 km². Previously listed as Critically Endangered, its numbers seem stable, and in 2000 it was downlisted to Vulnerable. It tolerates a range of habitats, but probably needs a dense understorey for nesting. Local traditional farming, a mixture of crops and natural vegetation, provides good vireo habitat. However, the island's development plan, which has earmarked scrub habitats for agriculture, could drastically change its status, unless traditional practices are followed, and some dry scrubland habitat protected.*

[*Vireo caribaeus*, San Andrés Island, SW Caribbean. Photo: Mark K. Peck]

The artificial reduction of cowbird numbers by means of an aggressive trapping programme, along with improving of the habitat by prescribed burning, can result in dramatic increases in breeding populations of Black-capped Vireos; at Kerr Wildlife Management Area, in Texas, following such programmes, singing males increased in number from 27 to 422 between 1986 and 2002. Consequently, cowbird control, an expensive and labour-intensive process, is regarded as an essential part of the conservation strategy for the Black-capped Vireo.

Although Bell's Vireo has a much larger breeding range than the Black-capped Vireo, it still gives cause for some concern and is currently considered Near-threatened. The species is particularly susceptible to destruction of riparian habitats, which support a significant part of its breeding population. Cutting for firewood, the grazing of stock and riverside urbanization have all reduced the amount of available habitat, although in some cases, as, for example, in Arizona, water-impoundment projects have resulted in the local creation of suitable habitat where none previously existed. Nevertheless, habitat loss on both the breeding and the wintering grounds, coupled with habitat fragmentation into parcels too small for the long-term viability of local populations, has resulted in major population declines. Breeding Bird Survey analysis revealed a 64% decrease, or a drop of about 2·7% per year, in the numbers of Bell's Vireos between 1966 and 2005, although the species has at the same time been exhibiting a slow but steady expansion of its range in a north-easterly direction. The geographically isolated Californian subspecies, *pusillus*, is especially vulnerable and was listed as regionally "Endangered" in 1986, leading to an extensive conservation initiative. Vigorous cowbird-control programmes and co-operative ventures to preserve and restore riparian habitat have resulted in an increase in the numbers of *pusillus* from 330 pairs in 1986 to 1336 pairs by 1996.

The Grey Vireo has a quite restricted breeding range in the south-west USA and adjacent Mexico, and migrates to non-breeding grounds in north-western Mexico. Habitat destruction by the clearing of chaparral for cattle range, on both the breeding and the wintering grounds, is a serious threat; it is estimated that over a million hectares of pinyon–juniper habitat were lost in the USA alone between 1950 and 1964. The increase in ranching brought with it a corresponding increase in the populations of cowbirds, especially when blocks of habitat were broken up by newly opened rangeland. Grey Vireos and their chaparral habitat have been identified by the Partners in Flight Bird Conservation Plans in several south-western states as being of high priority for conservation action.

Finally, in South America, several other members of the Vireonidae may potentially become species of concern in so far as they have fairly limited global ranges, often within a relatively narrow altitudinal range, in areas under severe pressure from habitat removal. One example is that of the Rufous-naped Greenlet, which occurs in the Andes from western Venezuela south to northern Ecuador, but with very few records in the southern part of its range. The status of such a species, and no doubt that of some other Neotropical members of this interesting and delightful family of birds, and the degree to which they may be at risk, is at present uncertain in the absence of more comprehensive distributional data.

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*The **Choco Vireo** was described in 1996, from two locations 520 km apart on the Pacific slope of the West Andes of Colombia. It was assumed that the bird was more or less continuously distributed between these sites, and that its range extended to a third site found later, some 95 km away in NW Ecuador. But although apparently suitable habitat exists between these widely scattered locations, searches have failed to find the bird. The Chocó region is being rapidly developed, and although some reserves have been established, they are exposed to incursions by loggers, local communities and colonists. The most threatened of the Vireonidae, the Choco Vireo is listed as Endangered.*



[*Vireo masteri*, Rio Ñambí Natural Reserve, Nariño, Colombia. Photo: Paul Salaman/ VIREO]

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(1973), Gill (2007), Godfrey (1986), Goguen & Curson (2002), Goldwasser *et al.* (1980), Gómez-Montes (2004), Gómez-Montes & Moreno (2008), Graber (1961), Graber *et al.* (1985), Grant & Cowan (1964), Greenberg, Niven *et al.* (1993), Grzybowski (1991, 1995, 2005), Grzybowski, Clapp & Marshall (1986), Grzybowski, Tazik & Schnell (1994), Guerra & Marini (2002), Hamilton (1958, 1962), Hanna (1944), Hauser (1959), Haverschmidt (1952, 1970), Haverschmidt & Mees (1994), Hayes & Sewlal (2004), Heindel (1996), Henriques & Wunderle (2003), Hilty (2003), Hilty & Brown (1986), Hopp *et al.* (1995), Howell (1999a), Howell & Webb (1995), Howell *et al.* (2003), Howes-Jones (1984, 1985a, 1985b, 1985c), Howes-Jones & Barlow (1988), Hudman & Chandler (2002), Isada *et al.* (2009), Jahn *et al.* (2007), James (1976, 1978, 1979a, 1979b, 1981, 1996a, 1996b, 1997a, 1997b, 1997c, 1998, 1999, 2007a, 2007b), Jaramillo (2003), Johnson, N.K. (1972, 1995), Johnson, N.K. & Zink (1985), Johnson, N.K. *et al.* (1988), Jones (2003), Jønsson & Fjeldså (2006), Kennedy *et al.* (1954), Kirkconnell & Garrido (1991, 2000), Kostecke & Cimprich (2008), Kus (2002), Kus *et al.* (2008), Lack (1976), Land (1970), Lasecki & Sciborska (2001), Latta *et al.* (2006), Lawrence (1953a), Laymon (1987), Lennon (1971), Lloyd-Evans (1983), Lõhmus, Sandberg *et al.* (2003), Lõhmus, Sundström *et al.* (2006), Machado (1999), de Marco *et al.* (2000), Marini *et al.* (2007), Marshall *et al.* (2002), McCarthy (2006), Miller (1953), Miller & Ray (1944), Miller *et al.* (1957), Mills (2006), Mills *et al.* (1989), Mönkkönen (1995), Monroe (1968), Moore & Medina (1956), Morgan *et al.* (1985), Morton (1975), Morton, Howlett *et al.* (2006), Morton, Stutchbury *et al.* (1998), Moskoff & Robinson (1996), Mountjoy & Leger (2001), Mulvihill & Rimmer (1997), Mumford (1952), Murphy (1915), Murray *et al.* (1994), Naumberg (1925), Nelson (1898), Noa *et al.* (2007), Nolan (1960), Nolan & Wooldridge (1962), Olson (1994), Olson *et al.* (1981), Orenstein & Barlow (1981), Ortega & Ortega (2003), Osburn (1859), Overmire (1962), Parker *et al.* (1996), Parkes (1990), Parrini *et al.* (2008), Parysow & Tazik (2002), Peck & James (1987), Peterson, R.T. & Chalif (1973), Peterson, B.L. *et al.* (2004), Phillips (1966b, 1968, 1991), Phillips *et al.* (1964), Pierce, McWilliams, O'Connor *et al.* (2005), Pierce, McWilliams, Place & Huguenin (2004), Pitelka & Koestner (1942), Post & Wiley (1977), Post *et al.* (1990), Purcell (2006, 2007), Pyle (1997), Raffaele (1989), Raffaele *et al.* (1998, 2003), Ralph (1971), Rand (1959), Raposo *et al.* (1998), Reddy (2008), Reddy & Cracraft (2007), Remsen (1997), Remsen, Cadena *et al.* (2009), Remsen, Cardiff & Dittermann (1996), Rhoads (1893), Rice (1976, 1978a, 1978b, 1981), Ricklefs (1996), Ridgely & Greenfield (2001a), Ridgely & Gwynne (1989), Ridgely & Tudor (1989, 2009), Ridgway (1886, 1904), Robbins *et al.* (1986), Robinson (1981), Rodewald & James (1996), Rohwer, S., Butler & Froehlich (2005), Rohwer, S., Hobson & Rohwer (2009), Rohwer, V.G., Rohwer & Barry (2008), van Rossem & Hachisuka (1937), Rowley (1962, 1966), Rowley & Orr (1960), Russell (1964), Russell & Monson (1998), Russell *et al.* (1979), Rust (1920), Salaman (1996), Salaman & Stiles (1996), Schaldach (1960), Schifter (1984), Schlossberg (2006), Schulenberg *et al.* (2007), Sclater (1881), Scott & Garton (1991), Scott *et al.* (2005), Sealy *et al.* (2000), Shackford (2004), Sharp & Kus (2004, 2006), Sibley (1940, 1996), Sibley & Ahlquist (1982b, 1990), Sibley & Monroe (1990, 1993), Siepielski *et al.* (2001), Simmons (1957), Skutch (1960, 1967, 1971), Smith, J.E. *et al.* (2004), Smith, J.I. *et al.* (2004, 2006), Smith, P.W. *et al.* (1990), Stake & Cimprich (2003), Stattersfield & Capper (2000), Stevenson (1957), Stewart *et al.* (1988), Stiles & Skutch (1989), Stotz *et al.* (1996), Stresemann (1954), Styrsky *et al.* (2004), Sutton (1948, 1949), Taylor & Anderson (1973), Thompson (1973), Todd (1929a, 1931, 1933), Tossas (2008), Tossas & Thomlinson (2007), Treplin *et al.* (2008), Tubaro & Segura (1995), Tye & Tye (1991), Underwood & Sealy (2006), Van Fleet (1919), Van Roo (2004), Van Roo *et al.* (2003), Voelker (2000), Voelker & Rohwer (1998), Walker (1997), Walker & Barlow (1997), Walsberg (1981), Watson (1963), Wells, J.V. (2007), Wetmore (1941a, 1962), Wetmore & Phelps (1956), Wetmore & Swales (1931), Wetmore *et al.* (1984), Wheatley & Brewer (2001), Wilbur (1979), Wiley (1985), Willard (1908), Williamson (1971), Willis (1960, 1986a, 1991), Willis & Eisenmann (1979), Winker *et al.* (1994), Wolf (1967a, 1967b), Wolters (1982), Woodworth (1997, 1999), Woodworth *et al.* (1998, 1999), Worth (1938), Zimmer, J.T. (1941, 1942), Zimmer, K.J. & Hilty (1997), Zwartjes (1999, 2001, 2003).


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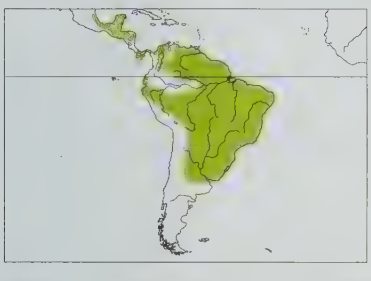
Genus *CYCLARHIS* Swainson, 1824

1. Rufous-browed Peppershrike

Cyclarhis gujanensis

French: Sourciroux mélodieux **German**: Rostbrauenvireo **Spanish**: Vireón Cejirrufo
Other common names: Yellow-backed Peppershrike (*virenticeps*); Chaco Peppershrike (*viridis*); Ochre-crowned Peppershrike (*ochrocephala*)

Taxonomy. *Tanagra gujanensis* J. F. Gmelin, 1789, "Guyane" = French Guiana.
Genus formerly placed in its own separate family, Cyclarhidae, and sometimes placed in a subfamily, Cyclarhinae. Race *flaviventris* intergrades with *nicaraguae* in S Mexico (SW Chiapas) and with *yucatanensis* in Honduras. Twenty-two subspecies recognized.
Subspecies and Distribution.
C. g. septentrionalis A. R. Phillips, 1991 – E Mexico (S Tamaulipas S to N Hidalgo).
C. g. flaviventris Lafresnaye, 1842 – SE Mexico (N Veracruz, N Puebla, NE Tabasco, N & W Chiapas) E to Guatemala and N Honduras.
C. g. yucatanensis Ridgway, 1887 – SE Mexico (Yucatán Peninsula) S to N Honduras.
C. g. insularis Ridgway, 1885 – Cozumel I (off NE Yucatán Peninsula).
C. g. nicaraguae W. deW. Miller & Griscom, 1925 – S Mexico (C Chiapas), Guatemala, El Salvador, Honduras and Nicaragua.
C. g. subflavescens Cabanis, 1861 – Costa Rica and W Panama (E to Veraguas).
C. g. perrygoi Wetmore, 1950 – WC Panama on Pacific slope.
C. g. flavens Wetmore, 1950 – C & E Panama along Pacific coast.
C. g. coibae E. J. O. Hartert, 1901 – Coiba I (off SW Panama).
C. g. cantica Bangs, 1898 – N & C Colombia (Caribbean coast S to Huila).
C. g. parva Chapman, 1917 – NE Colombia and N Venezuela (S to N Amazonas).
C. g. flavipectus P. L. Sclater, 1859 – NE Venezuela and Trinidad.
C. g. gujanensis (J. F. Gmelin, 1789) – E Colombia, S Venezuela, the Guianas, E Peru, NE Bolivia (La Paz), and Brazil S to N Mato Grosso.
C. g. virenticeps P. L. Sclater, 1860 – W Ecuador and NW Peru.
C. g. contrerasi Taczanowski, 1879 – SE Ecuador and N Peru (S to San Martín).
C. g. saturata J. T. Zimmer, 1925 – C Peru (R Marañón S to Huánuco).
C. g. pax Bond & Meyer de Schauensee, 1942 – EC Bolivia (La Paz).
C. g. dorsalis J. T. Zimmer, 1942 – highlands of C Bolivia.
C. g. tarijae Bond & Meyer de Schauensee, 1942 – SE Bolivia (Tarija) and extreme NW Argentina (Jujuy).
C. g. viridis (Vieillot, 1822) – Paraguay and N Argentina (S to La Rioja, San Luis, Córdoba and Santa Fe).
C. g. ochrocephala Tschudi, 1845 – Paraguay S to NE Argentina (Misiones, Corrientes, Entre Rios, N Buenos Aires), SE Brazil and Uruguay.
C. g. cearensis S. F. Baird, 1866 – E Brazil (Maranhão and Ceará S to S Mato Grosso and São Paulo).



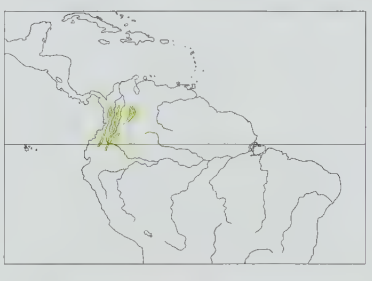
Descriptive notes. 14–16 cm; 22–35 g (*flavipectus*). Nominate race has forehead, crown and ear-coverts medium-grey, darkening on nape, narrow chestnut-brown area above bill and on supercilium (extending around eye); upperparts, including exposed parts of tertials and secondaries bright olive-green, darkening to dull olive-grey on primaries; tail olive-green; chin grey-white, throat and chest lemon-yellow, belly grey, becoming whitish-grey on undertail-coverts and pale yellow on flanks and thighs; iris red, orange or orange-yellow; bill silvery grey; legs flesh-coloured. Sexes alike. Juvenile differs from adult in having facial markings less distinct, iris brown. Race *septentrionalis* is larger and longer-tailed than nominate, wholly yellow below; *flaviventris* has back greenish, chin white, throat and underparts wholly bright yellow; *yucatanensis* is similar to previous, but paler and duller above, with crown clear grey, cinnamon on forehead less warm, paler yellow below; *insularis* has chest and belly and underwing-coverts yellowish-olive or straw-coloured without clear yellow, cheek dark, crown and back greyish olive-green, bill and tarsus heavier than those of mainland races; *nicaraguae* is similar to *flaviventris*, but belly mixed yellow and white, iris usually yellow or orange; *subflavescens* has underparts dull, pale yellow, iris yellow, deep yellow or orange, forehead, supercilium and (usually) crown and back of head darker than on previous races; *perrygoi* closest to *flaviventris* but brighter yellow with less olive tinge, white lower belly, pale lemon-yellow flanks; *flavens* is similar to last, but yellow below brighter and extending over most of belly, brighter green above but with crown more grey (less brown); *coibae* is duller and browner than preceding races, with deep citron-yellow chest, greenish back; *cantica* is small and short-winged, with throat and breast deep golden-yellow; *flavipectus* is larger than nominate and previous, has chest and throat more greenish-yellow; *parva* is smaller-billed and darker above than last; *virenticeps* has yellowish-green back, green cap bordered at front and on side by dark rufous, clear light yellow chest, ochraceous flanks, differs from nominate in having obvious yellow ear-coverts; *contrerasi* is similar to previous, but variable amount of dark rusty on top of head, back darker and tinged green, breast variably tinged with grey, variable amount of ochraceous on flanks; *saturata* is similar to last but larger, and richer in tone, with throat, breast and side of face deeper yellow, this colour extending farther back over breast, which is tinged with olive, especially at side; *cearensis* resembles *flavipectus*, but yellow on front and side of breast less extensive, legs dusty, wing shorter (less than 80 mm); *ochrocephala* has top of head and nape ashy with ochre wash, upperparts olive-green, lores, cheek and side of nape ashy, bill pale reddish-horn; *viridis* is similar to last, but with less of a brown wash on head, less extensive yellow on throat, brown supercilium extending backwards from eye, size larger than nominate; *tarijae* is similar to previous but smaller, much brighter golden-green above, yellow of throat brighter and more extensive posteriorly; *dorsalis* also is similar, but with longer wing and tail, shorter, stubbier bill, greyer mantle contrasting with green rump, paler yellow lower throat and chest, deeper buff lower underparts; *pax* is larger than nominate, with less green on lower throat and chest, white posterior underparts without ochraceous-buff wash. Voice. Song heard over much of year, usually delivered from concealed perch in tree canopy, a loud series of 5–7 melodious warbles like those of a saltator (*Saltator*), sometimes transcribed as "Do you wash every week?", frequently repeats one phrase for several minutes and then changes to another; considerable geographical variation over extensive range. Call a series of 3–8 loud slurred whistles, the first or second note loudest, the others successively lower. Alarm call a harsh scolding and a high-pitched nasal note. Juvenile call a repeated loud "wick".
Habitat. Forest, especially forest edge, also isolated trees in gardens, gallery forest, shade coffee plantations, mangroves, and similar, in both humid and semi-arid areas. Mostly sea-level to 2500 m, occasionally higher.
Food and Feeding. Items recorded comprise mainly arthropods, including beetles (Coleoptera) and spiders (Araneae), as well as cocoons and caterpillars. Moves in deliberate manner, mostly in outer fringes of canopy, then hopping down a tree to seize prey; sometimes hangs head downwards while probing for concealed items. Uses foot to clamp large arthropods onto perch before dismembering them. Usually in pairs, partners often widely separated; routinely follows mixed-species flocks.
Breeding. Nests found in Mar–Jul in Costa Rica, Jul in Panama, May in Venezuela, and Jun–Sept, Nov, Jan and Feb in Trinidad; birds in breeding condition in Mar–Oct in N Colombia and in Aug, Nov and Feb in C Colombia. Nest a thin-walled, hemispherical cup, often so slight that eggs visible from below, made from grasses, mosses and plant fibres, attached by rim in lateral fork of tree, often high up. Clutch 2–3 eggs, pinkish-white with brown spots or blotches; young fed by both parents. No other information.
Movements. Probably sedentary over most of range, but extreme N populations in Mexico may move to some extent.
Status and Conservation. Not globally threatened. Generally common in numerous parts of its extensive range. Adapts well to certain kinds of modification in habitat (for instance conversion to shade coffee plantations) provided that sufficient tree or bush cover remains. Range has recently expanded E in Panama, into E Panamá province and W Darién; has also extended farther S in N Argentina.
Bibliography. David & Gosselin (2002b), ffrench (1973), Haverschmidt & Mees (1994), Hilty (2003), Hilty & Brown (1986), Ridgely & Greenfield (2001a), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Stiles & Skutch (1989), Tubaro & Segura (1995), Worth (1938), Zimmer (1942).

2. Black-billed Peppershrike

Cyclarhis nigrirostris

French: Sourciroux à bec noir **German**: Schwarzschnabelvireo **Spanish**: Vireón Piquinegro

Taxonomy. *Cyclaris* [sic] *nigrirostris* Lafresnaye, 1842, Bogotá, Colombia.
Genus formerly placed in its own separate family, Cyclarhidae; sometimes placed in a subfamily, Cyclarhinae. Two subspecies recognized.
Subspecies and Distribution.
C. n. nigrirostris Lafresnaye, 1842 – upper tropical and subtropical zones of Colombia W of E Andes (excluding Santa Marta region and also Nariño) and of E slope in Ecuador (S at least to C Napo).
C. n. atrirostris P. L. Sclater, 1887 – upper tropical zone in W Andes of S Colombia (Nariño) and S into Ecuador (S generally to Pichincha, but at least one sighting has been reported as far S as El Oro).



Descriptive notes. 15–16·5 cm; 29·6–33·1 g. Nominate race has forecrown dull grey, upper lores and area above bill and above and behind eye dark chestnut, ear-coverts yellow-green; hindcrown and upperparts dull olive-green; primaries and secondaries dull greyish with olive-green on outer webs (giving olive-green appearance to closed wing), tail dull dark olivaceous; chin and throat grey; sides of chest yellowish (forming thin yellowish chestband), lower chest and belly off-white, thighs grey with faint yellow tinge; iris yellowish or greenish-grey; bill blackish-grey with paler base of lower mandible; legs grey or blue-grey. Sexes alike. Juvenile undescribed. Race *atrirostris* is more grey, less white, on underparts than nominate. Voice. Persistent singer. Song, usually from concealed perch in canopy, a series of loud whistles, similar to that of *C. gujanensis* but usually richer and more melodious, sometimes transcribed as "come right here right now" (with emphasis on penultimate word); very similar to song of Slate-coloured Grosbeak (*Saltator grossus*).
Habitat. Humid and wet forest, including cloudforest and forest edge; 1600–2700 m, usually below 2400 m. Absent from clearings and shrubby areas.
Food and Feeding. Food apparently consists mainly or wholly of arthropods, although no specific data available. Forages in foliage and outer branches of trees, from canopy down to middle levels; moves deliberately along twigs, seizing prey. Found singly or in pairs; frequently joins mixed-species flocks.
Breeding. Birds in breeding condition in May–Jul and also in Oct in Colombian Andes. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Considered to be generally uncommon over much of its relatively limited range. S boundaries of range in Ecuador remain uncertain: nominate race recorded S to C Napo, but reports from farther S require corroboration owing to possible confusion with *C. gujanensis* (of race *contrerasi*); race *atrirostris* known to occur S to Pichincha, and observed at least once in far S (in El Oro), but no records reported from intervening area. This species is much less tolerant of habitat modification than *C. gujanensis* and is absent from disturbed habitats.
Bibliography. Hilty & Brown (1986), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989).

On following pages: 3. Chestnut-sided Shrike-vireo (*Vireolanius melitophrys*); 4. Green Shrike-vireo (*Vireolanius pulchellus*); 5. Yellow-browed Shrike-vireo (*Vireolanius eximius*); 6. Slaty-capped Shrike-vireo (*Vireolanius leucotis*); 7. Slaty Vireo (*Vireo brevipennis*); 8. White-eyed Vireo (*Vireo griseus*); 9. Thick-billed Vireo (*Vireo crassirostris*); 10. Mangrove Vireo (*Vireo pallens*); 11. Cozumel Vireo (*Vireo bairdi*); 12. San Andres Vireo (*Vireo caribaeus*).

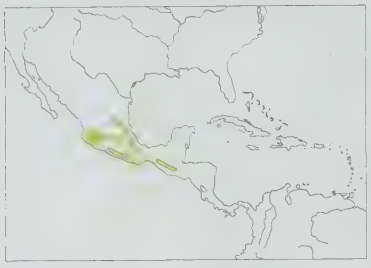
Genus *VIREOLANIUS* Bonaparte, 1850

3. Chestnut-sided Shrike-vireo

Vireolanius melitophrys

French: Smaragdan ceinturé **German**: Brustbandvireo **Spanish**: Vireón Pechicastaño
Other common names: Highland Shrike-Vireo

Taxonomy. *Vireolanius melitophrys* Bonaparte, 1850, Jico, near Jalapa, Veracruz, Mexico.
Genus formerly placed in its own separate family, Vireolaniidae; alternatively, is sometimes placed in a subfamily, Vireolaniinae. Three subspecies recognized.
Subspecies and Distribution.
V. m. melitophrys Bonaparte, 1850 – interior S Mexico from S Jalisco S to E México and from E San Luis Potosí S to W Veracruz.
V. m. crossini A. R. Phillips, 1991 – SW Mexico (Michoacán, Guerrero, S Oaxaca).
V. m. quercinus Griscom, 1935 – S Mexico (Chiapas) and S Guatemala (Volcán de Fuego and other mountains).



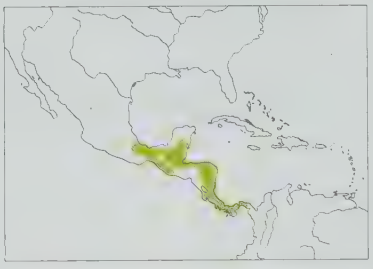
Descriptive notes. 16·5–18 cm; 35 g. Male nominate race has forehead, crown, nape and upper mantle bluish-grey, becoming olive-green on remainder of upperparts; supercilium from above bill to past ear-coverts golden-yellow; lores and area under and behind eye black, forming eyestripe which broadens posteriorly; primaries dark grey, whitish edgings on outer webs; tail greenish-olive, bluish tinge near feather shafts; cheek, chin and throat white, narrow black malar stripe; narrow chestnut chestband, rest of underparts white except for chestnut flanks, fading to duller grey-brown on lower flanks; undertail-coverts greyish-white; iris yellowish-green or grey; bill black; legs flesh-coloured or pinkish-buff. Female is similar in pattern to male, but supercilium and chestband duller in colour, eyestripe blackish-grey, rather than black. Juvenile is duller than adult, has less obvious facial pattern, crown brownish, underparts pale pinkish-cinnamon, no chestband. Race *crossini* has upperparts brighter, more greenish or yellow-green, than nominate; *quercinus* is smaller than other races, with chest darker, male deep rich green on uppertail-coverts, rusty-auburn chestband, female with supercilium yellow above ear-coverts (as on male). Voice. Song, by male only, a single syllable lasting less than a second, beginning as short, ascending whining moan and then becoming a rapidly descending wailing whistle, given singly or repetitively, with gap of c. 1·2 seconds between utterances (more frequently during territorial disputes), audible at up to 400 m. Other vocalizations include low-pitched buzzy contact calls by both sexes, longer rattling buzzes, again apparently a contact call, and a "myaaaah" threat call against intruders.
Habitat. Mixed forest, from humid to semi-arid, typically with pines (*Pinus*), and oaks (*Quercus*) and other deciduous trees, often with considerable epiphytic growth, and with fairly dense underbrush of leafy shrubs and vines; 1200–3500 m. Occurs both in untouched forest and in areas modified by selective felling for charcoal.
Food and Feeding. Food consists mostly of arthropods; recorded items include beetles (Coleoptera), ants (Formicidae), caterpillars, grasshoppers (Orthoptera) and spiders (Araneae). Also some vegetable matter, including hawthorn (*Crataegus*) fruits and seeds. Forages by searching for prey from a perch and subsequently hopping or flying to another perch, close by. Most prey is captured from leaves, rather than from bark, the bird gleaning from an upright position, or more rarely hanging below a cluster of leaves or epiphytes; alternatively, plucks prey while fluttering. Uses foot to hold down large prey items on perch while dismembering them; larger caterpillars may be beaten on a branch.
Breeding. Few nests described. In Mexico, two nests (in Morelos) in May, female with brood patch and shell-less egg in oviduct in late Apr, female in breeding condition in mid-Jun (in Oaxaca), and newly fledged young in early Jul. Nest built by both sexes, predominantly by male in early stages, female doing more later, construction taking 20–25 days, longer than is typical for smaller vireonids; a pensile cup made from filamentous lichen woven together with spider webs, cup lined with fine grasses, fibres and pine needles, exterior decorated with spider egg cases, attached at rim to lateral fork of tree branch, with cup suspended below fork. Clutch size uncertain, probably 3 eggs (figure based on ruptured follicles in one specimen). No other information.
Movements. Probably largely sedentary; scarcity in winter months in Mexican state of San Luis Potosí may indicate some movement by NE populations.
Status and Conservation. Not globally threatened. Generally rather uncommon in much of range; reported as locally common in some areas. Habitat over much of its range is under pressure from wood-cutting and clearance of forest for agriculture. Occurs in some protected areas, e.g. Volcán de Fuego National Park, in Guatemala.
Bibliography. Barlow & James (1975), Howell & Webb (1995), Land (1970), Miller *et al.* (1957), Rowley (1966).

4. Green Shrike-vireo

Vireolanius pulchellus

French: Smaragdan émeraude **German**: Smaragdvireo **Spanish**: Vireón Esmeralda

Taxonomy. *Vireolanius pulchellus* P. L. Sclater and Salvin, 1859, Guatemala.
Genus formerly placed in its own separate family, Vireolaniidae; alternatively, is sometimes placed in a subfamily, Vireolaniinae. Present species has been placed by some authorities in separate genus, *Smaragdolanius*, along with *V. eximius* and *V. leucotis*. Possibly forms a superspecies with *V. eximius* and often treated as conspecific, being very similar in plumage and vocalizations; no known intergrades between the two where ranges approach each other in E Panama. Proposed race *dearborni* (described from CS Guatemala) requires substantiation, and is currently synonymized with nominate. Four subspecies recognized.
Subspecies and Distribution.
V. p. ramosi A. R. Phillips, 1991 – SE Mexico (S Veracruz E to NC Chiapas and Quintana Roo, S to E Oaxaca).
V. p. pulchellus P. L. Sclater & Salvin, 1859 – SE Mexico (SE Campeche, SW Quintana Roo), Guatemala (except C highlands), Belize and Caribbean slopes of Honduras and N Nicaragua.
V. p. verticalis Ridgway, 1885 – Nicaragua (on Caribbean slopes), Costa Rica and W Panama (E Veraguas).
V. p. viridiceps Ridgway, 1903 – C Panama (E to Panamá province).



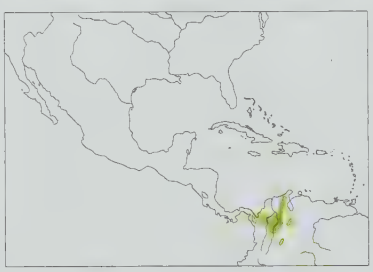
Descriptive notes. 13·5–14·5 cm; 22–30 g. Male nominate race has forehead, crown and nape deep sky-blue, with diffuse green markings on crown; rest of head, neck and upperparts bright emerald-green; exposed outer webs of primaries bright yellow-green; rectrices duller emerald-green on exposed webs, duller still on inner webs; chin yellow or whitish-yellow, throat bright lemon-yellow, becoming yellow-green on chest and belly, more greenish on flanks; carpal region and underwing-coverts lemon-yellow; iris dark brown; bill heavy and strongly hook-tipped, blackish, paler base of lower mandible; legs grey. Female is similar to male but generally duller, with less blue on crown, and throat sharply contrasting yellow. Juvenile is olive-green above, with indistinct yellowish stripes above and below eye, yellowish wingbars, dull yellowish below. Race *ramosi* is clearer yellow, less greenish, on chest, sides and flanks, yellow of throat contrasts less with chest, and has crown to nape mostly or wholly blue; *verticalis* has blue on head restricted to forehead and nape, with centre of crown all green; *viridiceps* has upperparts and sides of head entirely green, with narrow blue band on nape only. Voice. Song, delivered from concealed perch in forest canopy (singer very difficult to locate), a constantly repeated "peter-peter-peter" or "peea-peea-peea", usually 3–5 notes in a sequence. Calls include harsh, raspy scolding notes and, in aggressive situations, a sharp, raspy twitter.
Habitat. Inhabits humid evergreen forest with tall trees, also forest edge, mostly in canopy. Sea-level to 1800 m on Caribbean drainage of Mexico E to Honduras, 500–1000 m on Mexican Pacific drainage.
Food and Feeding. Food items mainly arthropods, but also fleshy fruits and berries. Forages mostly in canopy, also lower in forest edge. Searches deliberately in twigs, hopping to capture prey, sometimes clinging to underside of clumps of leaves. Usually in pairs; will join mixed flocks of tanagers (Thraupidae) and other species.
Breeding. Nest-building in Mar and birds in breeding condition Mar and May in Belize; nesting recorded in May in Panama. Nest a mossy cup, placed at medium height (c. 14 m) in tall forest tree. No other information.
Movements. Apparently entirely sedentary; territorial throughout year.
Status and Conservation. Not globally threatened. Common to fairly common in Mexico and N Central America; said to be not common in Belize; locally common in Costa Rica and common but somewhat local in Panama. Able to adapt to a limited amount of habitat change, but still dependent on a good degree tree cover of suitable species; much of the lowland habitat in this species' range has been lost to agriculture and other purposes.
Bibliography. Howell & Webb (1995), Land (1970), Ridgely & Gwynne (1989), Russell (1964), Skutch (1971), Stiles & Skutch (1989), Willis & Eisenmann (1979).

5. Yellow-browed Shrike-vireo

Vireolanius eximius

French: Smaragdan à sourcils jaunes **German**: Gelbbrauenvireo **Spanish**: Vireón Cejiamarillo
Other common names: Venezuelan Shrike-vireo

Taxonomy. *Vireolanius eximius* S. F. Baird, 1866, "Bogotá", Colombia.
Genus formerly placed in its own separate family, Vireolaniidae; alternatively, is sometimes placed in a subfamily, Vireolaniinae. Present species has been placed by some authorities in separate genus, *Smaragdolanius*, along with *V. pulchellus* and *V. leucotis*. Possibly forms a superspecies with *V. pulchellus* and often treated as conspecific, being very similar in plumage and vocalizations; no known intergrades between the two where ranges approach each other in E Panama. Poorly known race *mutabilis* (described from specimen of a female) considered by some to be inadequately differentiated to warrant recognition. Two subspecies recognized.
Subspecies and Distribution.
V. e. mutabilis Nelson, 1912 – E Panama (E Darién, Cana) and NW Colombia (Córdoba, Antioquia, N Chocó).
V. e. eximius S. F. Baird, 1866 – N Colombia (SW Guajira and Cesar S to Santander and Boyacá) and NW Venezuela (Sierra de Perijá, W Zulia and S Táchira).
Birds of undetermined race recorded in C Colombia (Meta); presumed nominate.



Descriptive notes. 14 cm. Male nominate race has forehead, crown and nape sky-blue, greenish patch on rear of crown; supercilium (extending above bill) and area under eye bright lemon-yellow, lores dull grey-black, ear-coverts emerald-green; upperparts, including upperwing-coverts, emerald-green; flight-feathers dark grey, outer webs of primaries and secondaries broadly edged with emerald-green, tertials with lemon-yellow edgings on inner web; tail dull emerald-green; chin and throat lemon-yellow, becoming more greenish on chest, belly and vent; carpal joint bright lemon-yellow; iris dark; bill blackish above, horn-grey below; legs dull grey-brown. Female is like male, but rather duller. Juvenile apparently undescribed. Race *mutabilis* is apparently more bluish above and on cheeks than nominate, and greener on chest, sides and flanks. Voice. Song (in Panama), delivered from hidden perch in forest canopy, a continuously repeated "peer-peer-peer", usually 3 or 4 notes, very similar to song of *V. pulchellus*.
Habitat. Canopy of humid tropical forest and tall second-growth woodland, mostly in foothill zone; generally 100–800 m, but in Perijá Mts to 1500 m in Colombia and once to 1700 m in adjacent Venezuela.
Food and Feeding. No data on diet; probably similar to that of *V. pulchellus*. Usually found while gleaning, with lethargic and deliberate movements, in forest canopy. Frequently follows mixed flocks.
Breeding. Birds in breeding condition in May and Jun in Colombia (S Bolívar and N Antioquia). No other information.
Movements. No evidence of any movements.

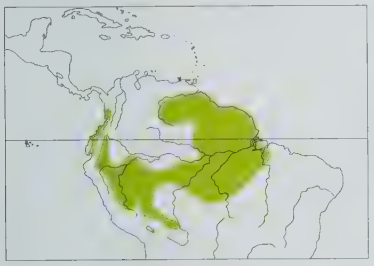
Status and Conservation. Not globally threatened. Generally rather uncommon in much of range. Depends upon largely undisturbed lowland forest. Occurs in Darién National Park, in Panama, and Los Katios National Park, in Colombia.
Bibliography. Hilty (2003), Hilty & Brown (1986), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Wheatley & Brewer (2001).

6. Slaty-capped Shrike-vireo

Vireolanius leucotis

French: Smaragdan oreillard **German**: Schieferkopfvireo **Spanish**: Vireón Coronigrís
Other common names: Grey-capped Shrike-vireo

Taxonomy. *Malaconotus leucotis* Swainson, 1838, "Africa?"; error = French Guiana.
Genus formerly placed in its own separate family, Vireolaniidae; alternatively, is sometimes placed in a subfamily, Vireolaniinae. Present species has been placed by some authorities in separate genus, *Smaragdolanius*, along with *V. pulchellus* and *V. eximius*. Four subspecies recognized.
Subspecies and Distribution.
V. l. mikettae E. J. O. Hartert, 1900 – W Colombia (S of R San Juan) and W Ecuador (S to NW Azuay).
V. l. leucotis (Swainson, 1838) – S Venezuela (Bolívar, Amazonas) and the Guianas S to N Brazil (N of Amazon); extreme S Colombia (SE Nariño), E Ecuador and N Peru (S to San Martín).
V. l. simplex Berlepsch, 1912 – E Peru (Huánuco S to Ayacucho and Cuzco) and NC Brazil S of Amazon (R Purús E to R Tocantins, S to NW Mato Grosso).
V. l. bolivianus Berlepsch, 1901 – SE Peru (Cuzco) S to NC Bolivia (La Paz, Cochabamba and Santa Cruz).



Descriptive notes. 14–15 cm; average 26 g. Nominate race has crown and nape blue-grey, forehead, supercilium and crescent under eye bright yellow, lores blackish-grey; broad eyestripe and broad malar stripe deep greyish-blue, area in between dull whitish; upperparts bright olive-green; primaries and secondaries dull blackish-grey, exposed outer webs olive-green (giving bright patch on closed wing), tail olive-green; chin, throat and chest bright lemon-yellow, belly lemon-yellow, flanks duller greenish-yellow, undertail-coverts lemon-yellow; iris pale green or lime-green; bill black above, pale grey or leaden blue below; legs leaden blue or pale grey. Sexes alike. Juvenile undescribed. Race *mikettae* lacks whitish auricular area, has yellow of underparts and supercilium deeper and brighter, olive-green on side of chest more pronounced and extensive, legs pinkish; *simplex* has light green band across forehead, back duller green with greyish tinge, nape paler, malar stripe greenish at front, ear-coverts light grey (paler than crown); *bolivianus* has strong blackish border across forehead and above superciliary stripe. Voice. Song, given continuously during foraging, a monotonously repeated "tyeer" or "eear"; W of Andes more drawn out, E of Andes shorter and with descending effect. Call a short "whit", also a single whistle, "wheeuw".
Habitat. Canopy of humid forest, including mossy forest and forest borders, in foothills and lower highlands, 200–2100 m, only rarely above 1800 m; not below 250 m in Amazonia.
Food and Feeding. Food mostly arthropods; in Suriname, bugs (Hemiptera) and Orthoptera, including grasshoppers (Acrididae). Forages with deliberate movements, hopping along branches and twigs, usually in canopy or middle levels of forest, rarely lower. Found in pairs, or in groups of three or four (possibly family parties), often with other species in mixed flocks.
Breeding. No information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Uncommon to fairly common over much of range; rather local in some parts. Requires relatively undisturbed forest. Occurs in several protected areas.
Bibliography. Haverschmidt & Mees (1994), Hilty (2003), Hilty & Brown (1986), Ridgely & Tudor (1989), Zimmer (1942).

Genus *VIREO* Vieillot, 1808

7. Slaty Vireo

Vireo brevipennis

French: Viréo ardoisé **German**: Schiefervireo **Spanish**: Vireo Pizarroso
Other common names: Green-winged Vireo

Taxonomy. *Neochloe brevipennis* P. L. Sclater, 1858, Orizaba, Veracruz, Mexico.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Present species has been placed by some authors in a monotypic genus, *Neochloe*, because of its atypically rounded tail and highly distinctive plumage, quite unlike that of all other vireos. Race *browni* considered poorly differentiated by some authorities, and species sometimes treated as monotypic. Two subspecies currently recognized.
Subspecies and Distribution.
V. b. brevipennis (P. L. Sclater, 1858) – C Mexico from Jalisco and Colima E to Morelos, Veracruz and Oaxaca.
V. b. browni (A. H. Miller & Ray, 1944) – SW Mexico (Guerrero).
Descriptive notes. 11·5–12 cm; 11·8–12·3 g. Nominate race has forehead, crown and nape deep yellow-green, lores dull greyish-black, chin off-white; upperparts slaty-grey, uppertail-coverts grey with greenish-yellow edgings, rectrices blackish-grey with broad greenish edgings; remiges and upperwing-coverts dull blackish-grey, bright yellow-green edgings on outer webs (conspicuous yellow-green patch on closed wing), narrow yellow edgings on lesser coverts; carpal area bright greenish-yellow; throat and chest slaty grey, becoming paler on flanks; belly off-white, undertail-coverts pale grey; iris conspicuously white; bill mostly black; legs dusky. Sexes alike. Juvenile has iris grey, head and upperparts olive, trace of lemon "spectacles", two buffy-yellow wingbars. Race



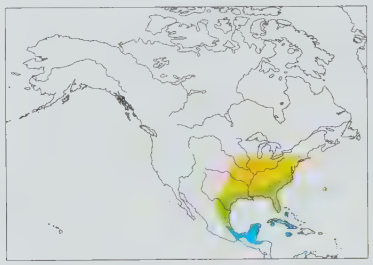
browni differs from nominate in having olive-green on back more extensive, grey on underparts paler, more white on side of belly, bill longer, shallower (possibly not a constant character), more slender, and with less sharply curved culmen. Voice. Song, from exposed perch, a series of varied, rich, slightly burry phrases often ending with emphatic note, e.g. "wheer, chi-i-wik". Call a gruff, scolding "chichichi".
Habitat. Arid to semi-humid brushy scrub, thickets, forest edge; race *browni* stated to be found in drier habitats than those preferred by nominate. At 1200–3000 m.
Food and Feeding. No data on diet; probably mainly arthropods. Forages in low vegetation, skulking and sluggish, while cocking tail and twitching it from side to side.
Breeding. Very few nests described. Birds in breeding condition in late May, nest and eggs found in Jun, and fledgling in mid-Jul. Nest a cup made from plant fibres, lined with finer plant fibres, exterior covered with dead leaves and plant down, suspended by rim between two fine twigs in lateral fork of branch at low to middle level in tree or bush. Clutch 3 eggs, white with sparse spots of light and dark brown, especially near blunt end; no information on incubation and nestling periods. Nest sometimes parasitized by Brown-headed Cowbird (*Molothrus ater*).
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Generally uncommon. Range covers area of c. 160,000 km², but occurs very patchily within this. Over much of its range habitat is fragmented and being continuously cleared for agriculture.
Bibliography. Anon. (2009a), Blake (1953), Howell & Webb (1995), Miller & Ray (1944), Moore & Medina (1956), Mountjoy & Leger (2001), Rowley & Orr (1960), Schaldach (1960), Stewart *et al.* (1988), Wolf (1967a).

8. White-eyed Vireo

Vireo griseus

French: Viréo aux yeux blancs **German**: Weißaugenvireo **Spanish**: Vireo Ojiblanco
Other common names: Veracruz Vireo (*perquisitor*)

Taxonomy. *Tanagra grisea* Boddaert, 1783, New Orleans, New Orleans Parish, Louisiana, USA.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. crassirostris*, *V. pallens*, *V. bairdi*, *V. caribaeus*, *V. modestus*, *V. gundlachii*, *V. latimeri* and *V. nanus*; probably closest to *V. crassirostris*, which has been treated as conspecific. Race *perquisitor* sometimes thought to represent a separate species. Conversely, *noveboracensis* sometimes synonymized with nominate. Seven subspecies recognized.
Subspecies and Distribution.
V. g. noveboracensis (J. F. Gmelin, 1789) – NC USA (Nebraska, Illinois and Indiana E to New York and Connecticut, S to Alabama); migrates to SE Mexico and S to Honduras, also Cuba.
V. g. griseus (Boddaert, 1783) – SE USA (coastal plain from S Virginia to N Florida, then W to Texas); migrates mainly to SE Mexico, N Guatemala, Belize and N Honduras.
V. g. maynardi Brewster, 1887 – S Florida.
V. g. bermudianus Bangs & Bradlee, 1901 – Bermuda.
V. g. micrus Nelson, 1899 – extreme S USA (S Texas) and NE Mexico (S to N San Luis Potosí).
V. g. perquisitor Nelson, 1900 – E Mexico (S San Luis Potosí, N Veracruz).
V. g marshalli A. R. Phillips, 1991 – EC Mexico (uplands of S San Luis Potosí and N Hidalgo).



Descriptive notes. 10·7–13·0 cm; 10–14·3 g. Nominate race has forehead, crown and nape dull dark yellowish-grey, becoming olive-green on upperparts; eyering and lores contrastingly bright yellow, giving conspicuous "spectacles"; flight-feathers and tail dull greyish-black, tertials edged with yellowish-white, outer webs of primaries, secondaries and rectrices with narrow greenish-yellow edges; greater and lesser upperwing-coverts dull dark greyish, broadly tipped with whitish-yellow (two prominent bars on closed wing); throat and chest greyish-white, becoming yellow on lower chest and upper belly; flanks yellowish (sometimes brownish), lower belly yellowish-white, vent dull pale yellow; iris pale bluish-grey to white; bill blackish-grey, lower mandible sometimes paler, has pale grey cutting edges; legs bluish-grey. Sexes alike. Juvenile has head plumage, including "spectacles", brownish-buff, iris greyish-brown. Race *noveboracensis* is brightest, with more yellow than nominate; *maynardi* is decidedly more grey, with yellow on flanks paler, sometimes only a pale wash of olive-yellow; *micrus* is similar to previous, but smaller; *bermudianus* is more grey above, with olive and yellow on flanks paler, wing shorter and tarsus longer on average; *perquisitor* is similar to *micrus* but smaller, except for bill, tarsus shorter, upperparts entirely greenish-olive, underparts wholly dingy yellowish; *marshalli* is dullest race overall, with dull, dark forehead, dull rump, dull olive sides and flanks, and fuscous-greyish hood reaching over nape. Voice. Song, by male on breeding grounds (female, too, sings in wintering area), of two types: primary song a short harsh warble, starting and finishing with characteristic "chik" note, entire sequence lasting c. 1 second; second song type (known as the "Rambling Song") quite different, a continuous warbling made up of brief squeaking or harsh notes, can last from several seconds to a minute or more, is rarer than primary song, and produced both by adult males and immatures. Within any one population considerable individual variation in songs, individuals having repertoires of 10–17 song types; in one study in Florida, neighbouring singing males tended to have more different song repertoires than non-neighbouring males, perhaps allowing territorial birds to recognize immediate neighbours, this comparable to the motif-matching found in e.g. Marsh Wrens (*Cistothorus palustris*). In addition, considerable geographical variation, with songs of S races *micrus* and *maynardi* significantly shorter than those of N races; nevertheless, all races respond to playback of other races' songs. Also imitates wide variety of other species, incorporating calls or notes of birds as diverse as Downy Woodpecker (*Picoides pubescens*), Carolina Chickadee (*Poecile carolinensis*) and Eastern Towhee (*Pipilo erythrophthalmus*). Calls include short "zip", to maintain contact between partners, and a "new" vocalization used in agonistic encounters on winter quarters.
Habitat. When breeding, various types of scrub, including abandoned farmland, and late to middle succession (c. 20–50 years) in abandoned pasture, typically with extensive undergrowth, with oc-

casional larger trees; race *noveboracensis* seems to favour more densely vegetated territories than does nominate; *maynardi* sometimes breeds in mangroves (*Rhizophora*) in S Florida. On migration, occurs in scrubland and middle succession; on wintering grounds habitat selection is fairly generalized and includes, for instance, successional scrubland, brushy fields and various types of forest.

Food and Feeding. Analysis of stomach contents during breeding season shows majority of food to be arthropods, mostly insects, moths and butterflies (Lepidoptera) accounting for c. 30–50% of identified items (the bulk as caterpillars), also leafhoppers (Cicadellidae) and aphids (Aphidoidea), beetles (Coleoptera), grasshoppers (Orthoptera), flies (Diptera) and the like; other items included a small chameleon (Chamaeleonidae) and snails (Gastropoda); vegetable matter relatively minor in total, less than 10%, including wild grapes (*Vitis*), sumac (*Rhus*) and dogwood (*Cornus*). On wintering grounds vegetable matter, e.g. gumbo-limbo tree (*Bursera simaruba*), comprises major proportion of diet, along with arthropods; will defend fruiting plants against conspecifics and other species on non-breeding grounds. Forages with deliberate movements among foliage, capturing most prey from a perched position; also hops to catch prey, and captures some items in short flights, often briefly hovering. Most prey taken from leaves.

Breeding. Season from early Apr (Texas) to late May (Virginia); apparently single-brooded. Monogamous; some infidelity by female appears to occur on occasion. Courtship starts shortly after arrival on breeding grounds, female apparently chooses mate, wandering among different territories until satisfied; copulation initiated by female, by wing-fluttering and by posture with head and tail held vertically; during courtship period partners remain in close contact. Nest-site chosen by female; nest a pendulous cup built by both sexes, lining added by female alone, construction taking 3–5 days, material mostly plant fibres, rootlets, leaves, fragments of bark and similar, woven with spider silk, nest attached by rim, or "basket handles", to small twigs in horizontal or lateral fork of bush or tree, 0·3–2 m (typically c. 0·8–1 m) above ground; initially, supporting twigs are covered with a lattice of spider and caterpillar silk, then plant material attached inside until cup formed; sometimes unmated males build unlined nest; territory from as little as 0·14 ha to 1·8 ha or more, size dependent on quality of habitat. Clutch 3–5 eggs, usually 4, average c. 3·75 for N races, less for S ones, least for *bermudianus* (usually 2–3, average 2·55), dull white or cream, sparsely spotted with black and brown; incubation by both sexes, more rarely by female alone and she then fed by male, starts with third or fourth egg (usually earlier if nest parasitized), period 13–15 days; chicks fed by both parents, nestling period c. 9–11 days; young on leaving nest have poor flying capability, but quickly improve, may be fed by parents for up to 23 days after fledging, disappearing from territory by end of summer. Many nests (often up to 50% in a given area) parasitized by Brown-headed Cowbird (*Molothrus ater*).

Movements. N races (nominate, *noveboracensis*) entirely migratory, wintering in S Mexico and Yucatán Peninsula, with casual records in Caribbean (primarily Cuba and Jamaica) and as far S as Panama. S populations and isolated race on Bermuda appear to be sedentary or largely so. Two occurrences in E Atlantic (Azores), in Oct 2005 and 2008, presumably involved migratory mainland races, rather than geographically closer, but sedentary, Bermuda population.

Status and Conservation. Not globally threatened. Fairly common to rather uncommon. Population density heavily dependent on habitat, prime locations supporting 2–3 pairs/ha. Scrub habitat most favoured by this species is frequently lost to development; on the other hand, colonizes farmland abandoned for a suitable time. During historic times expanded range into New England, including one breeding record in SE Canada (New Brunswick); more recently, has largely withdrawn from, for example, Massachusetts.

Bibliography. Adkinson & Conner (1978), Allfrey (2005), Bent (1950), Borror (1987), Bradley (1980, 1981), Brown & Collier (2005), Chapin (1925), Crowell & Rothstein (1981), Hopp *et al.* (1995), Nolan & Wooldridge (1962), Pyle (1997), Zwartjes (2003).

9. Thick-billed Vireo

Vireo crassirostris

French: Viréo à bec fort **German**: Dickschnabelvireo **Spanish**: Vireo Piquigrueso
Other common names: Large-billed Vireo

Taxonomy. *Laniovireo crassirostris* H. Bryant, 1859, New Providence, Bahama Islands.

This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. pallens*, *V. bairdi*, *V. caribaeus*, *V. modestus*, *V. gundlachii*, *V. latimeri* and *V. nanus*; probably closest to *V. griseus*, which has been treated as conspecific. Race *approximans* of *V. pallens* has sometimes been placed with this species, but is morphologically and vocally distinctive, and may represent a separate species. Five subspecies currently recognized.

Subspecies and Distribution.

V. c. crassirostris (H. Bryant, 1859) – Bahama Is.
V. c. stalagmium Buden, 1985 – Caicos Is.
V. c. tortugae Richmond, 1917 – Tortuga I, off NW Hispaniola.
V. c. cubensis Kirkconnell & Garrido, 2000 – Cayo Paredón Grande, off N Cuba.
V. c. alleni Cory, 1886 – Cayman Is.



Descriptive notes. 13–14 cm; 11–16·2 g. Nominate race has forehead, crown and upperparts dull greenish-grey, area above lores lemon-yellow, broken eyering paler, lower half almost white, lores blackish-grey, ear-coverts greyish-brown; flight-feathers dull blackish-grey, outer webs of primaries and secondaries narrowly edged with greenish-yellow, tertials more broadly edged with greenish-yellow; greater and median upperwing-coverts dark grey, broadly tipped yellowish-white to white (two obvious wingbars on closed wing); rectrices dull blackish-grey, outer webs edged with dull greenish; throat dull yellowish, becoming brighter on chest and belly and greyish-yellow on flanks; underparts very variable, from greyish to entirely yellow; iris pale brown or light hazel; bill notably stout and heavy, greyish-black above, slightly paler below; legs grey or dull blue-grey. Sexes alike. Juvenile lacks blackish on lores, has underparts olive-yellow. Race *stalagmium* differs from nominate in having shorter wing and tail, less deep bill, coloration tending to be more yellow on vent than most individuals from N Bahamas; *tortugae* is distinctly buff-washed and less yellow below than nominate; *cubensis* differs from all other races in having brownish-grey tinge on neck and upper back; *alleni* has bill darker than others, with dark brown or almost black culmen, darker towards base. Voice. Song, mostly during Dec–Jul, an assertive series of notes, often ending in sharp "chik", e.g. "chi-chip-weeeo-chik", similar to song of *V. griseus* but slower and less emphatic. Calls include low "turrr", buzzy "shhh" and nasal "enk".

Habitat. Woodland edge, bushes, scrubland; in Bahamas, xeromorphic habitats.

Food and Feeding. Food mostly insects and some berries. Forages by creeping along branches and twigs; very tame.

Breeding. Season Apr–Jul in Cayman Is, and peak of nesting apparently Mar on Tortuga I. Nest a deep cup made from bark strips, vegetable fibres and similar, lined with leaves and other soft materials, suspended by its rim 0·3–5·25 m above ground in fork of twigs. Clutch 2–3 eggs, white or pale buff, with brown spots concentrated at blunt end. No other information.

Movements. Mainly resident. Apparently some movement, as several extralimital records in extreme SE USA (Florida), in Feb–May and again in Dec; a few October records of nominate race on islands off N Cuba.

Status and Conservation. Not globally threatened. Restricted-range species: present in Bahamas, Hispaniola and Cuba EBAs, and present in Cayman Islands and Providence Island Secondary Areas. Fairly common in some parts of range. Race *cubensis*, found only on Cayo Paredón Grande (with records of non-breeding immatures on Cayo Coco), off N Cuba, described as "critically endangered", with population in the region of 100 individuals within a known range of only 60 ha. Race *alleni* extirpated from Little Cayman, although still present on Grand Cayman and Cayman Brac.

Bibliography. Barbour (1923), Bond (1985), Bradley (1985), Brudenell-Bruce (1975), Garrido & Kirkconnell (2000), Isada *et al.* (2009), Kirkconnell & Garrido (1991, 2000), Mountjoy & Leger (2001), Raffaele *et al.* (2003), Smith *et al.* (1990), Walker (1997), Walker & Barlow (1997), Wetmore & Swales (1931).

10. Mangrove Vireo

Vireo pallens

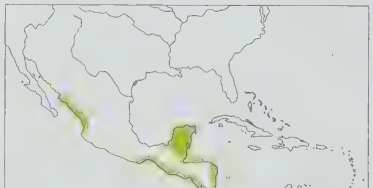
French: Viréo des mangroves **German**: Mangrovevireo **Spanish**: Vireo de Manglar
Other common names: Pale Vireo; Maya(n) Vireo (*semiflavus*); Old Providence Vireo (*approximans*)

Taxonomy. *Vireo pallens* Salvin, 1863, Realejo, Nicaragua.

This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. bairdi*, *V. caribaeus*, *V. modestus*, *V. gundlachii*, *V. latimeri* and *V. nanus*; sometimes treated as race of *V. griseus*. It has been suggested that two full species are involved, one consisting of Pacific-coast races *paluster*, *ochraceus*, nominate and *nicoyensis* (which are monomorphic), and the other of Caribbean races *salvini*, *semiflavus*, *wetmorei*, *angulensis*, *browningi* and *approximans* (which exhibit distinct grey and yellow plumage morphs, and which possibly have distinct vocalizations). Race *approximans* has been included by some authors in *V. crassirostris*; it is, however, morphologically and vocally distinctive, and may represent a further separate species; more study required. Proposed race *olsoni* (described from Turneffe Is, off Belize) treated as a synonym of *salvini*. Ten subspecies recognized.

Subspecies and Distribution.

V. p. paluster R. T. Moore, 1938 – W Mexico (SW Sonora S on coast to Nayarit).
V. p. ochraceus Salvin, 1863 – S Mexico (S Oaxaca) S along coast to Guatemala and W El Salvador (Puerto El Triunfo).
V. p. pallens Salvin, 1863 – S Honduras, W Nicaragua and NW Costa Rica.
V. p. nicoyensis Parkes, 1990 – Golfo de Nicoya, in W Costa Rica.
V. p. salvini van Rossem, 1934 – SE Mexico (Yucatán Peninsula) and N Belize (including Turneffe Is).
V. p. semiflavus Salvin, 1863 – Caribbean lowlands of N Guatemala, S Belize, E Honduras and E Nicaragua (Bluefields).
V. p. wetmorei A. R. Phillips, 1991 – El Cayo, in Bahía de Amatique (N of Puerto Barrios), off extreme E Guatemala.
V. p. angulensis Parkes, 1990 – Bay Is (off N Honduras).
V. p. browningi A. R. Phillips, 1991 – SE Nicaragua.
V. p. approximans Ridgway, 1884 – Old Providence I (E of Nicaragua).



Descriptive notes. 11–12 cm; 8·9–13 cm. Nominate race has area above lores buffy or lemon-buff, upperparts dull greenish-brown; flight-feathers dull dark grey, primaries and secondaries with outer webs narrowly edged yellowish-green, tertials with whitish edgings; greater and median upperwing-coverts dull dark grey, edged yellowish-white (two prominent bars on closed wing); rectrices dull dark grey, outer webs with greenish edgings; chin whitish-yellow, throat and underparts greyish, faint yellow tinges on belly and lower flanks; iris brownish-straw, yellow or dirty white (apparently very variable among different populations); bill dark brown or grey-brown above, paler below; legs grey-blue. Sexes alike. Juvenile is like adult, but facial pattern less distinct. Races differ mainly in depth of plumage coloration, also in size, Caribbean races (last six listed below) occur in two colour morphs, one more yellow and less grey than the other: *paluster* is large, yellower below than nominate; *ochraceus* has iris dull yellow; *nicoyensis* has iris light brown, pale yellow or white, plumage paler and duller than all other races, throat and abdomen almost pure white; *salvini* is small, relatively pale, yellowish below and greenish-olive above; *semiflavus* is brighter greenish above than others, underparts brighter yellow; *wetmorei* has bill larger and heavier than others, lores and lower eyelid dark, forehead deep olive-green, tinged yellowish; *angulensis* is small, cheeks with brownish-drab wash, back pale olive with brownish-drab wash, feathers of lower eyelid dark and contrasting upper eyelid; *browningi* has bill thin and less deep, darker on crown and cheeks, above darker and richer than *wetmorei*; *approximans* has breast yellowish, bill large with wide base. Voice. Song quite varied, in Costa Rica a harsh, loud, grating "jee-wee-wee-wee" or a burry "chewy-chewy-chewy-chewy", in Mexico a series of 3–12 (usually 4–6) twanging, slightly disyllabic notes, in Bay Is (*angulensis*) a complex series of buzzes, chirps and warbles, on Old Providence I (*approximans*) merely a "chatter". Other vocalizations include a nasal or buzzy scolding and a drawn-out, mewing "j-weehr".

Habitat. Notable difference between Pacific and Caribbean populations. Former found exclusively in mangroves, especially in dense young red mangrove (*Rhizophora*). Habitat in Caribbean part of range more varied; as well as mangroves, inhabits scrubby woodland, overgrown bushy fields, second growth and forest edge. In winter, in Yucatán Peninsula, occurs together with migrant *V. griseus*, latter favouring taller vegetation than that preferred by present species.

Food and Feeding. Prey items include spiders (Araneae), small beetles (Coleoptera) and leafhoppers (Cicadellidae); also takes considerable amounts of fruit such as arillate seeds of elephant tree

(*Bursera*), although to lesser degree than syntopic wintering *V. griseus*. Forages usually fairly low down in vegetation. Usually singly or in pairs, sometimes associating with other species in loose flocks. Territorial (and sings) during winter.
Breeding. Three nests recorded, all in Apr–Jun in Belize. Apparently only one (of race *semiflavus*) described in detail, a deep, thick-walled oval cup made from fine bark strips, grasses, lichens and cottony plant fibres, bound together with spider webbing, plant down and fibres, lined with pine (*Pinus*) needles, supported by its rim 1 m up in horizontal fork in live oak (*Quercus oleoides*); contained 3 eggs, white, with chocolate-brown spots concentrated around blunt end, adult incubating on 30th May, nest preyed on shortly thereafter. Other two nests had clutches of 3 eggs and 2 eggs, respectively. No other information.
Movements. Apparently sedentary; territories held throughout year in Yucatán Peninsula.
Status and Conservation. Not globally threatened. Fairly common in suitable habitat.
Bibliography. Figueroa & Albanese (2002), Greenberg, Niven *et al.* (1993), Howell & Webb (1995), Jones (2003), Mountjoy & Leger (2001), Parkes (1990), Russell (1964), Stiles & Skutch (1989).

11. Cozumel Vireo

Vireo bairdi

French: Viréo de Cozumel **German**: Bairdvireo **Spanish**: Vireo de Cozumel
Other common names: Baird's Vireo

Taxonomy. *Vireo bairdi* Ridgway, 1885, Cozumel Island, Quintana Roo, Mexico.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. pallens*, *V. caribaeus*, *V. modestus*, *V. gundlachii*, *V. latimeri* and *V. nanus*. Monotypic.
Distribution. Cozumel I (off NE Yucatán Peninsula), in SE Mexico.



Descriptive notes. 11·5–12·5 cm; 11·2–14·6 g. Crown is dark chestnut-brown, broad eyering and area above lores off-white (obvious spectacled appearance), ear-coverts dull chestnut-brown, upperparts light chestnut-brown; flight-feathers dull grey-brown, primaries and secondaries edged with dull greenish or olive-yellow on outer webs, tertials edged whitish; greater and median upperwing-coverts dull grey-brown, broadly edged yellowish-white (two conspicuous bars on closed wing); rectrices dull brownish-grey, outer webs with dull greenish edgings; chin, throat and chest off-white, side of chest chestnut-brown or cinnamon-brown, belly and vent off-white, brownish flanks; iris brown; bill flesh-coloured, sometimes darker on culmen or at tip; legs leaden blue, bluish-pink or flesh-coloured. Sexes alike. Juvenile is generally more pale than adult, has side of chest duller brown, not chestnut or cinnamon, also iris darker brown. Voice. Song a series of 3–10 nasal notes, somewhat similar to that of *V. griseus*. Calls include rapid scolding like that of a wren (Troglodytidae).
Habitat. Low scrubby woodland, abandoned farmland with scattered bushes, second growth, and thickets in deciduous woodland.
Food and Feeding. No data on food items. Forages in lower and middle levels of vegetation.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cozumel Island EBA. Locally fairly common. Despite its small global range (c. 490 km²), is regarded as not being at risk. Although substantial areas of habitat have been lost to tourist development, much remains intact; the species seems to adjust well to secondary habitat and appears to be quite common in several locations. Could possibly suffer habitat loss caused by hurricanes, which are regular in the region.
Bibliography. Anon. (2009a), Edwards (1972), Howell (1999a), Howell & Webb (1995), Mountjoy & Leger (2001), Peterson & Chalif (1973), Wheatley & Brewer (2001).

12. San Andres Vireo

Vireo caribaeus

French: Viréo de San Andrés **German**: San-Andrés-Vireo **Spanish**: Vireo de San Andrés
Other common names: St Andrew Vireo

Taxonomy. *Vireo caribaeus* Bond and Meyer de Schauensee, 1942, San Andrés, SW Caribbean.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. pallens*, *V. bairdi*, *V. modestus*, *V. gundlachii*, *V. latimeri* and *V. nanus*. Sometimes treated as conspecific with *V. griseus* or with *V. pallens*, but differs significantly from these in plumage and vocalizations. Monotypic.
Distribution. San Andrés I (E of Nicaragua), in SW Caribbean.



Descriptive notes. 12·5 cm; 8·6–10 g, mean 9·3 g. Has partial eyering and broad area above lores yellowish; otherwise dull greenish-grey above, becoming brighter and more greenish on lower back and rump; flight-feathers dull dark grey, primaries and secondaries with narrow greenish-yellow edgings on outer webs, tertials with whitish edgings on both webs; greater and median upperwing-coverts dull grey-brown, edged off-white (two wingbars on closed wing); rectrices dull dark grey-brown, dull greenish edgings on outer webs; chin and throat off-white, becoming suffused with yellow on chest and belly, the flanks a deeper and stronger yellowish-green; iris grey or grey-brown; bill dark horn; legs grey or leaden blue-grey. Sexes alike. No clear information available on juvenile. Voice. Unusual among vireos in having three song types, including specific courting-song. Simplest type involves rapid repetition of a single syllable 2–20 times, giving chattering song similar to that of *V. pallens* and *V. bairdi*; second type a serial repetition, 1–15 times, of 2 syllables, giving song similar to that of *V. modestus*; third consists of 3 or 4 syllables, uttered in random order. Calls include single contact note used by foraging pairs, a "chee-chee" call indicating agitation, and a raspy buzz in aggressive encounters.
Habitat. Various types of bush and woodland, including mangroves, sparse dry woodland with cocoa plantations, spring creepers and low open canopy, and denser, more humid woodland with higher canopy and some epiphytic growth; moderate understorey and an abundance of dry leaves on the ground seem important. In one study, 80% of nests located in dry scrubland, with 10% each in dense forest and mangrove forest.
Food and Feeding. Food includes both insects and fruit. Unusually for a vireo, fruit appears to form a significant proportion of nestling diet; in one study, insects were brought on only 40% of visits to nest, whereas on remainder fruit delivered, including fleshy seeds from *Randia gaumeri*, *Alberti edulis* and *Rauvolfia hirsuta*. Forages at all heights, from near ground level up to 10 m. Much more active forager than are others of family; behaviour more like that of a New World warbler (Parulidae).
Breeding. Nesting late Mar to Jun, with most starting in Apr, i.e. before rainy season, so that nestlings reared at time of maximum food abundance; probably single-brooded. Nest built entirely by female over c. 6 days; a deep cup of grasses and fibres, suspended by its rim at average height of 1·24 m in fine horizontal fork of tree or bush. Clutch 2 eggs, glossy white, with small brown spots at blunt end and finer brownish specks sparsely over remainder; incubation by both sexes for average c.17 days, male seen to sing while sitting; chicks attended by both parents during time in nest, c. 9 days, and for up to 1 month after fledging. In one study, breeding success varied between 42% and 48%; potential predators include race *magnirostris* of Tropical Mockingbird (*Mimus gilvus*), Mangrove Cuckoo (*Coccyzus minor*), and the large lizard known as the black tegu (*Tupinambis teguixin*).
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in San Andrés Island Secondary Area. Has probable population of between 8200 and 14,800 individuals; total suitable area estimated at 17 km², with high density of pairs in optimum habitat. San Andrés has a dense human population (1274 persons/km² in 2004) and is developed over much of its area; encroaching development associated with further population increases and expansion of agriculture continues. The island was declared a Biosphere Reserve in 2000, and some areas are protected against wood-cutting and encroachment; others, with significant numbers of this species, are not. This vireo appears to tolerate some habitat modification. Colonization of San Andrés by Shiny Cowbird (*Molothrus bonariensis*), a nest parasite which has expanded its range across the Caribbean in recent years, could have a very serious effect on this and other naive native bird species.
Bibliography. Anon. (2009a), Barlow & Nash (1985), Butchart & Stattersfield (2004), Gómez-Montes (2004), Gómez-Montes & Moreno (2008), Mountjoy & Leger (2001), Raffaele *et al.* (2003), Russell *et al.* (1979), Stattersfield & Capper (2000), Tye & Tye (1991).



PLATE 29

inches 2
cm 5

13. Jamaican Vireo

Vireo modestus

French: Viréo de Jamaïque **German**: Jamaikavireo **Spanish**: Vireo Jamaicano
Other common names: Jamaican White-eyed Vireo

Taxonomy. *Vireo modestus* P. L. Sclater, 1861, Jamaica.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. pallens*, *V. bairdi*, *V. caribaeus*, *V. gundlachii*, *V. latimeri* and *V. nanus*. Monotypic.
Distribution. Jamaica.



Descriptive notes. 12·5 cm; 9·2–10·8 g. Has diffuse pale area with yellow-olive tinge above lores, superciliary and ear-coverts; otherwise dull grey-green above, slightly brighter on rump; flight-feathers dull dark brownish-grey, outer webs edged greenish-yellow; greater and median upperwing-coverts dull dark brownish-grey, broadly edged pale yellowish-white (two obvious wingbars on closed wing); rectrices dull greyish, diffuse greenish edgings on outer webs of lateral feathers; throat whitish, chest dull yellowish-grey, darker on side, belly brighter yellow-grey; iris pale blue-grey to white; bill pale grey, pinkish below; legs grey, whitish soles. Sexes alike. Juvenile has head greyer than adult, yellow on underparts reduced to narrow central band, iris dark. Voice. Song a repetition of a short phrase, "sewi-sewi", or "twee-weet-weet-wuu", repeated for several minutes before changing to a new phrase. Calls include a loud, rapid scolding "chi-chi-chi-chi".
Habitat. Different forest types, from humid to semi-arid, also forest edge, thickets and similar; not found in mangroves. Sea-level to 2000 m or more.
Food and Feeding. Food mostly insects, in one study c. 14% fruit; in a food-supplementation experiment in SW Jamaica, vireo populations were not affected by provision of additional food in the form of split oranges. Forages in dense vegetation at all heights; secretive. Gleans mostly from leaves, to lesser extent from twigs; also hawks insects in mid-air.
Breeding. Season Apr–Jun. Nest is an open cup comprised of fern leaves or bromeliad stalks, supported by its rim in the crotch of a horizontal fork of a bush or tree. Clutch 2–3 eggs, white with spots and blotches of dark brown, which are concentrated at blunt end. No further information available.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Jamaica EBA. Common or abundant in many areas of its small range; widespread throughout the island. Appears able to adapt to some modification of habitat.
Bibliography. Bond (1999), Brown & Sherry (2006), Downer & Sutton (1990), Lack (1976), Mountjoy & Leger (2001), Raffaele *et al.* (1998), Zwartjes (1999).

14. Cuban Vireo

Vireo gundlachii

French: Viréo de Cuba **German**: Gundlachvireo **Spanish**: Vireo Cubano
Other common names: Gundlach's Vireo

Taxonomy. *Vireo gundlachii* Lembeye, 1850, Cienfuegos, Cuba.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. pallens*, *V. bairdi*, *V. caribaeus*, *V. modestus*, *V. latimeri* and *V. nanus*; sometimes treated as conspecific with *V. griseus*. Four subspecies recognized.
Subspecies and Distribution.
V. g. gundlachii Lembeye, 1850 – Cuba (except SE) and I of Pines.
V. g. sanfelipensis Garrido, 1973 – Cayo Real (W of I of Pines).
V. g. magnus Garrido, 1971 – Cayo Cantiles (E of I of Pines).
V. g. orientalis Todd, 1916 – SE Cuba (E of Camagüey).



Descriptive notes. 13 cm; 11·1–15·2 g. Nominate race has crown, ear-coverts and back dull olive-grey, patch from lores to behind eye (often discontinuous) yellow or creamy-white (contrasting with prominent dark eye) and fairly greyish-yellow area from base of lower mandible to ear-coverts; primaries and secondaries dull brownish-grey, pale yellowish edgings on outer webs; median and greater upperwing-coverts dull brownish-grey with whitish or pale greyish tips (two narrow wingbars); rectrices dull brownish-grey; throat and chest dull yellowish, becoming paler on belly and more grey on sides, undertail-coverts dull yellow-grey; weakly dimorphic, some individuals much more yellow than others, individuals from I of Pines may be whitish below; iris brown or reddish-brown; bill grey-brown above, paler below; legs lead-grey. Sexes alike. Juvenile is generally duller than adult. Race *orientalis* is generally the most grey of all, with paler yellow underparts; *magnus* is larger, longer-winged and longer-tailed than nominate and previous, less olivaceous on back and paler yellow on underparts; *sanfelipensis* is paler below than nominate, especially on chin and throat, which are whitish (not yellow). Voice. Song a loud whistling, very variable, e.g. "chuee-chuee" or "see-ree-ri-do". Other vocalizations include a rapid descending series of "chi" notes, a scolding "kik", a soft rattling call and, in spring courtship, a rapid repeated "wheet".
Habitat. Forest, forest edge, thickets and bushes; mainly at lower elevations, but also in hills and mountains.
Food and Feeding. Food items insects, fruits, small lizards. Forages mostly in lower levels of vegetation, usually in pairs; frequently in mixed flocks, especially with Yellow-headed Warbler (*Teretistris fernandinae*) or Oriente Warbler (*Teretistris fornsi*). Rather sluggish, not flying long distances.
Breeding. Season Mar–Aug, probably mostly Apr–Jun. Nest a well-concealed pensile cup made of plant fibres, grasses, mosses, lichens, horsehair, animal fur, cobwebs and small feathers, supported by its rim between lateral forks of fine twigs. Clutch 3 eggs, white, with small brown or purplish spots concentrated around blunt end. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cuba EBA. Considered to be generally common over much of its range. Races *magnus* and *sanfelipensis* have very small geographical ranges; both could be vulnerable to violent meteorological events, especially hurricanes.
Bibliography. Bond (1999), Buden & Olson (1989), Garrido (1971, 1973), Garrido & Kirkconnell (2000), Mountjoy & Leger (2001), Raffaele *et al.* (2003).

15. Puerto Rican Vireo

Vireo latimeri

French: Viréo de Porto Rico **German**: Braunscheitelvireo **Spanish**: Vireo Puertorriqueño
Other common names: Latimer's Vireo

Taxonomy. *Vireo latimeri* S. F. Baird, 1866, northern Puerto Rico.
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. pallens*, *V. bairdi*, *V. caribaeus*, *V. modestus*, *V. gundlachii* and *V. nanus*. Monotypic.
Distribution. W & C Puerto Rico (E to Loiza Aldea, Caguas and Patillas).



Descriptive notes. 12·5 cm; 10·1–14·9 g. Crown and nape are dull grey-green, eyering and area above lores whitish, upperparts greenish-grey (brighter than nape); primaries and secondaries dark grey, yellow-green edgings on outer webs; median and greater upperwing-coverts grey-green with small diffuse yellowish edgings; tail feathers grey-brown with olivaceous edgings; throat whitish-grey, contrasting with yellowish-grey chest; belly yellowish, duller on flanks and whitish-yellow in centre, vent yellowish; iris reddish-hazel or brown; bill dark horn-brown above, paler below; legs bluish-grey. Sexes alike. Juvenile has greater and median coverts tipped brownish (two wingbars on closed wing), underparts white, becoming yellow-olive on flanks and undertail-coverts. Voice. Song a melodious whistle of 3 or 4 syllables, repeated for several minutes with interspersed pauses, then changing to different motif, repeated in same manner; one transcription is "bien-te-veo". Calls include rattling "chur-chur-churrr", apparently used in courtship; also contact note "tup tup tup" and a hoarse grating cat-like mew.
Habitat. Various types of forest, including dry coastal shrub, wet mountain forest, moist forest in limestone hills, and shade coffee plantations; also mangroves, although not all mangrove forests are utilized.
Food and Feeding. Food mostly insects, but small fruits also taken. Forages at all levels, but usually lower down, in methodical and deliberate manner.
Breeding. Season mostly Mar–Jun, influenced by rainfall (with low spring rains clutch initiation may be delayed until early May; later rains can induce further surge in clutches as late as end Jul); probably single-brooded, although situation complicated by renesting after failures, some pairs observed to make up to six breeding attempts in a season. Nest a thin-walled deep cup made from dry grasses, plant down, hair and similar material, exterior decorated with moss and spider egg cases, located usually at no great height in lateral fork of tree or bush. Clutch 2–3 eggs, whitish, pink tinge when freshly laid, with reddish-brown or blackish spots concentrated towards blunt end, sometimes in form of a ring; no information on incubation and nestling periods; young remain on natal territory for prolonged period. Nests frequently parasitized by Shiny Cowbird (*Molothrus bonariensis*). Breeding success variable, heavily adversely affected by cowbird parasitism: in Guánica Forest studies, parasitized nests fledged 82% fewer vireo young than did unparasitized nests (86% of eggs in unaffected nests hatched, but only 38% in parasitized nests did so).
Movements. Sedentary; some short-distance movements between territories. Studies of marked individuals in Guánica Forest, in S of range, revealed that most adult males (70–90% or more) remained on territory from one breeding season to the next, and similar finding for females. Young dispersed to distances ranging from a few hundred metres to 2 km.
Status and Conservation. Not globally threatened. Restricted-range species: present in Puerto Rico and the Virgin Islands EBA. Common in much of its small global range. Vulnerable to introduced predators, i.e. mongooses (Herpestinae), rats (*Rattus*) and feral cats (*Felis catus*). More especially, suffers extensive brood parasitism by Shiny Cowbird, which in Caribbean formerly occurred only in Trinidad and Tobago, but is now widespread throughout most of region, this due in part to creation of suitable habitat through clearing of forest and introduction of cattle, but also to deliberate or accidental introductions by man (male cowbird an esteemed songster, and is kept in captivity); two apparent centres of introduction, one in Lesser Antilles (around Grenada or Barbados, whence it has spread NW as far as Antigua) and one in Greater Antilles (starting in E Puerto Rico and W Virgin Is). Cowbirds first observed in Puerto Rico in 1955, and first observed in Guánica Forest, the site of most studies, in 1969; parasitism rates in one study very high, on average 83% over several sites; in contrast to many other species, this species appears not to abandon nests containing foreign eggs, a naivety that makes it an excellent host. Although present species seems to have, for a small passerine, a good longevity as an adult, uncontrolled cowbird parasitism places local populations in danger of extirpation.

On following pages: 16. Flat-billed Vireo (*Vireo nanus*); 17. Bell's Vireo (*Vireo bellii*); 18. Black-capped Vireo (*Vireo atricapilla*); 19. Dwarf Vireo (*Vireo nelsoni*); 20. Grey Vireo (*Vireo vicinior*); 21. Blue Mountain Vireo (*Vireo osburni*); 22. Yellow-throated Vireo (*Vireo flavifrons*); 23. Plumbeous Vireo (*Vireo plumbeus*); 24. Cassin's Vireo (*Vireo cassinii*); 25. Blue-headed Vireo (*Vireo solitarius*); 26. Yellow-winged Vireo (*Vireo carmioli*); 27. Choco Vireo (*Vireo masteri*); 28. Hutton's Vireo (*Vireo huttoni*).

Bibliography. Biaggi (1983), Bond (1999), Cruz & Delannoy (1984b), Faaborg *et al.* (1997), Mountjoy & Leger (2001), Post & Wiley (1977), Post *et al.* (1990), Raffaele *et al.* (1998), Tossas (2008), Tossas & Thomlinson (2007), Wheatley & Brewer (2001), Woodworth (1997, 1999), Woodworth *et al.* (1999), Zwartjes (2003).

16. Flat-billed Vireo

Vireo nanus

French: Viréo d'Hispaniola **German**: Schnäppervireo **Spanish**: Vireo de la Española

Taxonomy. *Empidonax nanus* Lawrence, 1875, Santo Domingo (= Dominican Republic).
This genus and *Hylophilus* sometimes placed together in a subfamily Vireoninae. Present species sometimes accorded a separate monotypic genus, *Lawrencia*. Closely related to eight other scrub-dwelling vireos, namely *V. griseus*, *V. crassirostris*, *V. pallens*, *V. bairdi*, *V. caribaeus*, *V. modestus*, *V. gundlachii* and *V. latimeri*. Monotypic.
Distribution. Hispaniola, principally along N & E coasts and the Neiba Valley, and Gonâve I.



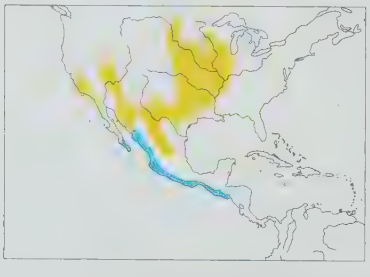
Descriptive notes. 12–13 cm; 10·4–11 g. Lores dark grey, broken eyering and area above lores pale olive-yellow (spectacled appearance), forehead to nape and upperparts dull greenish-grey; flight-feathers darker grey, primaries and secondaries with narrow grey-green edges on outer webs, tertials with broader edges on both webs; greater and median upperwing-coverts dull blackish-grey with off-white tips (two wingbars on closed wing); rectrices dull blackish-grey, outer ones with whitish tips; throat and chest dull greyish-yellow, belly and vent brighter yellow, becoming greyish-yellow on flanks (less commonly, throat and underparts whitish, with only faint yellow tinge in centre of abdomen); iris grey; bill (viewed from above) noticeably wide, flattened and triangular; bill dark grey above, pale cutting edges, lower mandible with dark grey line beneath cutting edge, rest of lower mandible and gape pale pinkish, three rictal bristles on each side of bill; legs bluish-grey. Sexes alike. Juvenile lacks blackish on lores. Voice. Song a clear, whistled series of notes, "wi-wi-wi-wi…", constantly repeated, also a more rapid chattering series, "weet-weet-weet-weet". Calls include harsh scolding note.
Habitat. Mostly semi-arid scrubland from sea-level to 1200 m, usually at low elevations; also in more humid forest.
Food and Feeding. Food items include insects and fruits. Forages deliberately, in low bushes or on ground. Perhaps more inclined to use flycatching method than are other vireo species.
Breeding. Season Feb–Jun. Nest a deep cup of plant fibres, sometimes with horsehair, placed in bush. Clutch 2 eggs, white, almost unmarked or with light grey markings at blunt end. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Hispaniola EBA. Generally rather uncommon. Has suffered considerable loss of habitat in recent times. So far, no data on impact of colonization of Hispaniola by Shiny Cowbird (*Molothrus bonariensis*), but by analogy with other naive vireo species in Caribbean this nest parasite could have significant adverse effect; cowbirds first recorded in SE Dominican Republic in 1972, spread rapidly W over next ten years, and by 1996 had crossed border into Haiti.
Bibliography. Bond (1999), Latta *et al.* (2006), Mountjoy & Leger (2001), Raffaele *et al.* (1998), Wetmore & Swales (1931).

17. Bell's Vireo

Vireo bellii

French: Viréo de Bell **German**: Braunaugenvireo **Spanish**: Vireo de Bell
Other common names: Least Bell's Vireo (*pusillus*)

Taxonomy. *Vireo bellii* Audubon, 1844, "short distance below Black Snake Hills" = near St Joseph, Missouri, USA.
Possibly most closely related to *V. atricapilla*, but may be closest to *V. griseus*. Four subspecies recognized.
Subspecies and Distribution.
V. b. bellii Audubon, 1844 – breeds C & S USA (from North Dakota E to Indiana, S to C Texas); migrates to Mexico, Guatemala, El Salvador, Honduras and (rarely) extreme NW Nicaragua.
V. b. pusillus Coues, 1866 – breeds S California S to extreme NW Mexico (NW Baja California); migrates to S Baja California.
V. b. arizonae Ridgway, 1903 – breeds SW USA (S Nevada, SW Utah, NW Arizona and SW New Mexico) S to NW Mexico (NE Baja California and Sonora); migrates to W Mexico (C & S Sonora S to Jalisco, rarely to C Michoachán).
V. b. medius Oberholser, 1903 – breeds SC USA (S New Mexico, SW Texas) S to NC Mexico (S to San Luis Potosí, probably SW Tamaulipas, possibly SW Durango); migrates to W Mexico.



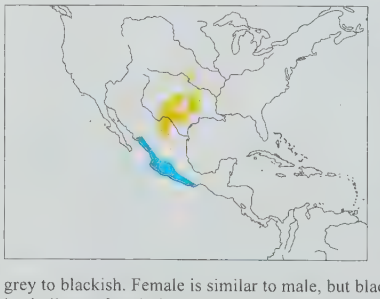
Descriptive notes. 11·5–12·5 cm; 7·4–9·8 g. Nominate race has crown and nape dull greyish-brown, becoming more greenish on back and rump; eyering and area above lores off-white (narrow, relatively inconspicuous spectacled appearance), ear-coverts brownish-grey; primaries and secondaries dull dark grey, outer webs narrowly edged off-white, greater and lesser upperwing-coverts tipped off-white (two narrow wingbars, varying in prominence); rectrices dull dark grey; chin and throat whitish, chest yellowish-white, more grey on side; belly and vent yellowish-white; iris dark brown to black; bill blackish, paler at base, greyish-brown to pale brown on lower mandible; legs dark greyish-blue to black. Sexes alike. Juvenile has brownish wash on upperparts, whiter underparts, relatively duller wing-bars. Race *pusillus* has proportionately longer tail than nominate, plumage generally duller, crown grey; *arizonae* has tail long, plumage paler and more grey, with less yellow below, than nominate; *medius* has crown and nape more grey, back greyer (with less green) than nominate, tail longer than nominate (but shorter than on preceding two). Voice. Primary song a characteristic loud, unmusical sequence of c. 10 spluttery notes, lasting c. 1·4 seconds, often ending with ascending or descending note; second song type, used during courtship, a quiet, squeaky version of primary song. Other vocalizations include a 3-note alarm call, an aggressive "zip-zip-zip" call, and a "chee" note, used in various circumstances, including during nest-building and, in more intense form, during territorial disputes.
Habitat. Dense low scrub, especially riparian bushland, young second-growth forest, coastal chaparral and scrub oak (*Quercus*); in arid regions often near water. In California, race *pusillus* requires dense understorey. In breeding range occurs from sea-level to 1300 m in USA, to 1900 m in Mexico; sea-level to 1500 m on wintering grounds.
Food and Feeding. Food mostly arthropods, especially large insects. Prey during breeding includes caterpillars of Lepidoptera, bees and wasps (Hymenoptera), spiders (Araneae), weevils (Curculionidae), and similar items; vegetable matter only 0·7% in summer. Fewer data on diet on non-breeding grounds. Holds large insects on perch with foot while using bill to hammer and dismember them. Forages mostly by gleaning, usually from leaves and twigs, from a perch; occasionally by hovering, and less commonly hawking in mid-air.
Breeding. Season mid-Mar to Jul, from May in N of range; usually only one brood in Kansas, usually two in California and Arizona. Monogamous; occasional sequential polygamy or polyandry (change of mate for second or subsequent brood), more rarely simultaneous polygamy or polyandry. Females settle into male territory within two days of arrival, and courtship begins immediately; male courtship can be quite violent, including attacks on, and deliberate collision with, female; in California, up to 20% of territorial males unmated. Nest built by both sexes, taking c. 4·5–5 days, an open cup made from grass, plant fibres, leaf midribs, bark strips and the like, woven with spider web, cup lined with fine yellow or brown grass stems; exterior often decorated with spider egg cases, suspended in fork of near-horizontal branches usually 0·5–1·5 m (more rarely 0·2–8 m) above ground near periphery of bush. Clutch 3–5 eggs, average 3·4 in both California (*pusillus*) and Kansas (nominate), laid usually within a couple of days of completion of nest; dull white, with fine brown or blackish dots mostly toward blunt end; incubation by both sexes, more by female than by male, at night always by female alone, period c. 14 days; hatching somewhat asynchronous over 2–3 days (smaller siblings rapidly catch up with older ones in size), chicks fed by both sexes (adults initially crushing prey, later feeding whole insects), both also brood young, at night probably female alone broods; nestling period 11–12 days; young may be fed by adults for up to 20 days after fledging, and observed to beg up to 30 days after leaving nest. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*). Breeding success often poor, owing chiefly to cowbird parasitism.
Movements. Migratory; one small area of overlap of summer and winter ranges in NW Mexico (Sonora). Nocturnal migrant. Autumn migration starts in late Aug at N end of range, and largely complete by early Oct, although individuals may linger in lower Colorado Valley (Arizona) until late Nov; winters along Pacific drainage of Mexico and N Central America from Sonora and S Baja California S to extreme NW Nicaragua. Spring migrants arrive in USA from early Mar to mid-Mar, reaching N limits of breeding range in May; males reach territory before females arrive. Recorded on passage over much of N Mexico; vagrant in S Canada (Ontario) and NE USA (Connecticut).
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Locally fairly common. Populations over much of range in decline, with 2·7% annual decrease, or 64% in total from 1966 to 2005; in NE part of range, however, appears to be slowly expanding. Race *pusillus* of California is of special concern, and classed as "Endangered" in USA in 1986; conservation action subsequently taken to preserve and restore habitat and to control cowbird parasitism; recovery of this taxon noted, with population estimated at 330 pairs in 1986, rising to 1336 pairs in 1990; believed probably almost extinct in N half of its former range (which extended N to C California), and close to extirpation in lower Colorado Valley. Status of Mexican populations of *pusillus* less well documented, but evidence of major decline. Causes of decreases of this taxon mainly destruction of riparian habitat in both California and Mexico and parasitism by Brown-headed Cowbird; parasitism rates in excess of 30% lead to vireo populations that are sufficiently unstable to be vulnerable to stochastic events, and rates of 48% and 69% led to extinctions in, respectively, 18 years and 8 years. Recovery measures in California include habitat preservation and intensive cowbird-trapping.
Bibliography. Anon. (2009a), Beezley & Rieger (1987), Bent (1950), Brown (1993), Budnik, Burhans *et al.* (2001), Budnik, Thompson *et al.* (2002), Chapin (1925), Franzreb (1987, 1989), Goldwasser *et al.* (1980), Howell & Webb (1995), Kus (2002), Kus *et al.* (2008), Laymon (1987), Mills *et al.* (1989), Mountjoy & Leger (2001), Mumford (1952), Nolan (1960), Overmire (1963), Peterson *et al.* (2004), Pitelka & Koestner (1942), Robbins *et al.* (1986), Russell & Monson (1998), Scott *et al.* (2005), Sharp & Kus (2004, 2006), Wilbur (1979).

18. Black-capped Vireo

Vireo atricapilla

French: Viréo à tête noire **German**: Schwarzkopfvireo **Spanish**: Vireo Cabecinegro

Taxonomy. *Vireo atricapilla* Woodhouse, 1852, Devil's River, near Sonora, Sutton County, Texas, USA.
Probably most closely related to, and has been thought to form a superspecies or to be conspecific with, *V. nelsoni*. Monotypic.
Distribution. Breeds in S USA from W Oklahoma S to Texas and in N Mexico (Coahuila, possibly also in S Nuevo León and S Tamaulipas); migrates to Pacific slope of Mexico (mainly S Sinaloa and W Durango S to Colima).



Descriptive notes. 11–11·5 cm; 8–10 g. Male has forehead, crown, nape, ear-coverts and malar region black, lores and broad eyering white; upperparts dull-olive green, becoming brighter on rump; upperwing dull grey-brown, tertials with yellowish-white edgings, outer webs of primaries and secondaries narrowly edged greenish-yellow; greater and lesser upperwing-coverts dull dark grey with broad yellow edgings (two obvious wingbars on closed wing); rectrices dull grey-brown; chin, throat and chest whitish, becoming greenish-yellow on flanks and pale yellowish on lower belly and vent; iris red; bill black; legs leaden grey to blackish. Female is similar to male, but black on head replaced by dull dark grey. Juvenile is similar to female but duller, has brown wash on head and back, "spectacles" light buff, iris brown; second-year male with black on nape replaced by grey, variable amounts of grey in crown, in some cases resembling female. Voice. Only male sings. Several different song types: primary song a series of hurried harsh, emphatic notes with chattering quality, transcribed as "prididzeegart" or similar; courtship song a series of low, squeaky and bubbly notes given more hurriedly, but more

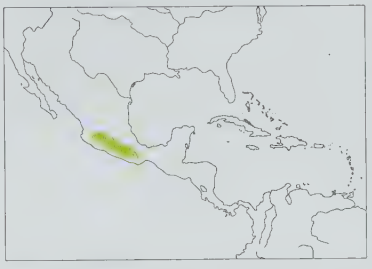
softly, than primary song; and "whisper" song, a less hurried, softer and less warbly version of courtship song. Calls include "zhrrreee" as alarm, a short "tidik", possibly a location call between pair-members, also other contact calls, and soft "yik".
Habitat. Low, dry scrubland with various species of oak (*Quercus*), juniper (*Juniperus*), Texas persimmon (*Dryosporis texana*), sumac (*Rhus*) and others; very frequently in successional areas after fires, when juniper growth suppressed in favour of fire-resistant oaks and other species. To 2000 m in Mexico. On non-breeding grounds, arid scrub and second-growth forest in lowlands and to 1600 m.
Food and Feeding. Food predominantly arthropods. During breeding season butterflies and moths and their larvae (Lepidoptera), beetles (Coleoptera), homopteran bugs, spiders (Araneae) and similar; small amounts of vegetable matter (seeds). On wintering grounds a greater proportion of vegetable matter, mostly seeds of Compositae, but still many arthropods. Forages mainly in brush-like vegetation. Often with mixed-species flocks.
Breeding. Laying early Apr in Texas (later in C Edwards Plateau), late Apr or early May in Oklahoma, and season Apr–Aug in N Mexico; sometimes or frequently double-brooded, especially when nest parasitism at low level. Monogamous, sometimes sequentially polygamous or polyandrous. On arrival in nesting area, female may travel through several male territories before selecting one or may immediately form pair. Courtship before beginning of nest-building can last for only one or two days; male may initiate building before pairing. Nest built by both sexes, most work done by female, and in subsequent broods (if male still caring for young) female may build unaided; nest an open cup composed of plant fibres, dried grass, dead leaves and the like, lined with fine dry grass, exterior decorated with animal silk, spider cocoons and similar, supported by rim in horizontal fork 0·2–3 m (usually 0·5–2 m, mean 1 m) above ground at edge of bush. First clutch (started one day after completion of nest) usually 4 eggs, rarely 3 or very rarely 5, second clutch 3–4 eggs, rarely 2, dull white without spots; incubation by both sexes, beginning in earnest with second or third egg, by female alone at night, female may do all of incubation for second brood (if male occupied in feeding first-brood fledglings), period 13–17 days, average 15 days; chicks fed by both sexes, 70–80% of food items brought by male, if female is present at nest he may transfer prey to her for transmission to young, nestling period 10–12 days; fledglings may be tended and fed for a further 35–45 days, but for shorter period if parents attempt second brood. Nests parasitized by Brown-headed Cowbirds (*Molothrus ater*). Breeding success variable, sometimes very poor; high rates of nest predation by snakes and mammals in some areas, and predation of nestlings by introduced red fire ant (*Solenopsis invicta*) can be significant, e.g. in one three-year study at Fort Hood (Texas) 31% of losses due to nest depredation were attributed to this last (mostly involving night-time raids by the ants).
Movements. Migratory. Winters on Pacific slope of W Mexico from S Sinaloa and extreme W Durango through Nayarit and Jalisco to Colima, with a few records in S Sonora and S to Oaxaca; migration routes probably avoid highest elevations of Sierra Madre Occidental. Young leave breeding grounds by late Aug, followed by adult females by early Sept, and finally adult males, which may linger to late Sept in Oklahoma and early Oct in Texas. Arrives back in breeding areas late Mar in C Texas and middle to late Apr in Oklahoma; males arrive in nesting area before females. Extralimital records from E Nebraska, NE Kansas, SE Louisiana, SE New Mexico; two bizarre occurrences in Canada, of individuals trapped and ringed at Long Point (Ontario) and L Vaseux (British Columbia) in, respectively, Apr 1991 and Sept 2008.
Status and Conservation. VULNERABLE. Local and uncommon. Rapid population declines through contracting range. Historical breeding range stretched from C Kansas S through C Oklahoma, and C Texas S to Coahuila and possibly adjacent Mexican states. Has disappeared from N parts of this range: last sight records from Kansas in 1950s, and probably has not bred in that state since 1930s; Oklahoma population now restricted to a few fragmented locations with small and probably unviable numbers. In parts of Texas still declining, but several large centres of distribution appear to hold stable numbers. Size of Mexican breeding populations uncertain, and the subject of vigorous debate and lack of consensus; further study required. High rate of return of marked breeding birds suggests that there are no serious problems for this species and its habitat in its non-breeding range. Principal cause of decline appears to be anthropogenic changes in habitat coupled with parasitism by Brown-headed Cowbirds (*Molothrus ater*). Overgrazing produces unsuitable habitat, as does long-term fire suppression, which results in unfavourable mix of shrubs; increased livestock-raising has secondary effect of increased cowbird populations, which cause major reductions in breeding success and extirpation of smaller breeding populations of this vireo. Losses through predation of nest contents also sometimes significant. This species has responded well to vigorous management programmes based on habitat maintenance and cowbird removal. Considerable portions of its range holding significant populations are protected, some as military reservations, and current habitat-restoration programmes are under way.
Bibliography. Anon. (2009a), Baicich & Harrison (2005), Bailey & Thompson (2007), Barber & Martin (1997), Barr *et al.* (2007), Benson & Benson (1990), Bent (1950), Bunker (1910), Butchart & Stattersfield (2004), Campomizzi *et al.* (2008), Cimprich (2009), Cimprich & Kostecke (2006), Collar & Andrew (1988), Collar *et al.* (1994), David & Gosselin (2002a), Downtown & Harris (2007), Fazio *et al.* (2004), Graber (1961), Grzybowski (1991, 1995, 2005), Grzybowski, Clapp & Marshall (1986), Grzybowski, Tazik & Schnell (1994), Kostecke & Cimprich (2008), Noa *et al.* (2007), Parysow & Tazik (2002), Scott & Garton (1991), Shackford (2004), Smith, J.E. *et al.* (2004), Stake & Cimprich (2003), Stattersfield & Capper (2000).

19. Dwarf Vireo

Vireo nelsoni

French: Viréo nain **German**: Zwergvireo **Spanish**: Vireo Enano
Other common names: Nelson's Vireo

Taxonomy. *Vireo nelsoni* Bond, 1936, Queréndaro, Michoacán, Mexico.
Initially named as *Vireo nanus*, but that name invalid, as preoccupied. Probably most closely related to, and has been thought to form a superspecies or to be conspecific with, *V. atricapilla*. Monotypic.
Distribution. SW Mexico from E Jalisco, NE Colima and S Guanajuato S in highlands to Guerrero, Puebla and Oaxaca.
Descriptive notes. 10–11 cm; 8·1–9·4 g. Crown dark grey, sometimes with bluish-grey cast, eyering (broken over eye) and area above lores off-white (diffuse spectacled appearance); upperparts dark grey with greenish tinge, becoming more greenish on rump; flight-feathers dull blackish-grey, primaries and secondaries narrowly edged whitish on outer webs, tertials with broader off-white edgings; greater and median upperwing-coverts dull-blackish grey with off-white tips (two wingbars on closed wing); rectrices dull blackish-grey, outer feathers with greenish edgings on outer webs; throat pale grey, chest pale yellowish-grey, becoming yellowish-white on belly, more yellowish on flanks; iris reddish; bill blackish; legs blue-grey or lead-grey, whitish soles. Sexes alike. Juvenile has iris pale tan. VOICE. Song a rather variable series of 3 or 4 scratchy notes or a series of hurried warbling phrases; scolding "cheh-cheh" calls, and dry "chi-chi-chi".



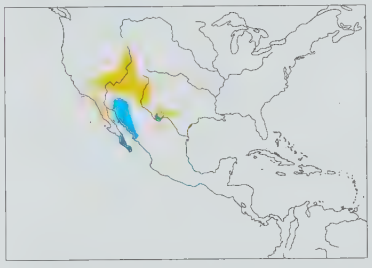
Habitat. Semi-arid to arid scrubland, sometimes with oaks (*Quercus*), scattered thickets, streamside vegetation, cypresses (*Cupressus*).
Food and Feeding. Few data. No information on diet. Forages low down in brush; secretive.
Breeding. Male on nest with eggs in mid-Jun in Guanajuato. Said to nest at low or medium level in tree or bush. No other information.
Movements. Unclear; present in some locations only in winter. Seems to move to higher elevations after breeding.
Status and Conservation. Not globally threatened. Widespread but very local. Total range 190,000 km². Has always been regarded as rare; for 60 years after its first description, this species was known only from the single type specimen (curiously, the very first specimen was taken in 1826, and it languished, unrecognized or overlooked, in a German museum for 160 years).
Bibliography. Bond (1936), Edwards (1972), Friedmann *et al.* (1950), Howell & Webb (1995), Mountjoy & Leger (2001), Nelson (1898), Peterson & Chalif (1973), Phillips (1968, 1991), Stresemann (1954).

20. Grey Vireo

Vireo vicinior

French: Viréo gris **German**: Grauvireo **Spanish**: Vireo Gris
Other common names: Grey Greenlet

Taxonomy. *Vireo vicinior* Coues, 1866, Fort Whipple, Arizona, USA.
Has been suggested that dark birds with deep black bill from Nachoguero Valley (Baja California) and NC Durango, in NW Mexico, might represent a distinct race. Currently treated as monotypic.
Distribution. Breeds in SW USA from Wyoming (occasional), C & E Utah, S Nevada and S California E, discontinuously, to W Colorado, N & E Arizona, W, N & SE New Mexico and W Texas (Big Bend and adjacent areas), and NW & N Mexico (N Baja California and N Coahuila). Migrates to non-breeding areas from SW Arizona S to NW Mexico (W Sonora, S Baja California) and in SW Texas.



Descriptive notes. 14 cm; male 11·5–13·5 g, female 12·1–13 g. Face and ear-coverts grey, inconspicuous whitish eyering and lores; crown, nape and upperparts dull grey; flight-feathers and upperwing-coverts slightly darker grey than back, secondaries with very narrow whitish edges on outer webs, greater coverts and to lesser extent median coverts sometimes with narrow, inconspicuous whitish-grey edgings (one or two slight wingbars on closed wing); rectrices medium-grey, outermost with very narrow whitish edgings on outermost web; throat and chest pale greyish-white, becoming clearer white on belly and vent; iris dark brown; bill black, blackish or plumbeous above, greyish-blue below; legs greyish-blue. Sexes alike. Juvenile has plumage washed with brownish and relatively distinct wingbars. VOICE. Several different song types. Primary song a loud disyllabic or trisyllabic "chu-weet" or "chu-cha-wet" with slightly burry quality, given by male; female also utters a version of this song during breeding season. Other song types include repetition of a single note, and a more complex series of up to 9 different syllables. Calls include a descending trill, often of more than 30 syllables (as revealed by sonagram), lasting for up to 2 seconds and resembling call of Harris's ground-squirrel (*Amnospermophilus harrisii*); and various other harsh or buzzy calls, and a chatter like that of a chickadee (*Poecile*). Some variation in vocalizations between Texas and Arizona populations.
Habitat. When breeding prefers hot, arid scrubland with wide variety of associations of bushes 0·5–2 m tall, also oak (*Quercus*), juniper (*Juniperus*), pinyon (*Pinus*), madrone (*Arbutus*) and others; in Mojave Desert (California) at 1650–2000 m, and in Chisos Mts (W Texas) 900–2400 m. On wintering grounds, arid lowland desert scrub with elephant tree (*Bursera microphylla*), various cacti and bushes.
Food and Feeding. During breeding season food predominantly insects, including, among others, bugs (Hemiptera), treehoppers (Membracidae) and other homopterans, grasshoppers and relatives (Orthoptera), flies (Diptera), beetles (Coleoptera). Nestling diet mostly caterpillars. On wintering grounds, and possibly also on migration, diet changes significantly, with vegetable matter then a major proportion of the food taken. Said to be more active and less deliberate in its foraging behaviour than other vireos. Forages from upper levels of bushes down to ground level, mostly by gleaning from twigs and foliage; also uses flycatching and pouncing from above. Territorial on wintering grounds; in Sonora usually occurs in areas where elephant trees grow, and defends individual fruiting trees against conspecifics and other species.
Breeding. Egg dates in California 20th Apr to 4th Jul (half during 21st–29th May), and in Colorado one full clutch by 13th Jun. Male arrives on territory a few days before female; pairing occurs almost immediately when female arrives. Nest-site chosen by female, both sexes participate in construction; nest a deep cup built from grasses, strips of juniper bark ripped from live trees, plant fibres, and spider webs and cocoons, lined with fine grass, hair, thistle down and plant fibres, supported by its sides in lateral fork of tree or bush (more rarely, supported by underlying twigs), average nest height in one Utah study c. 2 m, with extremes 1·3–3·4 m. Clutch 2–4 eggs, average just over 3, dull white with brown or reddish-brown or black spots; incubation by both sexes, both sing while sitting on nest, period 12–14 days; chicks fed by both parents, both also brood small chicks by day, female alone broods at night (only female has full brood patch), nest sanitation by both parents, nestling period 13–14 days. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); often abandons nest after appearance of a cowbird egg.
Movements. Short-distance migrant. Winters from SW Arizona (USA) S in Mexico to W Sonora, also in S Baja California, and possibly in other areas of N Mexico (records from San Luis Potosí and S Coahuila); also in SW Texas (USA). Although present in Big Bend, Texas, throughout year, studies of marked birds reveal that wintering and breeding populations are comprised of different individuals; origin of wintering visitors unclear, possibly from E slopes of Rocky Mts in Colorado. Departure from breeding areas starts by second week Aug, arrival on Sonoran wintering grounds from early Sept and bulk of population present by late Sept; return to breeding territory from late Mar to early Apr in Texas, middle to late Apr in C & N Arizona and early May in Colorado, males arriving on territory a few days before females.

Status and Conservation. Not globally threatened. Uncommon. Population decline and significant contraction in range recorded in historic times, the species no longer occurring in numerous previous breeding areas. Only one record in Wyoming. Formerly bred in NW Oklahoma; in Mexico apparently no recent records from Durango, where formerly present. Increased cowbird predation may be a major factor in population decreases. In some cases overgrazing, a common practice in SW, may benefit this vireo by increasing the amount of arid scrubland available to it. Currently listed as a species of moderate to high priority on the Partners in Flight watch list.
Bibliography. Barlow & Johnson (1969), Barlow *et al.* (1999), Bates (1987, 1992a, 1992b), Bent (1950), Coues (1866), Hanna (1944), Howell & Webb (1995), Phillips (1991), Phillips *et al.* (1964), Russell & Monson (1998), Schlossberg (2006).

21. **Blue Mountain Vireo**

Vireo osburni

French: Viréo d'Osburn **German**: Osburnvireo **Spanish**: Vireo de Osburn
Other common names: Osburn's Vireo

Taxonomy. *Laletes osburni* P. L. Sclater, 1861, Freeman's Hall, Trelawny Parish, Jamaica.
Monotypic.
Distribution. Jamaica.



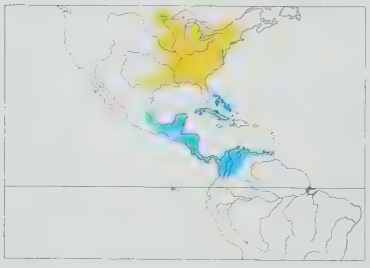
Descriptive notes. 12·5–15 cm; 19·9–22 g. Forehead, crown, nape and upperparts dull grey-brown, with olive-brown tinge on middle and lower back and rump; primaries and secondaries dull grey-brown with greyish-green edgings on outer webs (obscure greyish-green patch on closed wing); rectrices dull grey-brown, dull greenish edgings on outer webs (especially of lateral feathers); lores and ear-coverts dull grey-brown, chin and throat off-white with yellowish tinge, contrasting with yellowish-mottled greyish-brown upper chest; lower chest and belly dull yellowish-white with obscure greyish mottling, flanks brighter yellow, vent dull yellowish-white; iris brown; bill heavy, dull blackish above, somewhat less dark below; legs grey. Sexes alike. Juvenile has yellow below restricted to lowermost underparts. Voice. Song a deliberate trill, slightly descending in pitch towards end; alarm call a harsh descending "burr".
Habitat. Humid and moist mountain limestone rainforest, also upland woodland and shade coffee plantations; from 100 m upwards.
Food and Feeding. Little information. Food insects and fruits. Forages singly in dense foliage; secretive.
Breeding. Nesting season predominantly Mar–Jul; nest is a dangling cup at low to moderate height in a sapling or tree. Eggs spotted; no information about brood size, incubation or fledging.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Jamaica EBA. Uncommon. Has suffered much habitat destruction over a large part of of its range, although this has not yet been fragmented. Occurs in the Blue and John Crow Mountains National Park, Mt Diablo and the Cockpit Country, where rugged limestone terrain protects large areas of suitable habitat. Principal causes of habitat destruction are removal of trees for charcoal-burning, deliberate fires, small-scale farming and clearance for development.
Bibliography. Anon. (2009a), Bond (1999), Butchart & Stattersfield (2004), Downer & Sutton (1990), Mountjoy & Leger (2001), Raffaele *et al.* (1998), Stattersfield & Capper (2000), Wheatley & Brewer (2001), Zwartjes (2003).

22. **Yellow-throated Vireo**

Vireo flavifrons

French: Viréo à gorge jaune **German**: Gelbkehlvireo **Spanish**: Vireo Gorjiamarillo

Taxonomy. *Vireo flavifrons* Vieillot, 1808, eastern USA.
Has interbred with *V. solitarius*. Monotypic.
Distribution. Breeds in SE Canada (from SE Manitoba, S Ontario and SW Quebec) S in USA to C Texas and N Florida. Migrates to Mexico (S from S Veracruz and E Oaxaca) S throughout most of Central America to N Colombia and Venezuela; winters also New Providence and possibly other islands in Bahamas, Cuba (including I of Pines), and sporadically throughout N Caribbean.



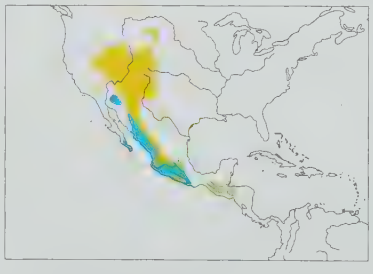
Descriptive notes. 13–14·8 cm; 15–21·4 g. Crown, sides of neck, ear-coverts and upper back deep olive-green, lower back and shoulders dull grey; eyering and area above lores lemon-yellow (conspicuous "spectacles"); flight-feathers dull dark grey, outer webs of primaries and secondaries narrowly edged grey-white, tertials broadly edged grey-white; greater and median upperwing-coverts broadly tipped greyish-white (two conspicuous wingbars on closed wing); rectrices dull blackish-grey; throat and chest bright lemon-yellow, darker at side; belly and vent off-white, more grey at side; iris brown; upper mandible greyish-black, lower mandible bluish-grey; legs bluish-grey. Sexes alike. Juvenile has upperparts with brownish wash, throat pale buffy yellow. Voice. Primary song a series of discrete notes each lasting c. 0·3 seconds, with gaps of c. 1 second between them; notes have characteristic buzzy or burry quality reminiscent of a Scarlet Tanager (*Piranga olivacea*), which distinguishes song from those of sympatric *V. olivaceus* and *V. solitarius*. Sometimes imitates or incorporates parts of songs of other species, e.g. *V. griseus* and *V. solitarius*, into its song. Calls include harsh scolding notes, a low-intensity alarm, a quiet "werrr", and a louder, staccato "ti-ti-ti-ti" used at times of greater stress. Female soliciting copulation gives quiet series of rapid "pink"; various other fairly harsh call notes.
Habitat. Breeds in various types of predominantly deciduous woodland, including forest edges, gallery forest alongside rivers, and open or semi-open areas with large deciduous trees; not in pure coniferous stands, but does occur in mixed deciduous–coniferous woodland. Favoured tree species include oaks (*Quercus*), maples (*Acer*), basswood (*Tilia americana*) and birch (*Betula*). Generally absent from interior forest unless gaps due to treefall or drowning by beaver (*Castor*) dams present. Where sympatric with *V. olivaceus*, latter frequently occurs in unbroken forest interior; where sympatric with *V. solitarius*, latter tends to occur in forest with substantial understorey, which not an invariable requirement for present species. On non-breeding grounds, found in various forest situations, including shade coffee plantations, humid and dry forest, cloudforest, thorny scrub, mangroves and second-growth woodland; sea-level to 1800 m, predominantly in montane zone.
Food and Feeding. In breeding season food predominantly arthropods, including Lepidoptera, bugs (Hemiptera), beetles (Coleoptera), flies (Diptera), Hymenoptera, and spiders (Araneae); in later summer and in autumn, increasing proportions of vegetable matter, especially fruits, e.g. rose (*Rosa*), wild grape (*Vitis*), various berries; on wintering grounds arillate fruit of elephant tree (*Bursera*) and other species. Forages mostly in upper and middle levels of forest; spends more time in foraging on tree trunks and large branches than do other, sympatric vireos. Moves rather slowly and deliberately while feeding. Most time spent in gleaning from perched positions, less time in hovering while picking off prey, and only minor amounts of flycatching for aerial prey.
Breeding. Season mostly from early May in S part of range to first half of Jun in N; single-brooded. Male arrives at breeding site one to several days before female; pairing then rapid, and nest-building starts immediately. Before arrival of female, male frequently places some nest material in several potential sites; female may select one of these, or choose a different site; nest built by both sexes, initially mainly by male, latterly mostly by female, a rounded cup made from dry rootlets, plant fibres, fine strips of bark, pine needles and the like, bound together with spider web, lining (added by female alone) of fine grasses, rootlets and similar, exterior decorated with grey lichens, plant down or spider egg cases, woven in with silk, the structure suspended by its rim in horizontal fork of twigs or small branches 1–24 m (mostly 6–15 m) above ground, i.e. frequently in crown of tree. Clutch 3–5 eggs, usually 4, white or creamy, spotted, mostly towards blunt end, with reddish or dark brown and black; incubation by both sexes, by female alone at night (male has only partial brood patch), period 13 days, can be 1–3 days longer if cowbird (*Molothrus*) eggs present in nest; chicks brooded for first 5–6 days by both sexes, at night only by female, fed by both parents (mostly with caterpillars carried in bill, sometimes by regurgitation), nestling period c. 13 days; fledglings fed for a further month; family-members may continue to associate until autumn migration. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*), frequently so (up to 50% of nests) in Ontario.
Movements. Migratory; non-breeding quarters from E & S Mexico S to N South America. Primarily a nocturnal migrant. Leaves Colombia by late Mar, Costa Rica by late Apr, arrives in numbers on US Gulf Coast from late Mar to late Apr (in Florida from mid-Mar to early Apr), and in Ontario from early to late May; males arrive at breeding sites up to several days before females. General scarcity of records on Caribbean islands suggests that many, perhaps bulk, of birds travel via Mexico, rather than across full width of Caribbean. Casual or vagrant over much of Caribbean, including Windward Is and Leeward Is, Trinidad and Jamaica; rare in Bermuda. Extralimital records in Canada from Saskatchewan E to Newfoundland; four recorded in W Palearctic, in SW England (Cornwall) in Sept 1990, Germany (Heligoland) in Sept 1998, and Azores, where two separate individuals in Oct 2008. On basis of pattern of occurrences, autumn migration route may be more to E than that in spring.
Status and Conservation. Not globally threatened. Fairly common; generally less common over most of its breeding range than are sympatric vireos. Breeding Bird Surveys revealed a significant increase of 1·2% per year over the period 1966–2005. Brood parasitism by cowbirds a potential threat in some areas; may reject or desert parasitized nests, but in majority of cases accepts cowbird eggs and rears resultant young.
Bibliography. Alfrey (2005), Aumüller (2005), Barlow *et al.* (1970), Chapin (1925), Cramp & Perrins (1994), Hauser (1959), James (1976, 1978, 1979a, 1979b, 1981, 1996a, 1996b, 1997a, 1997b, 1997c, 1999), Pyle (1997), Ridgway (1904).

23. **Plumbeous Vireo**

Vireo plumbeus

French: Viréo plombé **German**: Weißstirnvireo **Spanish**: Vireo Plomizo
Other common names: Solitary Vireo (when treated as conspecific with *V. cassinii* and *V. solitarius*)

Taxonomy. *Vireo plumbeus* Coues, 1866, Fort Whipple, Arizona, USA.
Probably forms a superspecies with *V. cassinii* and *V. solitarius*; the three were formerly treated as conspecific, but molecular-genetic studies indicate that they merit treatment as separate species. Some authorities suggest that S races *notius* and *montanus* may both warrant elevation to rank of full species. Proposed race *jacksoni* (SC Montana) is synonymized with nominate; in Mexico, proposed races *pinicolus* (described from Mound Valley, in Chihuahua) and *repetens* (from Tixtla, in Guerrero) likewise treated as synonyms of nominate. Four subspecies currently recognized.
Subspecies and Distribution.
V. p. plumbeus Coues, 1866 – breeds WC USA (S Idaho, Wyoming, SE Montana and SW South Dakota S to E California, C Arizona and W Texas) S to SW Mexico (to Guerrero and SC Oaxaca); winters from S Arizona (rarely) S through W Mexico.
V. p. gravis A. R. Phillips, 1991 – breeds EC Mexico (N & W Puebla, probably NE Hidalgo); winters also S to SE Veracruz.
V. p. notius Van Tyne, 1933 – Belize.
V. p. montanus van Rossem, 1933 – S Mexico (extreme SE Oaxaca, Chiapas) S to Honduras.



Descriptive notes. 14·75 cm; 12–20·3 g. Nominate race has eyering and area above lores white, ear-coverts leaden grey, crown to nape and upperparts leaden grey, very faint greenish tinge on rump; flight-feathers dull grey, primaries narrowly edged grey-white on outer webs, tertials more broadly edged whitish; tail grey, outer rectrices edged white; throat white, chest white with greyish suffusion, flanks more greyish, belly whitish with slight yellow tinge (strongest on lower flanks), vent whitish; iris brown; bill mostly blackish, most of lower mandible paler bluish-grey; legs bluish-grey. Sexes alike. Juvenile browner and drabber than adult. Race *gravis* is larger than nominate, darker above, secondaries edged deep olive-grey; *notius* is smaller than nominate, with short, rounded wing; *montanus* has short rounded wing, underparts more greenish, bill shorter. Voice. Primary song, by male only, a series of short, jerky phrases of 2–4 notes, characteristically burry in quality, separated by pauses of c. 1 second or more; not distin-

guishable from song of *V. cassinii*, but lacking pure notes of *V. solitarius*. Second song type, the "Complex song", consists of continuous warbling or chattering without intervening pauses, sustained for up to 15 seconds. Sings on migration, as well as on territory; male may sing while incubating. Various calls include loud grating scolding call when threatened, a rasping chatter, and low-volume contact calls between pair-members.

Habitat. Breeding habitat is various types of forest, predominantly coniferous, in USA mostly at 1150–2500 m; typical tree species are ponderosa pine (*Pinus ponderosa*), Douglas fir (*Pseudotsuga menziesii*), and pinyon–juniper (*Pinus–Juniperus*) woodland; occurs in mixed deciduous–coniferous forest, e.g. with aspen (*Populus tremuloides*), but not in pure deciduous stands. In Mexico, pine–oak (*Pinus–Quercus*) woodland, also oak scrub; in Honduras, pine–oak and open cloudforest; in Belize, lowland pine savanna, broadleaf and mixed forests and palmetto thickets. In California, utilizes more arid woodland than that occupied by *V. cassinii*; only rarely overlaps with *V. vicinior*, which occurs at lower, drier altitudes. Migrant N populations (nominate race) in winter from sea-level to 3000 m, occupying a wider variety of habitats, including mangroves, pine–oak woodland, tropical evergreen forest and second growth.

Food and Feeding. Food predominantly arthropods; no quantitative studies, but by analogy with closely related species probably mainly Lepidoptera, bugs (Hemiptera, including homopterans), flies (Diptera) and beetles (Coleoptera); can eat hairy caterpillars. Probably more vegetarian in winter, especially taking arillate fruits. Forages in methodical, deliberate manner, mostly in outer twigs or foliage and on large tree limbs, rarely on trunk or on ground; prefers conifers to broadleaf trees in mixed habitat.

Breeding. Most information from studies of N nominate race. Laying from Apr in S USA, from May farther N; resident populations in Mexico delay breeding until departure of wintering N migrants. Male arrives on territory shortly before female, and pair-forming takes place immediately. Male selects nest-sites and displays them to female by attaching spider webs and the like while singing constantly; if female rejects site, male displays another; nest built by both sexes in early stages, after 1–2 days most or all work done by female, a cup made from fine bark strips, rootlets and grass, lined with finer rootlets and grasses, exterior decorated with cocoons, lichens and catkins, suspended by its rim between two or more twigs or fine branches in lateral fork, generally in lower part of tree or in low understorey, rarely at great height, in mixed woodland quite often in deciduous species; unmated males may build incomplete "bachelor nests", which they abandon after pairing, although material may be reused for breeding nest. Clutch (N populations) 3–5 eggs, usually 4 (average 3·74 for 68 nests in Colorado), white or creamy white with sparse brown, red-brown or blackish spots; incubation by both sexes, although male has only partial brood patch, at night by female alone, period 13–15 days; small chicks brooded constantly, by both sexes, young fed, and nest cleaned, by both sexes, nestling period 13–14 days; fledglings fed by parents for at least two weeks after leaving nest. Nests parasitized frequently by Brown-headed (*Molothrus ater*) and, in S, Bronzed Cowbirds (*Molothrus aeneus*); rates of parasitization vary according to habitat and distance from good feeding areas for cowbird, being very high in riparian habitat and lower in mixed conifer habitats.

Movements. Nominate race entirely migratory in US range, wintering from S California (sparsely) and SC Arizona S to SW Mexico; N Mexican populations of this race partially migratory, whereas S Mexican populations sedentary, as are races *gravis*, *notius* and *montanus*. Autumn migration from mid-Aug to mid-Sept in N, to early Oct farther S; returning migrants arrive on breeding grounds from early Apr (S California) to May, males shortly before females. Vagrants (doubtless of nominate race) recorded in North Dakota, Alberta, Massachusetts, Ontario, Nova Scotia, New Jersey and Louisiana.

Status and Conservation. Not globally threatened. Locally common. Significant range expansions in historic times, into California and Nevada since 1940; subsequent substantial additional colonizations of those regions, and recent sight records in Oregon, suggest that further range expansions are in progress.

Bibliography. Baicich & Harrison (2005), Barlow (1980), Bent (1950), Chapin (1925), Curson & Gogen (1998), Heindel (1996), Howell & Webb (1995), Johnson (1995), Jones (2003), de Marco *et al.* (2000), Monroe (1968), Phillips *et al.* (1964), Pyle (1997), Dickey & van Rossem (1938), Russell (1964).

24. **Cassin's Vireo**

Vireo cassinii

French: Viréo de Cassin **German**: Cassinvireo **Spanish**: Vireo de Cassin
Other common names: Solitary Vireo (when treated as conspecific with *V. plumbeus* and *V. solitarius*)

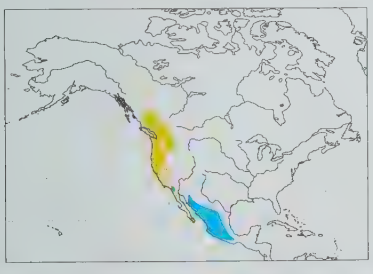
Taxonomy. *Vireo cassinii* Xántus de Vesey, 1858, Fort Tejon, California, USA.

Probably forms a superspecies with *V. plumbeus* and *V. solitarius*; the three were formerly treated as conspecific, but molecular-genetic studies indicate that they merit treatment as separate species. Breeding range in W Canada overlaps slightly with that of *V. solitarius*, and some interbreeding may occur; cytochrome *b* sequence studies, however, indicate as much divergence between the two as between *V. solitarius* and *V. flavifrons*. Two subspecies recognized.

Subspecies and Distribution.

V. c. cassinii Xántus de Vesey, 1858 – breeds SW Canada (S British Columbia S from c. 53° N) and W USA (Washington and W Montana S to S California), disjunctly also in NW Mexico (mountains of N Baja California); migrates to W Mexico (S to Oaxaca).

V. c. lucasanus Brewster, 1891 – S Baja California (W Mexico).



Descriptive notes. 13·5–14 cm; 10–20·6 g. Nominate race has eyering and area above lores white ("spectacles" on face), crown to nape and upper back dull greenish-grey, becoming slightly more greenish on lower back and rump; flight-feathers dull grey, primaries and secondaries narrowly edged yellowish-white on outer webs, tertials more broadly edged whitish; greater and median upperwing-coverts dull grey with broad whitish edgings (two prominent wingbars on closed wing); rectrices grey with dull greenish edgings; chin white, chest whitish, very faintly suffused with pale yellowish, belly grey-white with pale yellowish flanks, vent yellowish-white; iris dark brown or sepia; bill blackish or grey-black above, slate-grey with darker tip below; legs leaden grey. Sexes alike. Juvenile is generally browner and drabber than adult. Race *lucasanus* is smaller than nominate, has heavier bill but shorter and more rounded wing, and more yellow on sides and flanks. Voice. Primary song, by male alone, a series of disjointed phrases, each consisting of 2–4 burry notes, lasting c. 0·3 seconds, interspersed with pauses lasting a second or more; essentially indistinguishable from song of *V. plumbeus*. Other vocalizations include an alarm or agitation call, which is an extended rasping chatter, sometimes turning into a loud grating call, and lower-volume, more simple contact calls.

Habitat. Nominate race breeds in various forest types, including coniferous, deciduous and mixed stands; tree species utilized include ponderosa pine (*Pinus ponderosa*), larch (*Larix*) and aspen (*Populus tremuloides*), Douglas fir (*Pseudotsuga menziesii*) in interior, and more deciduous-dominated woodland with oaks (*Quercus*) in coastal regions; prefers dry open forest, such as rain-shadow areas, rather than full rainforest. Elevational range 1000–2400 m in N Baja California, 120–2400 m in S part of range, and sea-level to 1200 m in N. Resident race *lucasanus* in S Baja California occurs in thorn-forest and pine–oak woodland at 400–2500 m. On migration uses wider variety of habitats, including desert oases and riparian woodland. In winter quarters situation confused by presence of *V. plumbeus*, but appears to occur from sea-level to 3000 m and in wide variety of vegetation types, including pine–oak forest, mangroves, cloudforest, scrubland, tropical deciduous and evergreen forests, and second growth.

Food and Feeding. In breeding season bulk of prey arthropods, especially caterpillars (Lepidoptera), bugs (Hemiptera) and treehoppers (Membracidae), beetles (Coleoptera), wasps and ants (Hymenoptera), spiders (Araneae) and others; very small proportion of vegetable matter, mostly seeds and galls, also taken. No information on diet in non-breeding areas, but vegetable matter probably more important. Feeding techniques involve methodical, deliberate gleaning from foliage and twigs, occasionally hawking at moving insects and hovering to pick off prey. On wintering grounds often forages in mixed flocks with other species.

Breeding. Egg-laying starts late Apr in S to third week of Jun in N, later in interior locations than at coastal ones; no information on sedentary race *lucasanus* (S Baja California). Single-brooded over most of range, possibly double-brooded in S or at lower altitudes, but evidence lacking. Recent information, based on isotope ratios of muscle and claws, suggests some birds that breed in Canada or W USA later migrate to S Baja California, where they breed again in same year; limited habitat available in Baja California implies this strategy probably followed only by small numbers of birds; relationship between these birds and resident *lucasanus* unknown. Male arrives on breeding grounds before female, selects potential nest-site and adds small amount of nesting material to it, and performs ritualized nest-building display to female. Nest stated as being bulkier and of looser construction than those of other vireos, a cup built from dry grasses, moss and similar material, lined with fine grass, rootlets and sometimes animal hair, exterior often decorated with lichens, cocoons and paper from hornet (Vespidae) nests, suspended by its rim from lateral fork in lower or middle thin branches of tree or higher up in shrub. Clutch 2–5 eggs, usually 4, average in one California study 3·87, later or replacement clutches on average smaller; white or creamy white, sparsely spotted with brown or reddish-brown; incubation by both sexes, at night by female alone, period c. 13·5 days on average; probably both parents feed young, but confirmation required, nestling period 13–15 days, usually 14 days.

Movements. S Baja California race (*lucasanus*) sedentary. Nominate race wholly migratory, with discrete breeding and wintering areas. Winters in extreme S Arizona and in W Mexico S to Oaxaca. In S California, arrives on breeding grounds from end of Mar, most in Apr; in Oregon, bulk of arrivals mid-Apr to early May, with a few earlier dates; in SW Canada (British Columbia) late Apr to mid-May, with some arrivals as early as late Mar. Males arrive earlier than do females. Autumn migration more drawn out, in British Columbia Aug to mid-Sept, in Oregon late Aug to early Oct, in California early Aug to mid-Oct; common on passage in Arizona; in N Mexico (Sonora) transients mid-Sept to mid-Nov. Occurs on migration in W Alberta (W Canada). Has occurred as vagrant, mostly in autumn, in E Canada (Quebec) and, in USA, in SE Alaska, Nebraska, New York, New Jersey, S Texas and Louisiana. Earlier reports of wintering in Guatemala probably erroneous, resulting from confusion with *V. plumbeus*.

Status and Conservation. Not globally threatened. Common. Over much of its range present in substantial densities, with quoted figures of up to as many as 13·7 pairs/40 ha in lightly thinned forest in NW California and only slightly fewer in heavily thinned forest; significantly lower densities in some other habitats. Breeding Bird Surveys over whole North American range show a statistically significant increase of 1·1% per annum over years 1966–2005, with observed increases from British Columbia S to California.

Bibliography. Arndt (2003), Barlow *et al.* (1970), Bent (1950), Goguen & Curson (2002), Hamilton (1958), Howell & Webb (1995), James (1981), Pyle (1997), Rohwer, S. *et al.* (2009), Rohwer, V.G. *et al.* (2008).

25. **Blue-headed Vireo**

Vireo solitarius

French: Viréo à tête bleue **German**: Graukopfvireo **Spanish**: Vireo Solitario
Other common names: Solitary Vireo (when treated as conspecific with *V. plumbeus* and *V. cassinii*); Vera Paz Vireo ("*V. propinquus*")

Taxonomy. *Muscicapa solitaria* A. Wilson, 1810, Bartram's woods, near Philadelphia, Pennsylvania, USA.

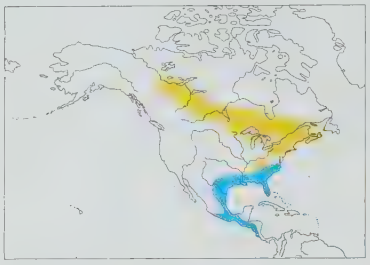
Probably forms a superspecies with *V. plumbeus* and *V. cassinii*; the three were formerly treated as conspecific, but molecular-genetic studies indicate that they merit treatment as separate species. Breeding range in SW Canada overlaps slightly with that of *V. cassinii*, and some interbreeding may occur; cytochrome *b* sequence studies, however, indicate as much divergence between the two as between present species and closely related *V. flavifrons*, with which it has likewise hybridized. Specimens of hybrids, from non-breeding range in S Mexico and Guatemala, were formerly classified as a full species under name "*V. propinquus*". Two subspecies recognized.

Subspecies and Distribution.

V. s. solitarius (A. Wilson, 1810) – breeds from Canada (SW Northwest Territories and W Alberta E to SW Newfoundland and Nova Scotia) S in E USA to N Minnesota, N Wisconsin, Pennsylvania and New Jersey; migrates to S USA (C Texas E to CN Carolina, S to C Florida), E Mexico and S mainly to N Nicaragua, rarely W Cuba and I of Pines.

V. s. alticola Brewster, 1886 – breeds S Appalachians from NE West Virginia and W Maryland S to N Georgia, casually elsewhere E of mountains; migrates to SE USA (SE Louisiana E to S South Carolina, S to S Florida).

Descriptive notes. 13–15 cm; 14·1–19 g. Nominate race has crown, nape and ear-coverts slate-grey or blue-grey, sometimes with slight greenish suffusions, eyering and area above lores white (prominent "spectacles"); upperparts dark greenish-grey; flight-feathers blackish-grey, outer webs of primaries and secondaries with narrow greenish-yellow edgings, tertials with broader yellowish-white edgings on outer webs; median and greater upperwing-coverts blackish-grey, broadly tipped yellowish-white (two prominent whitish wingbars); rectrices dark blackish-grey with off-white edgings; chin and throat white, chest yellowish-white, side deeper yellow with grey suffusions, belly yellowish-white, flanks grey-green; iris dark brown; bill mostly black, lower mandible sometimes with greyish at base; legs bluish-grey. Sexes alike. Juvenile is browner and drabber than adult. Race *alticola* is darker above than nominate, with mixed grey and olive on back, has larger



bill. Voice. Primary song, by male alone, a series of discrete phrases, each c. 0·3 seconds in length and with silent pauses of similar length between them, transliterated as e.g. "toowee, taweeto, tooyah", each male having repertoire of up to 20 distinct phrases, repeated irregularly; somewhat higher and sweeter than song of *V. olivaceus*, and distinguished from song of sympatric *V. flavifrons* by clarity of notes without burry or buzzy overtones (at W end of range, where no sympatry with latter, notes are less pure and more modulated). Wide variety of calls, including low "wi" or "teeweh" as contact; trills of up to 15 syllables over period of perhaps 1·5 seconds, short quiet "meer-mer-mer-mer" as low-intensity alarm, and a more intense staccato "ti-ti-ti-ti", and raspy "chee"; pre-copulation call involving some phrases from primary song mixed with trills, contact calls and scolds.

Habitat. In N parts of range, typically coniferous forest with spruce (*Picea*), fir (*Abies*), pine (*Pinus*) or hemlock (*Tsuga*), sometimes with deciduous admixture of alder (*Alnus*), willow (*Salix*), birch (*Betula*) and others; from sea-level (in E Canada) to 1200 m (in Rocky Mts). S populations usually at 600–2000 m and in wider variety of forest types, including pure deciduous stands of beech (*Fagus*), oak (*Quercus*), hickory (*Carya*) and similar. On migration found in varied forest types in Middle America, although usually avoids humid lowland forest. In wintering areas usually at 900–2100 m, in rainforest and cloudforest, shade coffee plantations, and various types of mixed forest.

Food and Feeding. Diet during breeding predominantly of animal items (96%), with little vegetable matter (4%); on wintering grounds much more vegetarian (up to 50% of diet). Main items caterpillars, especially in summer; also adult moths (Lepidoptera), true bugs (Hemiptera), beetles (Coleoptera), bees and ants (Hymenoptera), flies (Diptera), various other insects, spiders (Araneae) and small snails (Gastropoda). Vegetable matter mostly fleshy fruits, such as those of dogwood (*Cornus*) and elder (*Sambucus*). Nestling diet mostly caterpillars, but more varied prey as young grow. Forages in deliberate manner, moving slowly from perch to perch, picking prey from leaf surfaces, or by sallying and hovering to pluck food; apparently very opportunistic, changing its feeding techniques and patronage of different tree species according to immediate food availability. Will "fake" flycatching when approaching nest, apparently to deceive predators or parasites that would be guided to nest by a direct flight. May be mildly territorial on wintering grounds, where not found in flocks with conspecifics.

Breeding. Laying from late Apr to early May in Georgia and the Carolinas, and late May to early Jun in Wisconsin and Quebec; probably single-brooded, possibly some double-brooding (as opposed to replacement of lost clutches) rarely in S populations. Apparently monogamous. Male establishes territory by song immediately on arrival on breeding grounds; pair formation rapid after slightly later arrival of female. Male selects one or more nest-sites, often placing a little nesting material in the first of these; female seems to accept or reject sites. Nest-building takes about eight days, male doing most of work initially, after first day his role diminishing, and ceasing about sixth day, female completing and lining nest in last two days; nest a deep rounded structure made from bark strips, grasses, plant fibres and similar, with spider web, dead leaves and the like interwoven, rarely animal fur, feathers or porcupine (Erethizontidae) quills, lining of fine dry grasses, outside of nest adorned with birch-bark fragments and spider egg cases, suspended by its rim between twigs in horizontal branch 1·2 –18·9 m (usually 2–5 m) above ground in top centre of shrub or near end of lower branch in taller tree. Clutch usually 3–4 eggs, rarely 5 (nominate race), averages 3·83–3·92 (nominate) and 3·33 (*alticola*), white or creamy white, sparsely spotted with brown or blackish, especially near blunt end; incubation by both sexes during daytime, by female alone during night, period 13–14 days, 14–15 in cold weather; chicks brooded by both sexes (only female at night) frequently for first six days, less thereafter, fed by both sexes with items carried in bill, rarely by regurgitation, nestling period 12–13 days; young fly only weakly on leaving nest, cared for by adults for a further 2–4 weeks.

Movements. N race (nominate) highly migratory, leap-frogging over *alticola*, which appears not to leave continental North America in winter, moving relatively short distances to lowland forests. Nocturnal migrant. Nominate race winters from S USA S through E Mexico to NW Nicaragua, less commonly in Costa Rica and Panama, and in W Mexico, and rare in Cuba and I of Pines in winter; casual in Bahamas and Jamaica. Earliest of migratory vireos to arrive in spring, first returns in North Carolina by early Mar, W Pennsylvania in mid-Apr and, in Canada, Ontario by late Apr to early May and C Quebec by mid-May; latest to leave in autumn, when mostly gone from Canada by mid-Sept, but recorded rarely as late as Nov or Dec.

Status and Conservation. Not globally threatened. Common. Population appears to be increasing; Breeding Bird Surveys from 1966 to 2005 reveal significant annual increases of 4·2% (North America including Canada) and 5·2% (Canada only). In Canada, studies at Long Point Bird Observatory (in Ontario) from 1960 to 2007 show significant increases in numbers of migrants on both spring and autumn passages.

Bibliography. Bent (1950), Chapin (1925), Chiver *et al.* (2007), Godfrey (1986), Howell & Webb (1995), Hudman & Chandler (2002), James (1978, 1979b, 1981, 1996a, 1996b, 1997a, 1997b, 1998, 2007a), Johnson, N.K. *et al.* (1988), Morton *et al.* (2006), Murray *et al.* (1994), Phillips (1991), Pyle (1997), Ridgway (1904), Van Roo (2004), Van Roo *et al.* (2003).

26. Yellow-winged Vireo

Vireo carmioli

French: Viréo à ailes jaunes **German**: Gelbbindenvireo **Spanish**: Vireo Aliamarillo
Other common names: Carmiol's Vireo

Taxonomy. *Vireo carmioli* S. F. Baird, 1866, Santa María de Dota, Costa Rica.
Probably most closely related to *V. masteri*, though nearest relative might be *V. huttoni*. Monotypic.
Distribution. Mountains of Costa Rica (Cordillera Central, Dota Mts and Cordillera de Talamanca) and adjacent W Panama (Chiriquí highlands).
Descriptive notes. 11–11·5 cm; 12·7–15·2 g. Crown grey-green, eyering and area above lores whitish to buffy yellow (giving spectacled appearance), nape and upperparts dull greenish; primaries and secondaries blackish-grey, broadly edged with yellow-green, greater and median upperwing-coverts dark greenish-grey, broadly tipped whitish to pale yellow (two conspicuous wingbars on closed wing); rectrices blackish-grey, outer webs broadly fringed greenish-yellow; throat yellowish-white, chest and belly yellow, duller yellowish-green at sides, vent yellow; some individuals have yellow pigments quite muted, giving almost grey-and-white appearance; iris brown; upper mandible blackish, lower mandible pale grey; legs grey or bluish-grey. Sexes alike. Juvenile has wingbars



more ochraceous (less bright yellow), back more brownish (less green), breast tinged buff, superciliary area buffy white. Voice. Song a series of short, leisurely phrases of 2 or 3 syllables, of a rather burry or buzzy nature, often the last note characteristically accented, "cheeyah, cheeyah, chipcheewee", interspersed with longer pauses; in pattern resembles the song of such species as *V. olivaceus*, rather than that of *V. griseus*. Calls include nasal "net", and "chwick" like that of a New World oriole (*Icterus*).

Habitat. Cool, humid mountain forests, from c. 1900 m (1630 m in W Panama) up to treeline (c. 3000 m), moving downslope somewhat (to c. 1500 m) in wet season.

Food and Feeding. Recorded food items insects, spiders (Araneae), also vegetable matter (berries). Tends to forage with deliberate movements, up to 25 m or more above ground level; occasionally lower down in undergrowth or second growth. Sometimes joins mixed flocks.

Breeding. Nests in Mar–Jun (i.e. just prior to and in early part of rainy season). Nest, built by both sexes, a cup made from green leaves, mosses, lichens and the like, with egg cases of spiders incorporated, suspended by its rim 3–20 m up in lateral fork of tree or shrub branch. Clutch 2 eggs, white, with dark spots around blunt end; incubation of eggs and feeding of young by both sexes. No other information.

Movements. Essentially sedentary; some descend to lower elevations after breeding (i.e. at height of rainy season).

Status and Conservation. Not globally threatened. Restricted-range species: present in Costa Rica and Panama Highlands EBA. Quite common in suitable habitat. Considerable portions of this species' habitat are protected in private or public reserves, including e.g. Volcán Poás National Park, in Costa Rica, Volcán Barú National Park, in Panama, and La Amistad National Park, shared between those two countries.

Bibliography. Eisenmann (1962b), Mountjoy & Leger (2001), Phillips (1991), Ridgely & Gwynne (1989), Skutch (1967), Stiles & Skutch (1989), Wetmore *et al.* (1984), Wheatley & Brewer (2001).

27. Choco Vireo

Vireo masteri

French: Viréo du Choco **German**: Chocóvireo **Spanish**: Vireo del Chocó

Taxonomy. *Vireo masteri* Salaman and Stiles, 1996, Alto de Pisones, 7 km NW of Gaguadas, Municipio de Mistrato, Departamento de Risalda, Colombia.
Probably most closely related to *V. carmioli*. Monotypic.
Distribution. W & SW Colombia and NW Ecuador.



Descriptive notes. 11–11·5 cm; 11·0–11·4 g. Olive on crown, becoming brighter and greener on upperparts; supraloral area ochraceous, extending as broad whitish supercilium beyond eye, lores and orbital stripe dark, narrow pale yellowish eyering broken before and behind eye by dark orbital stripe; cheek and ear-coverts ochraceous yellow, mottled with olive; flight-feathers dull dark brown, primaries edged basally with yellowish-olive, secondaries narrowly edged olive-green; greater and median secondary coverts dull brown with slightly yellowish-white broad tips (two prominent wingbars); rectrices dull dark brown, central pair olive-green, outer three pairs narrowly edged pale brown; chin and throat dull whitish, tinged yellow; side of throat and entire chest bright ochraceous yellow, becoming olive-green on sides and flanks; lower breast, side of abdomen and vent clear pale yellow; iris dark brown; upper mandible blackish, tip dark horn, lower mandible paler horn, becoming whitish at base; legs bluish-grey. Sexes alike. Juvenile has supercilium and face paler and more cream-coloured than adult, wingbars broader and more yellow and less well defined, underparts generally more pale. Voice. Song, usually from upper canopy, a rapid series of c. 10 notes, lasting c. 2 seconds; sonagram analysis shows it to be in three parts, starting with c. 3 short high-pitched syllables, then c. 4 four lower-pitched ones, and a variable ending usually involving a syllable slurred first upwards and then down. In comparison with other members of genus, song is high in pitch and rapid in delivery. Calls include a sharp brief "chip" note and a nasal "zhree-zhree-zhree" alarm call.

Habitat. In Colombia found in primary rainforest, usually on steep slopes, with rather broken canopy c. 20–25 m tall, natural gaps created by treefall, and much epiphytic growth; at 1200–1600 m. In Ecuador apparently in wider spectrum of habitat types, including primary forest and forest edges; 800–1360 m.

Food and Feeding. Seen to take caterpillars; stomach contents of one specimen included beetles (Coleoptera) and bugs (Hemiptera). Forages actively, more in the manner of a New World warbler (Parulidae) than in the typical leisurely fashion of most vireos. Gleans underside of leaves in canopy; not seen to investigate clumps of moss or epiphytes. Frequently occurs in mixed flocks with other species.

Breeding. In SW Colombia, adults feeding fledged young on 6th and 15th Aug, and juvenile male mist-netted on 25th Aug had skull only 30% ossified. No other information.

Movements. Sedentary.

Status and Conservation. ENDANGERED. Restricted-range species: present in Chocó EBA. A recently described species. So far, known from only three locations: Alto de Pisones (in Risaralda) and the Junín area (Nariño), both in Colombia, and Alto Tambo (Esmeraldas), in Ecuador. The Colombian sites are separated by 520 km, and the location in Ecuador is 95 km S of the nearer of the Colombian sites; apparently suitable habitat exists between these widely scattered locations, but efforts to locate populations of this species have so far been unsuccessful. Attempts to assess global population sizes are subject to wide margins of error; a relatively conservative figure is of c. 12,300 mature individuals in Colombia and c. 3300 in Ecuador; other estimates have given a potential world population of up to c. 78,000, although this was based on assumptions that available habitat would be occupied by this species. More recently, a precautionary estimate of c. 15,600 adults has been proposed. It is thought that the population may well be declining as a consequence of continuing habitat loss and fragmentation caused by non-selective timber extraction and by clearance for cattle-ranching. Some parts of the known existing range are protected, the Río Ñambí

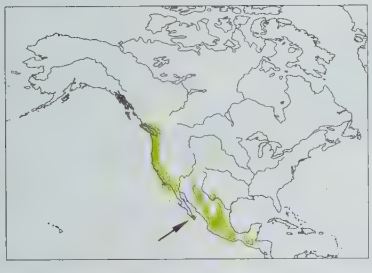
Natural Reserve, in S Colombia (Nariño), being an example; in Ecuador, may be present in the Cotacachi-Cayapas Ecological Reserve.
Bibliography. Anon. (2009a), Butchart & Stattersfield (2004), Jahn *et al.* (2007), Salaman (1996), Salaman & Stiles (1996), Stattersfield & Capper (2000).

28. Hutton's Vireo

Vireo huttoni

French: Viréo de Hutton **German**: Huttonvireo **Spanish**: Vireo de Hutton

Taxonomy. *Vireo huttoni* Cassin, 1851, Monterey, California, USA.
May be most closely related to *V. carmioli*; more study needed. Very wide divergence between coastal nominate race and interior *stephensi*, indicating effective genetic separation of sufficiently long standing to raise the question of distinction at species level, further study required. Proposed race *insularis*, described from Victoria, on Vancouver I (British Columbia), in Canada, is synonymized with *obscurus*. Eleven subspecies recognized.
Subspecies and Distribution.
V. h. obscurus Anthony, 1891 – extreme SW Canada (SW British Columbia) S in W USA to NW California.
V. h. parkesi Rea, 1991 – NW California (S to Marin County).
V. h. sierrae Rea, 1991 – N & C Sierra Nevada, in E California.
V. h. huttoni Cassin, 1851 – W California from Monterey S along coast to Santa Barbara County, also Santa Rosa I and Santa Cruz I.
V. h. unitti Rea, 1991 – Santa Catalina I (SW California).
V. h. cognatus Ridgway, 1903 – S Baja California, in W Mexico.
V. h. stephensi Brewster, 1882 – SW USA (C & E Arizona, SW New Mexico) S in Sierra Madre to Zacatecas, in C Mexico.
V. h. carolinae H. W. Brandt, 1938 – S USA (SW Texas) and E Mexico (S to SC Zacatecas and NW Hidalgo).
V. h. pacificus A. R. Phillips, 1966 – SW Mexico (Nayarit S to SW Jalisco).
V. h. mexicanus Ridgway, 1903 – S Mexico (C & SW México S to N Oaxaca).
V. h. vulcani Griscom, 1930 – SW Guatemala.
Birds of uncertain race in Chiapas (S Mexico) and adjacent W Guatemala possibly belong to *mexicanus*.



Descriptive notes. 13 cm; 9–15·1 g. Nominate race has lores and eyering pale grey-white (pale "spectacles" on face); otherwise dull grey-brown above, slightly paler on lower back and rump; upperwing darker grey-brown, tertials with off-white edges, greater and lesser upperwing-coverts with dull yellowish-white edges (two bars on closed wing); dull pale grey-brown below, becoming paler on lower belly and vent; iris brown; bill horn-coloured to blackish above, paler below (especially at base); legs sky-blue or grey, soles greyish. Sexes alike, female apparently tending to be heavier than male. Juvenile has upperparts paler and washed brownish, wingbars buffy. Race *obscurus* is relatively rich bright greenish-olive above, head and nape same colour as back, flanks washed olive-buff, wingbars and eyering yellowish; *parkesi* is like previous, but upperparts more yellowish, less greenish-olive, rump brighter greenish-yellow, contrasting with back; *unitti* is generally dark, deep olive, below, chest and flanks washed olive-grey with little greenish or yellowish; *sierrae* is generally paler and whiter below than adjacent races, lacks dusky wash on flanks, has crown and nape feathers tipped pale greyish; *cognatus* is paler, less greenish-olive, above than nominate, chest clear buffy yellow (rather than dusky yellowish); *stephensi* resembles last, but larger, darker below, chest concolorous with rest of underparts; *carolinae* is similar to preceding race, but darker or greener-tinged olive above, especially on crown and nape; *pacificus* is generally dark, olive-tinged above, with yellowish suffusions on rump, wing edgings and side of head; *mexicanus* is still darker than previous, with chest distinctly darker than belly; *vulcani* is similar to last but richer in colour, with more greenish on crown. Voice. Sings through much of year, with peak early Feb to mid-Apr. Much variation among individuals and races, typical song a monotonous series of wheezy, nasal two-syllable phrases, repeated for prolonged period at rate of c. 1 per second; also a 2-note descending phrase, or a mixture of both song types. Call notes harsh and scolding, of one or two syllables.
Habitat. Evergreen forest with moderate to dense crown closure and understorey, tree species including Douglas fir (*Pseudotsuga menziesii*), spruce (*Picea*), hemlock (*Tsuga*), western red cedar (*Thuja plicata*) and redwood (*Sequoia sempervirens*); also mixed pine–oak (*Pinus–Quercus*) forest. Below 250 m in British Columbia, to 1800 m in California, and mostly 1200–3500 m in Mexico. Largest populations found in stands of evergreen oaks.
Food and Feeding. Food predominantly arthropods, including bugs (Hemiptera), butterflies and moths (Lepidoptera), beetles (Coleoptera) and spiders (Araneae). Some vegetable matter, e.g. fruit of elderberry (*Sambucus*), poison oak (*Toxicodendron diversilobium*) and others; has been seen to drink fresh sap from holes created by sapsuckers (*Sphyrapicus*). Forages mostly in middle or upper levels of canopy, taking most prey items from leaf surfaces in a slow, methodical manner; sometimes hovers while gleaning, or hawks for aerial prey. In winter, often joined in mixed flocks with other species such as kinglets (*Regulus*) or chickadees (*Poecile*).
Breeding. Nesting begins early, in first week Feb in California, later farther N; generally single-brooded, although some evidence of occasional second broods. Nest built by both sexes, a globular open cup made with fibrous lichens, mosses, plant down, fine grass, feathers and the like, woven together with spider silk, lined with fine grass and hair or finely shredded grass, suspended by its rim 0·9–13·7 m (mean 4·9 m) above ground between twigs in horizontal fork in tree, e.g. live oak, Douglas fir, Arizona sycamore (*Platanus wrightii*) or other. Clutch 1–5 eggs, typically 4, white, sparingly spotted with brown or reddish-brown; incubation by both sexes, begins in earnest when clutch about half-complete, period 14–16 days; chicks fed by both parents, initially by regurgitation of a paste (of unidentifiable prey), after about second day whole prey delivered, and by day c. 5–6 regurgitation ceases in favour of whole items; parents swallow chicks' faeces for first five days, thereafter carry them away; nestling period c. 15 days; fledged young fed by adults for up to 21 days after departure from nest. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*), typically to a much lesser extent than some other vireo species.
Movements. Generally regarded as non-migratory, but some obvious movements do occur; although present in most habitats throughout year, it does occur away from these, e.g. in Arizona found in winter in lower Colorado Valley. In Oregon, some evidence for post-breeding altitudinal movement. Populations in mountains of S Mexico and Guatemala probably truly sedentary.
Status and Conservation. Not globally threatened. Frequently common or abundant in suitable habitats. One estimate in California of 15·6 breeding pairs/40 ha. Breeding Bird Surveys indicate some increases in numbers, and some local declines; latter possibly associated with higher than normal cowbird parasitism, although well-concealed nests of this vireo and its early nesting season may usually help to protect it against such parasitism. Wholesale degradation of habitat detrimental, but modest disturbance, provided that basic tree cover is untouched, may be beneficial, at least in winter.
Bibliography. Allen (1930), Baicich & Harrison (2005), Barlow *et al.* (1970), Bent (1950), Chapin (1925), Cicero & Johnson (1992), Davis (1995), Miller (1953), Miller *et al.* (1957), Phillips *et al.* (1964), Pyle (1997), Van Fleet (1919), Willard (1908).

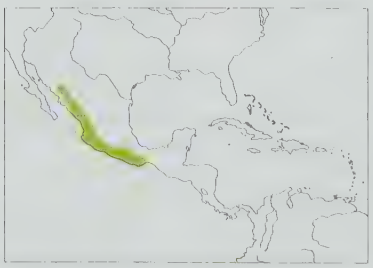


29. **Golden Vireo**

Vireo hypochryseus

French: Viréo doré **German**: Goldbauchvireo **Spanish**: Vireo Dorado

Taxonomy. *Vireo hypochryseus* P. L. Sclater, 1863, Mexico.
Three subspecies recognized.
Subspecies and Distribution.
V. h. nitidus van Rossem, 1934 – S Sonora, in NW Mexico.
V. h. hypochryseus P. L. Sclater, 1863 – W Mexico from Sinaloa S to Oaxaca.
V. h. sordidus Nelson, 1898 – Tres Marias Is, off Nayarit (W Mexico).
Descriptive notes. 12–13 cm; 8·5–14·1 g. Nominate race has forehead and crown greyish-brown, tinged with yellow, nape with stronger yellowish tinge; dull yellow supercilium becoming bright yellow behind eye, yellow ear-coverts mottled brownish-green; upperparts dark olive-brown with yellowish tinge; flight-feathers darker, primaries and secondaries narrowly edged dull yellow on outer webs; chin, throat, chest and belly dark lemon-yellow, darker and obscurely mottled on flanks; iris deep red-brown; bill dark greyish-horn above, paler below; legs dark brownish to grey. Sexes alike. Juvenile has crown and upperparts washed brown, underparts paler than adult. Race *nitidus* is brighter yellow than nominate; *sordidus* is duller, less yellowish, above, sides and flanks dull greenish, tail and tarsus longer than previous. Voice. Song loud, a series of repeated "chu-chu-chu-chu" notes, or a rolling clear series of 3 notes followed by higher-pitched one, "weer-weer-weer-peck"; also a quiet, scratchy warble. Calls include accelerating nasal scolding.



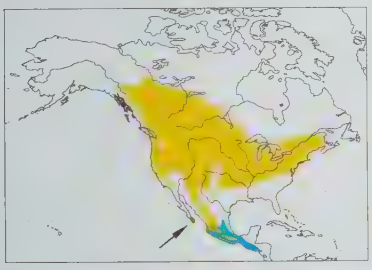
Habitat. Arid to semi-humid scrub, thorn-forest, brushy canyons, woodland, forest edge, streamside groves and plantations; sea-level to 1900 m.
Food and Feeding. No data on diet. May associate with other species in mixed feeding flocks.
Breeding. Nest under construction 2nd Jul, nest with slightly incubated eggs 10th Jul, and adults with enlarged gonads 12th Jul and 12th Aug; season probably Jun–Aug. Only one nest described, located c. 6 m up in outer branches of cazahuate tree (*Ipomoea arborescens*); no further details. Clutch 3 eggs, white with reddish streaks and dots around blunt end (more heavily marked than most vireo eggs). No other information.
Movements. Resident, with some evidence of local movement; has been observed only in May in Sonora (in N of range), and only in summer in Colima (in C area).
Status and Conservation. Not globally threatened. Common or fairly common over much of its range. Relatively poorly known.
Bibliography. Edwards (1972), Gaviño de la Torre & Cruz-Galindo (1984), Howell & Webb (1995), Mountjoy & Leger (2001), Peterson & Chalif (1973), Rowley (1962), Russell & Monson (1998).

30. Warbling Vireo

Vireo gilvus

French: Viréo mélodieux **German**: Sängervireo **Spanish**: Vireo Gorjeador
Other common names: Eastern Warbling Vireo (*gilvus*); Western Warbling Vireo (*swainsoni*, *brewsteri*, *victoriae*, *sympatricus*)

Taxonomy. *Muscicapa gilva* Vieillot, 1808, New York State, USA.
Sometimes placed in a separate genus, *Melodivireo*. May form a superspecies with *V. leucophrys*, and often considered conspecific, but the two differ in plumage and some vocalizations. Nominate race has been treated as representing a single monotypic species, the other four races together forming a separate species, on basis of an alleged degree of reproductive isolation of the two taxa in overlap zone in S Canada (Alberta); further study required. Proposed race *leucopolius*, described from W USA (Warner Mts, in SE Oregon), considered synonymous with *swainsoni*; *petrorus* (from Wyoming, in USA) and *connectens* (from Chilpancingo, in Guerrero, in SW Mexico) both subsumed in *brewsteri*. Five subspecies recognized.
Subspecies and Distribution.
V. g. swainsoni S. F. Baird, 1858 – breeds from SE Alaska and W Canada (S from S Yukon, SW Mackenzie region and W Alberta) S in W USA (E to N Montana) to SW California; migrates to W & S Mexico, Guatemala, Honduras and W Nicaragua.
V. g. brewsteri (Ridgway, 1903) – breeds Rocky Mts from SW Montana and S Idaho S through SW Texas to W Mexico (S to SC Oaxaca); winters in Mexico.
V. g. victoriae Sibley, 1940 – breeds Cape region of Baja California (W Mexico); wintering area unknown.
V. g. sympatricus (A. R. Phillips, 1991) – C Mexico (N & EC Puebla).
V. g. gilvus (Vieillot, 1808) – breeds S Canada (C Alberta E to extreme SW Ontario and New Brunswick) and USA (E from N Montana, S to S Oklahoma, Louisiana and Virginia); migrates to Central America.



Descriptive notes. 12·5–14 cm; 11–18·4 g (nominate), 9·9–15·8 g (*swainsoni*). Nominate race has forehead, crown and nape medium grey, supercilium greyish-white, contrasting with crown and with greyish lores and ear-coverts; upperparts medium grey with faint greenish tinge, becoming more strongly greenish towards rump; primaries and secondaries blackish-grey, outer webs edged grey-brown, greater and median upperwing-coverts very obscurely edged dull whitish-grey; chin and throat off-white, chest off-white with yellowish tinge, side of chest darker greyish and flanks with yellowish tinge; lower belly and vent whitish, tinged yellowish at sides; iris dark brown; bill grey to blackish-brown, paler on cutting edges and at base of lower mandible; legs blue-grey. Sexes alike. Juvenile has brown upperparts, cinnamon-buff tips of greater coverts, and white underparts. Races differ mainly in size, in brightness of coloration and in bill size, nominate generally larger, brighter and thicker-billed than others: *swainsoni* is smaller than nominate, with less deep bill, dull olive-grey crown and back without any greenish tinge; *brewsteri* is duller and less olivaceous than previous, has dull grey crown contrasting with greyish-olive back, flanks washed greyish-olive; *victoriae* has bill broader at base and deeper than that of last two, forehead paler and less greyish, flanks duller and darker than nominate, cheeks and lores buffy brownish; *sympatricus* has crown browner and contrasting with back. Voice. Song a set of continuous spirited warbling notes lasting for 2·5–3 seconds, often ending on higher note, somewhat reminiscent of song of Purple Finch (*Carpodacus purpureus*) but with less pure notes, and with characteristic buzzy tone, quite unlike that of any sympatric vireo of E North America; song of W race *swainsoni* said to differ somewhat from that of nominate, being "less musical with higher tones and a break near beginning". Both sexes sing. A very persistent songster; incubating male will sing from nest, and the species sings during migration. Large variety of other calls; a dozen different types identified, e.g. a nasal "eeah", probably as contact between pair-members, a harsher version of the same, apparently aggressive, and a twitter, which may indicate alarm or aggression.
Habitat. On breeding grounds a wide variety of deciduous woodland, both in interior and at forest edge; often found in stands of mature trees bordering agricultural fields and along roadsides, including low-density suburban situations with numerous large trees, and old orchards; sometimes in mixed deciduous–coniferous stands; sea-level to 3200 m in W North America, mainly 900–2500 m in Mexico. In non-breeding range occurs in various wooded habitats, scrub and plantations.
Food and Feeding. Analysis of stomach contents (Apr–Oct) indicates that great majority (97%) of food consists of arthropods, including spiders (Araneae), butterflies and moths (Lepidoptera), especially caterpillars when available, beetles (Coleoptera), bugs (Hemiptera) and similar; vegetable matter a minor component, most taken in autumn, includes fruit of elder (*Sambucus*), poison oak (*Toxicodendron*). Few data on winter diet; by analogy with other vireonids, may include more vegetable matter. Forages predominantly in higher levels of trees, especially in canopy, but also lower down. Gleans from leaf surfaces (especially) and twigs, also obtains large proportion of prey by hovering and picking; catches aerial prey to much lesser extent. On breeding grounds feeds alone or in pairs; in wintering areas habitually follows mixed flocks.
Breeding. First egg dates typically in late May or early Jun in NE USA; laying late Apr to late Jul in California (mostly late May to mid-Jun), mid-May to mid-Jul in Montana, early May to mid-Jul in British Columbia (mostly middle to late Jun); E populations single-brooded, double-brooding probably common among W races. Pairs form rapidly on arrival on territory, and some evidence that mated pairs may at times travel together. Nest-site selected by female; nest-building starts 2–7 days after pair formation, takes 6–7 days, most of the work done by female; nest a rounded cup built from dry grasses, lichen, horsehair, bark and similar, bound with spider web, lined with fine grasses, rootlets and feathers, exterior often decorated with birch (*Betula*) bark, spider silk and cocoons (some material from other nest may be reused, or material even pilfered from nests of other species), suspended by rim in lateral fork at height of 1·1–37 m (average 6–7 m in Ontario), usually in peripheral branches of (most frequently) deciduous tree or shrub. Clutch 1–5 eggs, usually 3 or 4, in Montana (race *swainsoni*) average for unparasitized nests 3·8, white, sparsely spotted with dark brown, reddish or black; incubation by both sexes, more by female than by male, and only by female at night, period 10·5–16 days (mean 12·5 days); chicks fed and nest cleaned by both sexes; nestling period 10·5–19 days (average 14 days in Montana, Idaho and Arizona). Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*). Breeding success variable: if a cowbird egg is accepted, typically no young vireos are raised, or success rate is drastically lowered; E populations (nominate race) frequently reject cowbird eggs by puncturing or ejecting them, whereas W race *swainsoni* appears not to do this and suffers higher rate of parasitism.
Movements. Highly migratory over much of range. Canada and USA completely vacated after breeding season. Nominate race winters in S Mexico (S of Isthmus of Tehuantepec) S to Nicaragua, and *swainsoni* in W Mexico S to Nicaragua; these two taxa differ in moult strategy, moult of primaries of nominate being rapid (38 days) and occurring before autumn migration, that of *swainsoni* being more protracted (55 days) and taking place after most or all of migration complete. Race *brewsteri* winters in Mexico. In S Mexico, *sympatricus* apparently resident in mountains of Puebla. Non-breeding range of *victoriae*, which breeds in Cape region of S Baja California, is not known. In E North America, returning migrants appear on US Gulf Coast in first half Apr, arriving in S Canada (Ontario) typically c. 10th May. In autumn a fairly early migrant, most having left Ontario by end of first week of Sept; migrants in autumn probably follow the land route via Mexico, rather than making direct cross-Caribbean flights. Vagrant in Bermuda.
Status and Conservation. Not globally threatened. Common over much of range. Breeding Bird Surveys for North America as a whole over years 1966–2005 show a statistically significant increase of 1% per annum in the numbers of this species; for Canada the equivalent figure is 1·5%, and for Ontario alone 4%. Migration-monitoring at Long Point Bird Observatory (Ontario) from 1960 to 2007 also reveals significant increases on both spring and autumn migrations. E populations adapt well to modified habitats provided that adequate cover in the form of large trees or bushes remains. In some local situations, has disappeared as a result of habitat destruction, primarily removal of cottonwood trees (*Populus*) from riparian habitat, e.g. has gone from two counties in Arizona; further, greater incidence of parasitism by increased Brown-headed Cowbird populations may have significant adverse effect. Since area of wintering habitat is much less than that of breeding habitat, changes in Mexico and Central America have a greater potential impact on populations than does equivalent habitat destruction farther N.
Bibliography. Baicich & Harrison (2005), Bent (1950), Chapin (1925), Dunham (1964), Gardali *et al.* (2000), Howes-Jones (1984, 1985a, 1985b, 1985c), Howes-Jones & Barlow (1988), Johnson, N.K. *et al.* (1988), Mountjoy & Leger (2001), Ortega & Ortega (2003), Peck & James (1987), Phillips (1991), Phillips *et al.* (1964), Purcell (2006, 2007), Pyle (1997), Ralph (1971), Rust (1920), Sealy *et al.* (2000), Sibley (1940), Sibley & Monroe (1990), Smith, J.I. *et al.* (2004, 2006), Sutton (1948), Underwood & Sealy (2006), Voelker & Rohwer (1998), Walsberg (1981), Zimmer (1941).

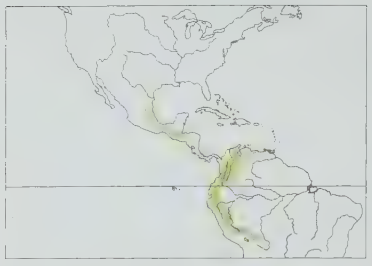
31. Brown-capped Vireo

Vireo leucophrys

French: Viréo à calotte brune **German**: Braunkappenvireo **Spanish**: Vireo Coronipardo
Other common names: Mexican Brown-capped Vireo (N races *eleanorae*, *dubius*, *amauronotus*, *strenuus*, *bulli*, *palmeri*)

Taxonomy. *Hylophilus leucophrys* Lafresnaye, 1844, Colombia.
Sometimes placed in a separate genus, *Melodivireo*. May form a superspecies with *V. gilvus*, and often considered conspecific, but the two differ in plumage and some vocalizations. N races (*eleanorae*, *dubius*, *amauronotus*, *strenuus*, *bulli*, *palmeri*) have been treated as forming a separate species, distinct from that consisting of remaining races (in Costa Rica, Panama and South America). Proposed races *chiriquensis* (described from Boquete, at Volcán de Chiriquí, in Panama) and *disjunctus* (from Antioquia, in Colombia) both treated as synonyms of *dissors*. Thirteen subspecies recognized.
Subspecies and Distribution.
V. l. eleanorae Sutton & Burleigh, 1940 – NE Mexico (SW Tamaulipas S to N Hidalgo).
V. l. dubius (A. R. Phillips, 1991) – EC Mexico (near Ciudad Victoria, in Tamaulipas).
V. l. amauronotus Salvin & Godman, 1881 – SE Mexico (NE Puebla E to WC Veracruz).
V. l. strenuus Nelson, 1900 – S Mexico (N Chiapas).
V. l. bulli J. S. Rowley, 1968 – SW Mexico (SE Oaxaca).
V. l. palmeri (A. R. Phillips, 1991) – mountains of Honduras, possibly also N El Salvador.
V. l. costaricensis (Ridgway, 1903) – C Costa Rica (Cordillera de Tilarán).
V. l. dissors J. T. Zimmer, 1941 – S Costa Rica, W & E Panama, and NW Colombia (W & C Andes, S on W slope to W Nariño).
V. l. mirandae E. J. O. Hartert, 1917 – N Colombia (Santa Marta Mts) and NW Venezuela (Zulia, and Táchira E to Sucre).
V. l. josephae P. L. Sclater, 1859 – SW Colombia (C Andes in Nariño) and W Ecuador.
V. l. leucophrys (Lafresnaye, 1844) – E Andes from Colombia S to C Peru.
V. l. maranonicus J. T. Zimmer, 1941 – N Peru (both slopes of W Andes, W of R Marañón).
V. l. laetissimus (Todd, 1924) – SE Peru and N Bolivia (La Paz and Cochabamba).
Descriptive notes. 11·5–12·5 cm; 11·3–13·4 g. Nominate race has crown dull chestnut-brown, area above lores grey-white, supercilium off-white, ear-coverts dull light brown with whitish central crescent; upperparts olive-brown, rump dull olive; primaries and secondaries dull grey-brownish, outer webs with greenish edgings (giving greenish colour to closed wing); rectrices dull greenish-brown; throat greyish with paler streaks, chest and belly lemon-yellow, flanks yellowish with obscure darker streaks; iris dark brown; bill brownish, paler below; legs bluish or blue-grey. Sexes

On following pages: 32. Philadelphia Vireo (*Vireo philadelphicus*); 33. Red-eyed Vireo (*Vireo olivaceus*); 34. Noronha Vireo (*Vireo gracilirostris*); 35. Yellow-green Vireo (*Vireo flavoviridis*); 36. Black-whiskered Vireo (*Vireo altiloquus*); 37. Yucatan Vireo (*Vireo magister*).



alike. Juvenile has supercilium less obvious than adult's, back buffy brown, and yellowish or cinnamon edgings on greater and median upperwing-coverts. Race *eleanorae* is strongly rufescent brown dorsally; *dubius* is paler and duller above than previous; *amauronotus* is deeper brown above than preceding two; *strenuus* is similar to last but darker on upperparts, with warmer, less sooty, back, and is perhaps a little smaller; *bulli* resembles previous but is darker and sootier, less rufescent, above, crissum paler yellow, and is possibly larger; *palmeri* is brighter and less uniform than preceding races, has back bright greenish citrine-drab, contrasting with crown (which paler and less rufescent than that of *strenuus*), and carpal joint and underwing-coverts tinged with yellow; *costaricensis* has underparts distinctly pale yellow, rump more yellowish-olive, crown paler and more brownish; *dissors* differs from nominate in having darker, more greyish (less warm brown) cap, with back more green-tinged olive (less brown); *mirandae* has more white on throat than nominate, with pale back, rump and uppertail-coverts, and paler, more sulphur-yellow breast, abdomen and vent; *josephae* is similar to previous, but darker above and below, with dark olive back and darker cap; *maranonicus* resembles last, but top of head less dark, yellow of underparts deeper, white on throat more restricted in extent and slightly yellowish, differs from nominate in having back more greenish (less brown) and cap darker and more drab (less brownish); *laetissimus* has cap lighter and contrasting less with back than on nominate, back more greenish, less brown, and underparts paler yellow. Voice. Song a continuous series of warbling notes, similar to that of *V. gilvus* but (at least in Panama) shorter and less varied, the individual phrases lasting 3–3·5 seconds, with pauses of 3–5 seconds between repetitions; in Mexico, phrases seem to be still shorter, c. 1·5–2·5 seconds. Calls include sibilant "pisss" and nasal, upslurred "rreik".

Habitat. Humid forests, including tall second growth, shade coffee plantations, montane woodland and similar, from 1200 m upwards to c. 2600 m; locally somewhat lower, some low-altitude records perhaps referable to post-breeding wandering.

Food and Feeding. Food includes insects and caterpillars, also some fleshy-coated seeds. Forages in canopy and outer branches of trees, sometimes hanging upside-down to probe into leaf tangles. Usually singly or in pairs, but often in association with other species in mixed flocks.

Breeding. Two nests with young in, respectively, mid-Jun and early Aug in Ecuador; birds in breeding condition Mar–Jul in Colombia; probably breeds Mar–Jul in Costa Rica. Only two nests described (both in Pichincha Province, in Ecuador, at altitude of 1850 m), both of typical vireo construction, a compact cup made from dead plant fibres, outer layer consisting mostly of long strands of green moss and some hair, held together with hair and spider silk, suspended in fork (attached to twigs of fork by green moss and spider silk) c. 8 m above ground near end of long, nearly horizontal branch; each contained two nestlings, fed by both parents. No other information.

Movements. Largely sedentary; possibly some post-breeding dispersal to lower altitudes.

Status and Conservation. Not globally threatened. Common over much of its range. Some races (e.g. *strenuus*) have suffered significant reduction in amount of available habitat as a result of deforestation.

Bibliography. Gelis & García (2009), Hamilton (1962), Hilty (2003), Hilty & Brown (1986), Howell & Webb (1995), Mountjoy & Leger (2001), Olson *et al.* (1981), Phillips (1991), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Stiles & Skutch (1989), Wetmore (1962).

32. Philadelphia Vireo

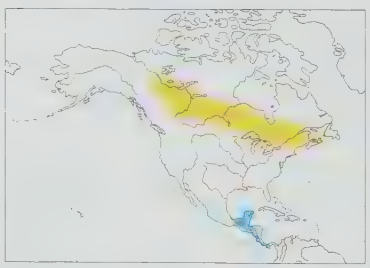
Vireo philadelphicus

French: Viréo de Philadelphie **German**: Schlichtvireo **Spanish**: Vireo de Filadelfia

Taxonomy. *Vireosylvia* [sic] *philadelphica* Cassin, 1851, Bingham's woods, near Philadelphia, Pennsylvania, USA.

Sometimes placed in a separate genus, *Melodivireo*. Most closely related to *V. gilvus*. One report of hybridization with *V. olivaceus* in SE Canada (Quebec). Monotypic.

Distribution. Breeds S Canada (from Alberta and extreme E British Columbia E to SE Quebec and New Brunswick, possibly also Nova Scotia), S in N USA to N North Dakota, N Minnesota, N Michigan, N New York and Maine. Migrates to Central America (extreme S Mexico, in Chiapas and Yucatán, S to C Panama).



Descriptive notes. 11·5–13 cm; 9·8–16·1 g. Crown grey-olive, diffuse supercilium pale grey-white (more obvious behind eye than in front), lores and area behind eye dusky grey, ear-coverts grey-brown; nape and upperparts more olive, less grey, than crown; primaries and secondaries dull grey-brown, greyish-olive edgings on outer webs; rectrices dull grey-brown; chin whitish, throat pale yellow, becoming stronger yellow on chest, with belly and undertail-coverts yellowish-white, somewhat yellower on vent, becoming greyish-yellow on flanks; considerable variation in amount of yellow throughout; iris deep, dark hazel-brown; bill dark grey, paler base of lower mandible; legs blue-grey. Sexes alike. Juvenile is generally more drab than adult, with brownish wash on upperparts and more distinct pale edgings on greater and median upperwing-coverts. Voice. Only male sings; sings also from nest, and during spring migration, but not on wintering grounds. Five types of song, each used in a particular context. The "non-repetitious song" consists of short, variable phrases of c. 0·5 seconds, with pauses of 1–2 seconds in between, very similar to song of *V. olivaceus* but delivered more slowly; this song used when *V. olivaceus* not present or in adjacent territory. The "fast-mixed song" similar, but phrases repeated more rapidly; used during establishment of territory or in response to nearby songs of conspecifics. In "slow-mixed song", phrases repeated several times, but more slowly, with raspy quality; typically delivered from perch high in canopy. The "repetitious song" consists of a single phrase repeated identically many times. The "bubble song", consisting of a 2-second rising and then falling series of short bubbling notes, is used during intense aggressive encounters. Also, imitates song of *V. olivaceus* and able to distinguish between its own songs and those of its larger relative (latter apparently cannot do so); this mimicry maintains interspecific territorial integrity. Calls include "ehz", used aggressively and as contact.

Habitat. Early and middle stages of successional deciduous woodland with such broadleaf trees as aspen (*Populus*), alder (*Fraxinus*) and birch (*Betula*), among others; also in mixed coniferous–deciduous woodland. Found in older regenerating logged or burnt areas, streamside thickets and similar; generally not in mature climax forest, nor in gardens. On non-breeding grounds occurs in light woodland and forest edge, including coffee plantations and gardens, from sea-level to 1650 m, rarely to 2130 m. On migration found in second growth, thickets and riparian shrubbery.

Food and Feeding. Food predominantly (c. 93%) arthropods, including in particular larval and adult moths and butterflies (Lepidoptera), beetles (Coleoptera), especially weevils (Curculionidae), flies (Diptera) and spiders (Araneae), among others. In summer only a small amount of vegetable matter; on wintering grounds in Costa Rica, diet includes small berries and arillate seeds rich in oil. Forages mostly in upper levels of forest; during fledging period, parents expand foraging ranges into lower levels of forest. Gleans prey from leaf (mostly) or bark surfaces while perched or sometimes while fluttering. On wintering grounds, frequently found in mixed flocks with such species as Tennessee Warbler (*Vermivora peregrina*).

Breeding. Season mainly May/Jun–Aug; nest construction observed mostly 28th May to 29th Jun, sometimes to early Jul, in Ontario; single-brooded, but possibly two broods reared during caterpillar plagues. Monogamous. Pair formed soon after arrival on territory. Nest-site selected by female; nest built mostly by female, taking c. 6 days for completion, a cup made from grass, bark strips, spider webs, with birch bark, seed tufts, sometimes a few feathers and similar soft material, lined with dry pine (*Pinus*) needles, suspended by its rim in lateral fork of branch 7·5–20 m (average 15·3 m) above ground in tree. Clutch 2–5 eggs, usually 4, white, spotted (especially near blunt end) with dark brown or black; incubation by both sexes, beginning soon after laying of first egg (hatching asynchrony of up to 2 days), period 11–13 days; chicks fed by both sexes, leave nest at c. 14 days; young cared for by parents for up to 24 days after fledging, parents protect fledglings from aggressive attacks by *V. olivaceus*. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*), e.g. 136 out of 354 nests in Ontario study, but does not continue to feed young cowbird after fledging. Breeding success enhanced by caterpillar plagues, when higher average number of fledglings reared.

Movements. Wholly migratory; entire population moves to Central America after breeding. Nocturnal migrant. Departs from breeding areas late Aug to early Sept, occasional individuals as late as Nov in Ontario, passage in S USA (Texas) from late Aug to Oct, arrival in Panama by early Oct; populations at W extremity of breeding range presumably initially move in E direction, as the species is a scarce autumn vagrant in California and other W states. Leaves wintering area in Panama middle to late Apr, arriving in Texas from late Apr to mid-May; last migrants may not reach N areas of breeding range until early Jun. Regular but scarce vagrant in Bermuda; four Oct records in W Palearctic, of which two in SW Ireland, one in Britain (Is of Scilly) and one in Azores (Corvo).

Status and Conservation. Not globally threatened. Common. In Canada, there has been a steady increase in population as determined by Breeding Bird Survey; in S Ontario, a modest increase in area occupied probably associated with increase of poplar (*Populus*) plantations; studies at Long Point Bird Observatory, on L Erie, reveal steady and significant increase during period 1960–2008. As successional forest, rather than climax forest, is this species' preferred breeding habit, it may benefit from some human activities. Greatest potential threat undoubtedly destruction of habitat on wintering grounds, since extent of these is only 15% of that of the breeding area.

Bibliography. Alfrey (2005), Baicich & Harrison (2005), Barlow & Rice (1977), Bent (1950), Curry (2006), Downes & Collins (2007), Hamilton (1962), Howell & Webb (1995), Johnson, N.K. *et al.* (1988), Mills (2006), Moskoff & Robinson (1996), Murray *et al.* (1994), Pyle (1997), Rice (1976, 1978a, 1978b), Robinson (1981), Stiles & Skutch (1989), Wetmore *et al.* (1984).

33. Red-eyed Vireo

Vireo olivaceus

French: Viréo aux yeux rouges **German**: Rotaugenvireo **Spanish**: Vireo Chivi
Other common names: Chivi Vireo (South American races)

Taxonomy. *Muscicapa olivacea* Linnaeus, 1766, North America = (South) Carolina, USA.

Probably forms a superspecies with *V. gracilirostris*, *V. flavoviridis*, *V. altiloquus* and *V. magister*. Often treated as conspecific with *V. gracilirostris*, but latter appears distinct; sometimes regarded as conspecific with *V. flavoviridis*, but biochemical studies coupled with morphological and vocal differences strongly indicate that the two are distinct species. Neotropical races treated by some authors as representing a distinct species, under name of "*V. chivi*", although this apparently diverged from nominate only c. 370,000 years ago (whereas *V. flavoviridis* and present species diverged from each other c. 4·6 million years ago); it is hypothesized that the "*chivi* group" of races arose from wintering individuals of nominate race from North America that failed to migrate back N in spring, and in a situation where migration is largely unnecessary, and consequent gene-pool mixing of different populations is reduced, further subspeciation of Neotropical populations is likely. Additional work required on some resident South American races, which appear to have distinct vocalizations, before the matter can be resolved. One report of hybridization with *V. philadelphicus* in SE Canada (Quebec). Ten subspecies recognized.

Subspecies and Distribution.

V. o. olivaceus (Linnaeus, 1766) – breeds Canada (except NW & N) and NW, C & E USA; migrates to N South America.

V. o. caucae (Chapman, 1912) – W Colombia (Pacific coast at Juradó, W slope of W Andes, and valleys of upper R Patía and upper R Cauca).

V. o. vividior Hellmayr & Seilern, 1913 – Colombia (S to Meta), Venezuela, the Guianas, extreme N Brazil, and Trinidad.

V. o. tobagensis Hellmayr, 1935 – Tobago.

V. o. griseobarbatus (Berlepsch & Taczanowski, 1884) – W Ecuador and NW Peru.

V. o. pectoralis J. T. Zimmer, 1941 – N Peru (middle Marañón Valley).

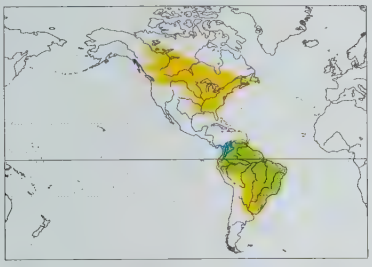
V. o. solimoensis Todd, 1931 – E Ecuador, NE Peru, and W Brazil (E to lower R Negro, S to upper R Juruá and R Purús).

V. o. chivi (Vieillot, 1817) – C Peru, WC Brazil, E Bolivia, W Paraguay, and NE Argentina (S to San Luis, Córdoba, Santa Fe and N Buenos Aires); non-breeding E Colombia, S Venezuela and NC Brazil (S of R Amazon).

V. o. agilis (M. H. C. Lichtenstein, 1823) – E Brazil (E from near Faro on N bank of R Amazon and, on S bank, from R Madeira) S to Rio de Janeiro.

V. o. diversus J. T. Zimmer, 1941 – E Paraguay, SE Brazil and Uruguay.

Descriptive notes. 13·8–15·6 cm; 12–25·1 g. Nominate race has crown grey with darker grey edges, long supercilium extending above ear-coverts off-white, lores dull grey, area under eye diffuse pale greyish, ear-coverts greenish-grey; nape and upperparts dull greenish; primaries and secondaries dull dark greyish-brown, contrasting olive-green edges on outer webs; greater and median upperwing-coverts dull greyish, edged olive-green; rectrices dull greenish-grey, brighter



greenish edgings on outer webs of outer feathers; throat, chest and belly greyish-white, side of chest greenish-grey, greenish tinge on lower flanks and vent; iris deep red; bill olivaceous black or blackish-horn above, paler below; legs blue or blue-grey. Sexes alike. Juvenile has iris brown or grey-brown, upperparts tinged brownish, greater and median coverts with indistinct brownish-green tips. Race *chivi* has more rounded wing than nominate, iris usually brown with at most a slight reddish tinge (never bright ruby-red), generally duller overall; *caucae* is darker than previous, with ear-coverts more grey; *griseobarbatus* has back brighter yellowish-green, dark lines bordering crown quite prominent; *pectoralis* is similar to last but larger, with throat and breast noticeably tinged greyish-buff (rather sharply demarcated from white middle belly), ear-coverts duller greyish-olive, flanks less brightly greenish-yellow, undertail-coverts deeper yellow, back darker and duller green; *solimoensis* is small, generally bright yellow below (including on crissum), grey of crown extends over hindneck; *vividior* is bright, often yellowish-green, on back, has crown moderately light grey, supercilium broad and whitish and separated from crown by broad blackish stripe, bill relatively long; *tobagensis* is large, with relatively heavy bill, lateral crownstripe heavy and blackish, back darker, undertail-coverts pale; *agilis* is more brightly coloured than *chivi*, with crown clearer lighter grey, supercilium whiter, dark lateral crownstripes prominent, side of breast, flanks and crissum clearer and brighter yellow, edgings of primaries, secondaries and rectrices brighter and more yellow; *diversus* is similar to previous, but darker and duller above, back with brownish tinge, top of head mouse-grey (instead of neutral grey), supercilium buff (not white), ear-coverts duller, buffy olive (not greenish), differs from *chivi* in greener upperparts, flanks and sides, more yellowish crissum. VOICE. Most studies done with nominate race; often only anecdotal data on other populations. Song of nominate, by male only, a characteristic series of phrases containing several notes, with upward, downward or constant pitch, lasting less than 0·5 seconds, interspersed with longer pauses of up to 2 seconds or more; rate of singing varies with circumstances, accelerates during disputes; numerous song types identified, individual males having large vocabulary, with phrases used singly or in combination. Song extremely persistent and frequently continues throughout heat of day; sings on migration, but less persistently than when on territory; N populations appear not to sing on wintering grounds. Some individuals may produce quite aberrant songs, not immediately recognizable as those of present species. Songs of resident South American races follow the usual vireo pattern of brief phrases interspersed by longer pauses, but phrases tend to be shorter and more simple (usually of 2 notes) than those of nominate, at least in Venezuela (race *vividior*); migratory populations in far S of range (*chivi*) have more complex song than that of resident races to N, with polysyllabic phrases similar to those of nominate; South American birds seem to be just as persistent and indefatigable singers in heat of day. Other vocalizations of North American nominate race include cat-like "myaah", used in aggressive encounters, various begging calls e.g. "tcher tcher" by female to solicit food from male, and greeting calls.

Habitat. On breeding grounds, nominate race favours areas of deciduous forest or mixed deciduous–coniferous forest; in coniferous areas, usually along streambeds where deciduous trees present. More abundant in forest interior than at edge, and usually requires substantial understorey, but does occur in substantially modified areas, such as parks or cemeteries, so long as large trees present. At N edge of range in Canada found in groves of aspen (*Populus*) and alder (*Alnus*). On migration uses wider variety of habitats, but usually still deciduous-dominated; on wintering grounds various forest types, including rainforest, mangrove swamps, *várzea*, dry forest and plantations, sparsely up to 3600 m. South American races occur in both wet and dry forests, forest edge and light woodland, from sea-level to c. 1500 m. Resident Neotropical populations frequently found in same habitats as boreal and austral migrants at relevant times of year.

Food and Feeding. In breeding season, food of N populations mostly (85%) animal, predominantly arthropods, especially caterpillars when abundant, flies (Diptera), cicadas (Cicadidae) and other bugs (Hemiptera), beetles (Coleoptera) and spiders (Araneae), more rarely also small snails (Gastropoda). Vegetable matter, which includes various fruits and fleshy seeds, forms greater proportion of diet later in season; on wintering grounds diet contains much higher proportion of vegetable matter. Young fledglings fed predominantly with caterpillars, dragonflies (Odonata) and spiders. Few data on diet of South American races; apparently mostly arthropods. Forages mostly in upper and middle levels of forest, more rarely in lower understorey, although preferred foraging level differs markedly between the sexes, males constantly higher than females, overlapping only 35% of time; in effect, males forage mostly near height of their singing perches, females more at level of nest. Catches most prey by hopping along branches, making short flights of a metre or so within canopy.

Breeding. Season mostly Apr/May–Aug in North America, with egg-laying late May to mid-Jul (replacement clutches as late as mid-Aug) in S Canada (Ontario); N populations single-brooded, but two broods in S Louisiana; few breeding data for South American populations, but two nests in E Brazil (Minas Gerais) early Oct and end Oct. Monogamous. In N range male arrives on territory 3–15 days before female, pair formation taking place rapidly after her appearance. Copulation occurs before, during and after nest-building, mostly after nest complete; female may solicit copulation by carrying nest material in bill. Female selects nest-site, she also builds nest, initially by attaching materials to narrow part of tree fork, using spider web as adhesives, although male may collect material or provide her with food during construction period; nest an open cup or basket mostly of plant fibres and bark strips, lined with fine grasses, pine (*Pinus*) needles, fibres and sometimes animal hair, exterior may be decorated with spider egg cases, lichens, wasp-nest paper and the like; structure attached by its rim in angle of horizontal fork, or between two twigs and a thicker branch, 0·4–19 m (usually 2·5–4·3 m) above ground in tree. Clutch 1–5 eggs, average 3·3 in Ontario, dull white, with irregular speckling of sepia concentrated towards blunt end; incubation by female alone, period 11–15 days (average 12·8 days in Ontario and Michigan); chicks fed by both sexes, more by female, nestling period 10–12 days; fledglings fed by parents for further 15 days, sometimes 25 days, after leaving nest. Little information on Neotropical populations: in Venezuela (race *vividior*) 2 eggs, white with blackish spots, in thin fibre cup suspended in fork, and in E Brazil (Minas Gerais) two nests 5 m and 7–8 m up, one contained 3 white eggs. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*) in N range, also by Bronzed Cowbird (*Molothrus aeneus*) in S USA, and by Shiny Cowbird (*Molothrus bonariensis*) in South America.

Movements. N populations (nominate race) wholly migratory, spending non-breeding season in South America from Colombia S to E Peru and into Amazonia, with passage through Central America and W Caribbean. Nocturnal migrant. Migrants start to leave South America by Mar and are largely gone by mid-Apr; arrives in quantity on North American mainland in mid-Apr in Florida and Louisiana, up to late May or early Jun in E Canada (Quebec); males reach breeding territories up to two weeks before females. In autumn, departure from N areas by late Aug to mid-Sept, with records on US Gulf Coast and Florida to mid-Oct; uncommon migrant in E Caribbean and Bermuda. Vagrant in autumn throughout E Atlantic seaboard, from Greenland, Iceland and British Is (over 100 records) S to Spain, Azores and NW & W Africa (Morocco and Gabon), and E to Netherlands, Germany, Poland and Malta. Most South American races resident; in far S of range, however, *chivi* and probably *diversus* are migratory, leaving breeding range (C Peru and S Brazil S to NE Argentina) to spend austral winter in Amazonia and S Venezuela. Vagrant in N Chile.

Status and Conservation. Not globally threatened. Abundant breeder throughout much of its North American range; widespread and common in South America. North American Breeding Bird Surveys over years 1966–2005 reveal a statistically significant annual increase of 1·2%; similar increases apparent in annual migration indices at Long Point Bird Observatory, in Ontario (Canada), for period 1960–2007.

Bibliography. Alström & Colston (1991), Barlow & Rice (1977), Bent (1950), Borror (1981), Brosset (1968), Buzzetti & Silva (2005), Cimprich *et al.* (2000), Dunford *et al.* (2002), Hilty (2003), Hudman & Chandler (2002), James (1976, 2007b), Jaramillo (2003), Kennedy *et al.* (1954), Lasecki & Sciborska (2001), Lawrence (1953a), Lennon (1971), Löhmus, Sandberg *et al.* (2003), Löhmus, Sundström *et al.* (2006), Marshall *et al.* (2002), Pierce, McWilliams, O'Connor *et al.* (2005), Pierce, McWilliams, Place & Huguenin (2004), Pyle (1997), Rice (1976, 1978a, 1981), Ridgely & Gwynne (1989), Van Roo *et al.* (2003), Siepielski *et al.* (2001), Williamson (1971), Zimmer (1941), Zwartjes (2003).

34. Noronha Vireo

Vireo gracilirostris

French: Viréo de Noronha **German**: Schmalschnabelvireo **Spanish**: Vireo de Noronha

Taxonomy. *Vireo gracilirostris* Sharpe, 1890, Fernando de Noronha, Brazil.

Probably forms a superspecies with *V. olivaceus*, *V. flavoviridis*, *V. altiloquus* and *V. magister*. Often treated as conspecific with first of those, but appears in many ways distinct. Monotypic.

Distribution. Island of Fernando de Noronha, off NE Brazil.



Descriptive notes. 14 cm; 11·5–25·1 g. Crown and upperparts dingy greyish-olive, becoming more greenish on lower back, rump and tail; brownish lores, buffy supercilium; primaries and secondaries edged greenish on outer webs; throat and underparts dull buffy whitish; iris brownish; bill brownish-horn above and at tip, paler below; legs light bluish-grey. Differs from *V. olivaceus* (of race *chivi*) in much duller coloration, brownish iris, noticeably longer and finer bill, distinctly longer tail, and decidedly more rounded wing with shorter primary extension. Sexes alike. Juvenile has crown, back and secondary coverts rich rusty brown. VOICE. Song a melodious "weet a weet, chewegoo, whit, whit". Calls include "tschrrr", used in alarm, a scolding harsh "skeeur" and a high thin whistle. Bill-snapping in agonistic situations.

Habitat. Forest and shrub, including fig trees (*Ficus*), gardens and second growth.

Food and Feeding. Food items identified in stomach contents include beetles (Coleoptera), Hymenoptera, Orthoptera, caddies flies (Trichoptera), probably also homopteran bugs. Some small fruits (Ulmaceae) taken. Forages widely, from treetops to ground level. Notably tame. In absence of competing passerine species, seems to have developed a wide variety of feeding techniques. More than other, closely related vireos, it hangs upside-down to glean from undersides of leaves and flowers; also hawks for aerial prey. Sometimes uses its foot to hold prey in order to dismember it.

Breeding. Appears to have protracted breeding season; on basis of gonadal data on specimens, nesting probably occurs in May or Jun, but other evidence suggests Sept or Oct; some adults attending fledged young at end Jul; no active nests described. Nest of typical vireo construction, built from partially macerated leaves, fibres, rootlets and spider webs, located in fork of branch, three nests were at respective heights of 2·5 m, 5 m and 6 m. Clutch reported by local inhabitants as 2–5 eggs, but higher number seems implausible in view of small clutch sizes of mainland relatives (as well as tendency of island populations to lay fewer eggs than those on mainland). No other information.

Movements. Sedentary; one marked adult was subsequently seen only 500 m from site where ringed.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Fernando de Noroña EBA. Has tiny global range of just 18·4 km², and small population of c. 1000 individuals. Presumably, was found all over the island prior to human settlement; still very common, with high densities in forested areas, and persists in secondary growth. Absent from cleared fields and airfield area. Effects on present species of the egg-eating Argentine black-and-white tegu (*Tupinambis merianae*), a large lizard introduced in 1950s in vain hope that it would control rats (*Rattus*), is not clear; this lizard now considered a pest, as it preys on bird eggs, but further study required in order to determine whether it is a significant predator on vireo nests.

Bibliography. Anon. (2009a), Butchart & Stattersfield (2004), Murphy (1915), Olson (1994), Ridgely & Tudor (1989), Stattersfield & Capper (2000).

35. Yellow-green Vireo

Vireo flavoviridis

French: Viréo jaune-verdâtre **German**: Zitronenflankenvireo **Spanish**: Vireo Verdiamarillo

Taxonomy. *Vireosylva flavoviridis* Cassin, 1851, San Juan de Nicaragua, Nicaragua.

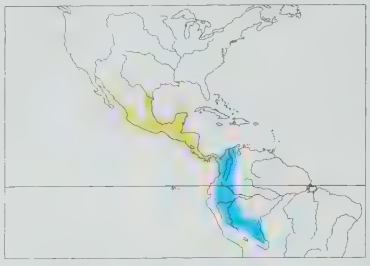
Probably forms a superspecies with *V. olivaceus*, *V. gracilirostris*, *V. altiloquus* and *V. magister*. Frequently treated as conspecific with first of those, but differs morphologically and vocally, and biochemical studies indicate that the two diverged from each other c. 4·6 million years ago. Proposed race *insulanus*, described from I del Rey, in Pearl Is (Gulf of Panama), is synonymized with nominate. Three subspecies recognized.

Subspecies and Distribution.

V. f. flavoviridis (Cassin, 1851) – breeds Rio Grande delta (S USA–NE Mexico border) and S in Mexico (from NC Sonora in W and from N Tamaulipas in E) through Central America to C Panama (including Coiba I and Pearl Is), possibly also to E Panama (Darién) and adjacent Colombia; migrates to NW South America (Colombia S to Bolivia).

V. f. forreri Madarász, 1885 – breeds Tres Marias Is, off Nayarit, in W Mexico; migrates to Amazonia.

V. f. perplexus (A. R. Phillips, 1991) – breeds N Guatemala (Petén), possibly also adjacent SE Mexico; migrates to E Ecuador and E Peru.



Descriptive notes. 14–15 cm; 15·5–21·1 g. Nominate race has crown medium grey, narrow and often weak blackish-grey border above greyish supercilium, lores dull dark greyish, ear-coverts greenish-grey; nape and upperparts dull greenish; primaries and secondaries dull greyish-brown with yellowish-green edgings on outer webs (yellow-green patch on folded wing); rectrices dull greenish-grey; throat and centre of chest whitish, side of neck and flanks greyish-yellow, becoming brighter yellow on vent and undertail-coverts; iris dull red; bill greyish-brown above, greyish below; legs blue-grey or slate-blue. Sexes alike. Juvenile has plumage brownish-tinged, with indistinct edgings on greater and median upperwing-coverts, iris brown. Race *forreri* has longer and larger bill than nominate, head markings less distinct, with dark line above supercilium reduced or absent, supercilium darker and more drab; *perplexus* is same size as nominate, but darker, duller olive, with less yellowish in plumage. Voice. Song a persistent series of usually disyllabic phrases, occasionally trisyllabic or monosyllabic, interspersed with longer pauses, "viree, viree, fee, vireo" and similar; generally simpler, more monotonous and with shorter phrases than song of *V. olivaceus*. Calls include a nasal mew, high nasal "chaaa" used in scolding, and high nasal rasping alarm notes.

Habitat. Open country with scattered trees, plantations, forest edge, riparian woodland; absent from continuous unbroken forest. Sea-level to 1500 m.

Food and Feeding. Food items insects, including caterpillars and beetles (Coleoptera), also spiders (Araneae); fleshy arillate fruits, mistletoe berries (Loranthaceae) and melastomes (*Melastoma*). Apparently more frugivorous on breeding grounds than are most vireo species. Forages in deliberate manner in middle and upper levels of trees. Spiders sometimes gleaned directly from webs.

Breeding. Season Apr–Jul/Aug; in Costa Rica, migrants return to nesting areas (and start singing) in late Jan or early Feb, but do not begin nest-building until early Apr; apparently single-brooded, at least in Costa Rica. Nest apparently built by female alone, taking c. 6 days, a cup or pouch made from grass blades, strips of bark, vegetable fibres, leaf midribs and similar material, with green moss on surface, lined with fine fibres and leaf rachises, attached by its rim in horizontal fork of branch 1·7–12·3 m (mostly 2–4 m) above ground. Clutch 3 eggs, occasionally 2, laying begins c. 4–5 days after nest completed, white, with spots of light or dark chocolate-brown concentrated around blunt end; incubation by female alone, period 13–14 days; chicks brooded by female, fed by both parents, nestling period 12–14 days; total time from start of nest-building to fledging of young c. 6 days longer for present species in Costa Rica than corresponding period for *V. olivaceus* in Canada (Ontario). Nests subject to parasitization by Bronzed Cowbird (*Molothrus aeneus*). Nest predators include toucans (*Ramphastos*), araçaris (*Pteroglossus*) and Swallow-tailed Kite (*Elanoides forficatus*).

Movements. Wholly migratory; the only Middle American passerine that vacates breeding range entirely during winter months. Departure from breeding grounds from Sept; migrates to South America, wintering mostly E of Andes in Amazonian Peru and Bolivia (S to NW Santa Cruz) and probably W Brazil; possibly only a transient migrant in Colombia and Ecuador. Arrival back in breeding areas from late Jan in Costa Rica, late Mar in Belize and Apr in Mexico. Recorded as vagrant in S USA from California (including Farallon Is) and Arizona E to Florida.

Status and Conservation. Not globally threatened. Common or abundant over much of its range. Status in E Panama (Darién) and adjacent Colombia unclear; possibly breeds in both regions, but more study required. Able to adapt to modified habitats such as plantations and gardens, provided that sufficient cover is left.

Bibliography. Borror (1972), Grant & Cowan (1964), Howell & Webb (1995), Johnson & Zink (1985), Ridgely & Gwynne (1989), van Rossem & Hachisuka (1937), Russell (1964), Skutch (1960), Stiles & Skutch (1989), Styrsky *et al.* (2004).

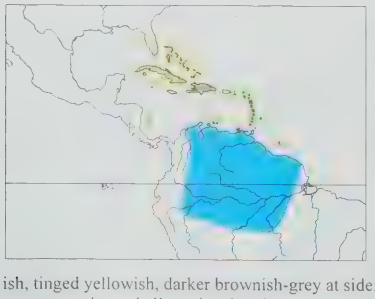
36. **Black-whiskered Vireo**

Vireo altiloquus

French: Viréo à moustaches **German**: Bartvireo **Spanish**: Vireo Bigotudo

Taxonomy. *Muscicapa altiloqua* Vieillot, 1808, St Thomas, Virgin Islands.
Probably forms a superspecies with *V. olivaceus*, *V. gracilirostris*, *V. flavoviridis* and *V. magister*. Six subspecies recognized.

Subspecies and Distribution.
V. a. barbatulus (Cabanis, 1855) – breeds SE USA (S Florida from Pasco and Volusia Counties S to Keys), Bahama Is, Cuba (including I of Pines), Little Cayman and Cayman Brac; migrates to South America (Amazon Basin).
V. a. altiloquus (Vieillot, 1808) – breeds Jamaica, Hispaniola and Puerto Rico; migrates to N South America.
V. a. grandior (Ridgway, 1884) – Old Providence I (E of Nicaragua), in SW Caribbean.
V. a. canescens (Cory, 1887) – San Andrés I (E of Nicaragua), in SW Caribbean.
V. a. bonairensis Phelps, Sr & Phelps, Jr, 1948 – Netherlands Antilles (Aruba, Curaçao, Bonaire) and Margarita I (off NE Venezuela).
V. a. barbadensis (Ridgway, 1874) – Lesser Antilles (from St Croix S to Barbados), possibly also Trinidad.



Descriptive notes. 15–16·5 cm; 15·4–26·2 g. Nominate race has crown dull dark grey-brown, supercilium dull buffy grey, lores and eyestripe dull greyish-brown, ear-coverts and area under eye grey-buff; nape and back slightly more greenish-brown than crown, merging into dull greenish on rump; primaries and secondaries dull blackish-grey, edged dull greenish-brown; greater and lesser upperwing-coverts with variable obscure yellowish-brown edgings; rectrices dull dark greyish-brown, outer webs edged dull greenish; blackish-grey malar stripe, contrasting with slightly yellow-tinged grey-white chin and throat; chest greyish, tinged yellowish, darker brownish-grey at side; belly whitish, tinged yellow, yellow becoming stronger on lower belly and undertail-coverts; flanks dull greenish-grey; iris red or reddish-brown; bill greyish-brown above, paler and greyer below; legs blue-grey or slate-blue. Sexes alike. Juvenile is browner than adult, with hint of pale wingbar, has brown iris. Race *barbatulus* is generally small, with slightly shorter bill, crown dull grey, supercilium distinct and whiter, back and rump dull olive, tinged greyish; *bonairensis* is lighter and brighter olive-buff dorsally than previous, has whiter supercilium and underparts; *grandior* has massive bill, malar stripe narrow, flanks yellowish-olive, vent pale yellow; *canescens* has bill long as in preceding race, but plumage generally duller, greyish-olive above and on sides, with flanks and vent whitish; *barbadensis* is similar to *barbatulus*, but bill and tarsus longer, crown greyish, only anterior supercilium whitish. Voice. Song a sequence of short phrases of 2 or 3 notes, lasting less than a second, with longer pauses (a second or more) between phrases, loud and noticeable, giving rise to various local names for the species (e.g. "bien-te-veo" in Cuba; "cien chavos por el" in Puerto Rico; "John chew-it" in Jamaica). Considerable variation in song type among different races, sedentary populations tending to have less complex phraseology than migratory ones; sedentary race *grandior* the most different, with heavily upslurred single-note syllables; song variation among different populations sufficient to be obvious in the field. Migratory races also have larger repertoire of song types than do sedentary ones. Various calls include "chuck-chuck-chuck" when agitated, "whit-whit" contact call, and various harsh buzzy calls.

Habitat. Woodland of most types, also tall undergrowth and vegetated gardens. In Florida, largely confined to coastal areas dominated by various species of mangrove, often tidally inundated, and, at lower densities, "hammocks" (woodland areas at slightly higher elevations with hardwood forest with substantial epiphytic growth); also suburban areas with forest, but absent from pine (*Pinus*) forest. In Jamaica, breeding densities highest (90–95 individuals/40 ha) in subtropical wet and subtropical dry limestone forest, lower (26 individuals/40 ha) in mangroves and lower still (22/40 ha) in montane broadleaf forests, also in cultivated woodlands and secondary hillside forests; in Cayman Is high densities in subtropical dry limestone forest, and in Bahamas low densities (5·5/40 ha) in Caribbean pine forest.

Food and Feeding. Animal food mostly arthropods, including weevils (Curculionidae) and other beetles (Coleoptera), caterpillars, bees and wasps (Hymenoptera), earwigs (Dermaptera) and bugs (Hemiptera). Vegetable items include large seeds (of *Cupania*, *Guarea*, *Roystonea*) and fruits or seeds of *Clusia*, *Cecropia* and others. Noticeably more vegetarian than other vireo species; proportion of vegetable matter in different studies 13% to 58%. Forages mostly in middle or upper levels of trees, often higher up than syntopic congeners (e.g. *V. modestus* and *V. osburni*). Obtains food mostly by gleaning from leaf and other surfaces; also by quick hovers in foliage while picking from substrate.

Breeding. Most studies centred on Florida population (race *barbatulus*). Season mostly May–Aug; eggs recorded 25th May–28th Jun in Florida, and 24th Apr in Cuba; May–Jul in Puerto Rica, where earliest nest-building in last week Apr (delayed to mid-May in dry years); apparently single-brooded. Nest-site selected by female alone; nest built solely by female, taking c. 8 days, with pause of a few days before egg-laying, a typical pensile structure made from dry grasses, fibrous lichens, plant fibres and bark strips, woven with spider web, sometimes with artificial materials (e.g. carpet fibres and the like), lined with fine grasses, supported by rim usually 1·5–4·6 m above ground in lateral fork of tree or shrub; in Florida most often in mangrove (*Rhizophora*, *Avicennia* or *Laguncularia*), in Puerto Rico in mahogany (*Swietenia mahoganii*) and *Guaiacum officinale* trees in abandoned mahogany plantations and in *Eugenia* and *Bunchoria glandulosa* shrubs. Clutch 2–4 eggs (mean from 13 nests in Puerto Rico 3·16, from 25 nests in St Lucia 2·4), pure white, sparsely dotted with brown or purplish-brown; incubation by female alone, rarely fed on nest by male, both sexes defend nest from intruders, incubation period 14 days; eggs usually hatch in mid-morning, chicks brooded by female alone, fed by both sexes, large prey sometimes dismembered before being fed to young, nestling period c. 11 days; young fed by parents for up to 36 days after fledging, while at same time foraging for themselves. Nests very frequently parasitized by cowbirds (*Molothrus*), in Caribbean by Shiny Cowbird (*Molothus bonariensis*), which has only recently colonized much of range of present species in C Caribbean; between 54% and 82% of nests parasitized according to several studies in Puerto Rico. Breeding success variable, often poor owing to cowbird parasitism; vireos reject only a small proportion of cowbird eggs, and parasitized nests produce fewer fledglings than non-parasitized ones.

Movements. N race *barbatulus* (breeding Florida, Bahamas, Cuba and Caymans) migratory, wintering in Amazon Basin. Nominate (breeding Jamaica, Hispaniola, Puerto Rico) winters in N South America and has occurred as vagrant on US Gulf Coast; isotope analysis of feathers suggests that some populations of this race may be only partially migratory, as present all year in Hispaniola, and same study indicated that *barbadensis* (breeding Lesser Antilles) may also be a partial migrant. Remaining three races, *grandior* and *canescens* (both on islands in SW Caribbean) and *bonairensis* (islands in SE Caribbean), are entirely sedentary. Migrants arrive late Feb in Cuba, mid-Mar in Bahamas (New Providence), and in Florida late Mar in Miami and mid-Apr in Fort Myers; vagrants (of undetermined race) have occurred in spring in USA (North Carolina, Virginia, and Gulf Coast from E Texas E to NW Florida), Belize, Costa Rica and Tobago. On autumn migration, latest records 9th Sept in Florida, 21st Oct in Cuba and 8th Dec in Bahamas; autumn vagrants recorded Yucatán Peninsula, Costa Rica and Panama.

Status and Conservation. Not globally threatened. Fairly common to common; rare, and possibly extirpated on Aruba (race *bonairensis*). Removal of mangroves for development purposes has reduced area of available habitat in Florida; recent catastrophic effects from hurricanes, however, may provide political incentive for preservation of coastal barriers to flooding; this species is able to exist in very small (0·2 ha) patches of residual mangroves. Recent colonization of much of Caribbean range by Shiny Cowbird has potential to lead to serious population decline of this vireo (several other Caribbean bird species have recently declined owing to cowbird parasitism); frequency of cowbird parasitism increases with increasing duration of sympatry with victim species.

Bibliography. Bent (1950), Biaggi (1983), Bond (1953), Bradley (1985), Buden & Olson (1989), Chace *et al.* (2002), Cruz (1980a, 1980b), Garrido & Kirkconnell (2000), Post & Wiley (1977), Post *et al.* (1990), Raffaele *et al.* (1998), Wetmore & Swales (1931), Wiley (1985), Zimmer (1941), Zwartjes (2001, 2003).

37. **Yucatan Vireo**

Vireo magister

French: Viréo du Yucatan **German**: Yukatanvireo **Spanish**: Vireo Yucateco
Other common names: Belize Vireo

Taxonomy. *Vireosylvia magister* S. F. Baird, 1871, Belize.
Probably forms a superspecies with *V. olivaceus*, *V. gracilirostris*, *V. flavoviridis* and *V. altiloquus*. Four subspecies recognized.

Subspecies and Distribution.
V. m. magister (S. F. Baird, 1871) – SE Mexico (Quintana Roo, including islands of Mujeres and Cozumel) and mainland Belize.
V. m. decoloratus (A. R. Phillips, 1991) – islands off Belize (Ambergris Cay S to Turneffe Is).
V. m. stilesi (A. R. Phillips, 1991) – Glover's Reef (off C Belize) and Bay Is (off N Honduras).

V. m. caymanensis Cory, 1887 – Grand Cayman I.



Descriptive notes. 15 cm; male 19·5–24·8 g and female 16·7–22·5 g (nominate), 13·5–17 g (*caymanensis*). Nominate race has pale brownish-white supercilium, dull brownish-grey lores and postocular region; crown to nape and upperparts dull, rather dark grey-brown, with olive tinge on back; primaries and secondaries dull blackish-grey, narrow paler olive edgings on outer webs, rectrices dull dark brownish-grey; throat and centre of chest dull buffy white, side of chest greyish, centre of belly and vent buffy white, flanks and sides dull greyish washed olive; iris blackish; bill notably heavy and stout, overall grey, lower mandible with paler grey base; legs bluish or blue-grey. Sexes alike. Juvenile apparently undescribed. Race *decoloratus* is larger than nominate, with longer bill and tail, dull above, crown dark greyish, paler and more whitish below; *stilesi* is brighter and more olive-green on rump and edges of rectrices than other races; *caymanensis* is small, dull olive above, brightest on rump, feet (of type specimen) slaty brown. Voice. Song a series of phrases of two or three syllables, "whoi whu" or "sweet bridget", separated by pauses; more leisurely and mellower than that of *V. flavoviridis*, very similar to song of *V. altiloquus*. Calls include a soft, dry "shi-tchi-chi-chi" chatter, a low, frequently repeated "bik-bik", and a "wik" like that of a woodpecker (Picidae).

Habitat. Mangroves, mixed woodland, littoral forest, humid and semi-humid scrubby woodland; thickets on pine (*Pinus*) ridges in Belize; on Grand Cayman limestone-associated forest, especially in winter.

Food and Feeding. Little information. On Grand Cayman said to feed mostly on fruit. Forages quietly and secretively in low and high levels of foliage.

Breeding. Season Apr–Aug on Grand Cayman I; birds in breeding condition in Apr and May in Belize. Nest a deep cup, suspended by its rim in crotch of lateral fork of tree or shrub branch. Clutch 2 eggs, white with few (or hardly any) dark spots. No other information.

Movements. Sedentary. Single report of individual of nominate race caught in S USA (Galveston County, in Texas) on 28th Apr 1984; has been disputed, albeit with possibly more vigour than justification.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cozumel Island EBA, and in Cayman Islands and Eastern Yucatán Secondary Areas. Very common in parts of range. In Belize, apparently more abundant on offshore cays than on mainland. Status of island races not well known; most likely to be of concern.

Bibliography. Bond (1999), Bradley (1985), Edwards (1972), Howell & Webb (1995), Jones (2003), Morgan (1985), Mountjoy & Leger (2001), Phillips (1991), Raffaele *et al.* (1998), Russell (1964).


inches 2
cm 5
PLATE 31
39
ssp thoracicus
41
40
ssp aemulus
38
43
42
47
ssp aurantiifrons
ssp flaviventris
ssp hypoxanthus
46
44
48
ssp helvinus
ssp griseifrons
45
ssp muscicapinus
ssp ferrugineifrons
ssp flavipes
50
51
49
ssp ochraceiceps
ssp luteifrons
ssp viridiflavus
ssp insularis
52
ssp minor
ssp decurtatus

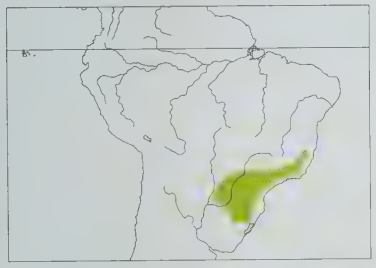
Genus *HYLOPHILUS* Temminck, 1822

38. **Rufous-crowned Greenlet**

Hylophilus poicilotis

French: Viréon oreillard **German**: Rostkappenvireo **Spanish**: Verdillo Coronado
Other common names: Rufous-crowned Vireo

Taxonomy. *Hylophilus poicilotis* Temminck, 1822, Ypanema, São Paulo, Brazil.
Formerly treated as conspecific with *H. amaurocephalus*, with which partly sympatric, but appears to be clearly differentiated by plumage, eye colour, vocalizations and habitat preference. Previously reported hybridization between the two explained as being due to presence of a "residual cline" that reflects geographical variation of the ancestor. Monotypic.
Distribution. SE Brazil (S Mato Grosso do Sul E to Espírito Santo, S to Rio Grande do Sul), E Paraguay and NE Argentina (Misiones).



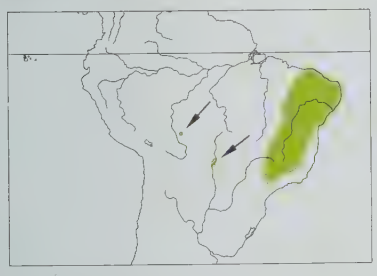
Descriptive notes. 12·5 cm; 9–12 g. Crown is bright chestnut-brown, contrasting with olive-green back and shoulders, lower back and rump brighter green; flight-feathers dull greyish-black, primaries and secondaries with narrow green edgings on outer webs (giving greenish appearance to closed wing), tertials with diffuse greenish edging on inner webs and yellow-green edging (not visible on closed wing) on inner webs; carpal joints yellowish; rectrices greyish-green, brighter greenish edgings on outer webs; ear-coverts dull greyish-black with paler grey mottling, throat dull pale grey, chest yellowish-grey, becoming dull yellow on breast, somewhat brighter yellow on belly and flanks, vent dull yellowish; iris dark reddish-brown, rarely grey-brown or greyish (possibly age-related); bill dull blackish above, grey to flesh-coloured below; legs greyish. Sexes alike. Immature is similar to adult, but underparts brighter, back more olivaceous. Voice. Song by male a simple series of high notes, "sweet-sweet-sweet-sweet", ending on higher pitch; female also sings, with squeaky note, and sometimes also gives modulated note immediately after male song. Considerable geographical variation in song, S populations tending to have more and faster notes in each phrase. Contact call in groups "chek" or "chi-chek".
Habitat. Canopy of humid or fairly humid forest, woodland, tall second growth; apparently absent from pure stands of bamboo, although found in stands mixed with other plant species. Sea-level to hills; to at least 1000 m in mountains of E Brazil (Espírito Santo).
Food and Feeding. Food mostly invertebrates; also some vegetable matter, e.g. fruit of *Trichilia chausseni* (Meliaceae), sometimes in large quantity. In study in SE Brazil, diet mostly arthropods, but fruit also recorded, including berries of mistletoe (of genus *Struthanthus*) and *Miconia pusilliflora*, drupes of *Rapania* and capsules of *Clusia* and *Alchornea triplinervia*. Forages mostly in upper levels, also lower down, in middle strata, sometimes to near ground level. Makes short flights within foliage; sometimes clings sideways to vertical twigs or creepers, and hangs upside-down in foliage. Gleans items from substrate; rarely, seen to capture small insects in air. Singly, in pairs and in small groups; joins mixed-species flocks.
Breeding. One individual carrying green moss at end of Sept. Parties of up to six birds, if family groups, would suggest larger brood than that of *H. amaurocephalus*. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Poorly know; appears to be quite common in many habitats.
Bibliography. Parrini *et al.* (2008), Raposo *et al.* (1998), Ridgely & Tudor (1989), Willis (1991).

39. **Grey-eyed Greenlet**

Hylophilus amaurocephalus

French: Viréon aux yeux gris **German**: Grauaugenvireo **Spanish**: Verdillo Ojigrís

Taxonomy. *Sylvia amaurocephala* Nordmann, 1835, boundary of Bahia and Minas Gerais, Brazil.
Formerly treated as conspecific with *H. poicilotis*, with which partly sympatric, but appears to be clearly differentiated by plumage, eye colour, vocalizations and habitat preference. Previously reported hybridization between the two explained as being due to presence of a "residual cline" that reflects geographical variation of the ancestor. Monotypic.
Distribution. NE Brazil, from Piauí and Ceará S through Bahia and Minas Gerais to N São Paulo; also, apparently disjunctly, in SW Mato Grosso do Sul and N Bolivia (Beni).



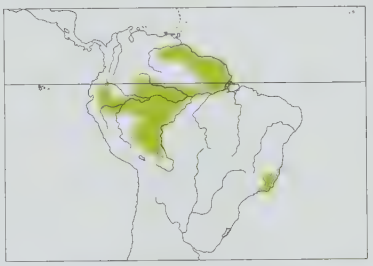
Descriptive notes. 12·5–13 cm. Forehead and crown are chestnut-brown, ear-coverts and area around and below eye mottled grey-white; distinct pale greyish superciliary line; nape and upper back dull grey-brown, becoming tinged with green on lower back, shoulders and rump; primaries and secondaries dull grey-black, narrow greenish edgings on outer webs (giving greenish appearance to closed wing); tail rectrices grey-green, brighter edgings on outer webs; chin dull whitish, throat dull greyish, becoming dull brownish-grey on chest, belly and vent, with yellowish on flanks; carpal joints greyish-white, underwing-coverts yellowish-grey; iris light grey or medium grey; bill grey above, grey-brown below; legs dark grey. Sexes alike. Juvenile has iris brown. Voice. Song of several syllables repeated, "tooweeder, tooweeder…", quite distinct from and more complex than that of *H. poicilotis*, with phrases ending in lower pitch; female may sing, with different song, "dec-terwee-ter-tee-bit", notes modulated, in response to playback, female song can also include a series of simple squeaks, sometimes in duet with male. Songs exhibit considerable geographical variation, some populations showing more or fewer notes in a phrase, with different fine structure revealed by analysis of sonagrams.
Habitat. *Caatinga* woodland, forest edge, scrub and bushy pastures.
Food and Feeding. Observed food items arthropods, also considerable quantities of vegetable matter, including fruit of *Struthanthus concinnus*. Seen to take a spider (Araneae) from a web and dismember it while holding it down with one foot. Forages 1–10 m above ground. In autumn, sometimes in groups of 3–4 individuals, presumably family parties; also in pairs, with partners well separated. Regularly occurs in mixed flocks with other species.
Breeding. Nest-building observed on 1st Jan, and newly fledged young at different location on 21st Jan. One nest described, a thin cup of green moss and white plant down, suspended in forklet and dense projecting tuft of leaves of a dense vine 4·5 m up in small tree. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Fairly common. Adaptable; occurs in substantially modified habitats (more so than *H. poicilotis*), including regenerating pastures and irregularly fire-burnt woodlands.
Bibliography. Guerra & Marini (2002), Raposo *et al.* (1998), Ridgely & Tudor (1989), Willis (1991).

40. **Lemon-chested Greenlet**

Hylophilus thoracicus

French: Viréon à plastron **German**: Gelbbrustvireo **Spanish**: Verdillo Pechilimón

Taxonomy. *Hylophilus thoracicus* Temminck, 1822, Rio de Janeiro, Brazil.
N races have sometimes been regarded as constituting a distinct species. Birds from mountains of S Bahia may represent a further, hitherto undescribed species, based partly on larger size and also suspected vocal differences; taxonomic study currently in progress. Three subspecies normally recognized.
Subspecies and Distribution.
H. t. aemulus (Hellmayr, 1920) – SE Colombia, E Ecuador, E Peru and N Bolivia.
H. t. griseiventris Berlepsch & E. J. O. Hartert, 1902 – E Venezuela (Bolívar), the Guianas and N Brazil (S to upper R Purús in W and to R Amazon in E).
H. t. thoracicus Temminck, 1822 – E Brazil (SE Minas Gerais, S Bahia, Espírito Santo and Rio de Janeiro, possibly also parts of São Paulo).



Descriptive notes. 12–12·2 cm; 11–13·8 g. Nominate race has forehead ochraceous-olive, crown dull greyish-olive with faint green edgings, face, area around eye and ear-coverts tinged greenish, contrasting with grey crown; upperparts dull green; primaries and secondaries dull blackish-grey, outer webs edged greenish (giving green appearance to closed wing), inner webs of tertials edged bright yellow; rectrices dull greenish, brighter on outer webs; chin and throat dull greyish-white, chest bright yellow, belly pale creamy buff, carpal joints and underwing-coverts bright lemon-yellow; iris brown, rimmed with pale straw colour; bill and legs grey. Sexes alike. Juvenile has crown dull grey-brown, lores and ear-coverts whitish; whitish areas of underparts smudged brownish-buff, flanks greyish; iris dark grey-brown. Race *aemulus* has less grey on crown than nominate, throat and underparts more buffy, iris whitish (possibly brown in juvenile), bill brown above, pink below, legs pinkish-flesh; *griseiventris* has iris yellow, throat and vent more greyish, more grey on crown. Voice. Song (N & W populations) a series of 6–8 notes, "chew-ew chew-ew chew-ew", sometimes becoming louder at end of a series. Call a rich, whistled "where-it", sometimes doubled.
Habitat. Humid forest and tall second growth; in Venezuela, only in seasonally unflooded forest, but elsewhere also in seasonally flooded forest (*várzea*). Isolated nominate race in SE Brazil found also in scrub and low woodland.
Food and Feeding. Recorded food in Suriname beetles (Coleoptera), spiders (Araneae) and caterpillars. Forages actively in middle levels and canopy, often while hanging upside-down; typically very territorial. May join mixed flocks, including those with *H. hypoxanthus*.
Breeding. No information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Not well known; appears to be generally rather uncommon over much of its range.
Bibliography. Haverschmidt & Mees (1994), Hilty (2003), Hilty & Brown (1986), Ridgely & Tudor (1989), Schulenberg *et al.* (2007), Todd (1929a), Zimmer (1942).

41. **Grey-chested Greenlet**

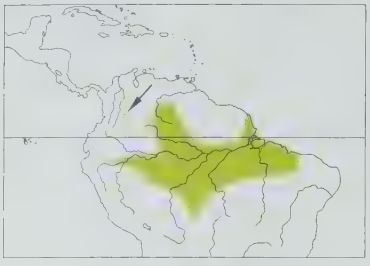
Hylophilus semicinereus

French: Viréon à gorge grise **German**: Graunackenvireo **Spanish**: Verdillo Pechigrís
Other common names: Grey-naped Greenlet

Taxonomy. *Hylophilus semicinereus* P. L. Sclater and Salvin, 1867, Belém, Pará, Brazil.
Three subspecies recognized.
Subspecies and Distribution.
H. s. viridiceps (Todd, 1929) – S Venezuela (Amazonas and Bolívar), E French Guiana, and N Brazil S to R Solimões & R Amazon (possibly also to Borba, on lower R Madeira), probably also E Colombia (E Vichada and E Guainía).
H. s. juruanus Gyldenstolpe, 1941 – NW Brazil S of R Solimões (region of upper R Juruá and R Purús) and NE Peru.

On following pages: 42. Ashy-headed Greenlet (*Hylophilus pectoralis*); 43. Tepui Greenlet (*Hylophilus sclateri*); 44. Brown-headed Greenlet (*Hylophilus brunneiceps*); 45. Rufous-naped Greenlet (*Hylophilus semibrunneus*); 46. Golden-fronted Greenlet (*Hylophilus aurantiifrons*); 47. Dusky-capped Greenlet (*Hylophilus hypoxanthus*); 48. Buff-cheeked Greenlet (*Hylophilus muscicapinus*); 49. Scrub Greenlet (*Hylophilus flavipes*); 50. Olivaceous Greenlet (*Hylophilus olivaceus*); 51. Tawny-crowned Greenlet (*Hylophilus ochraceiceps*); 52. Lesser Greenlet (*Hylophilus decurtatus*).

H. s. semicinereus P. L. Sclater & Salvin, 1867 – N Brazil S of lower R Amazon (from Pará and Maranhão, possibly from R Madeira, S to N Mato Grosso) and extreme NE Bolivia.
Individual of undetermined race recorded C Colombia (W Meta).

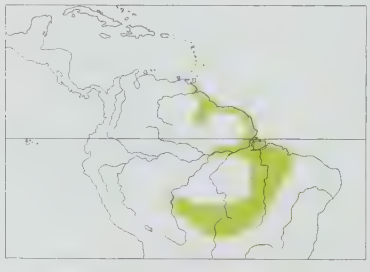


Descriptive notes. 12 cm; one bird 13 g. Nominate race has forehead greyish-green, becoming duller on rear of head; lores and side of face buffy, more grey-buff on ear-coverts; upperparts greenish; primaries and secondaries blackish-grey, edged greenish (giving greenish appearance to closed wing), inner web of tertials edged yellow; rectrices dull olive-green, edged brighter green; chin, whitish-grey, throat dull grey, chest grey with strong greenish-yellow tinge, brighter greenish-yellow at side; belly dull buff-white, more buff-grey at side, lower belly grey-white, faintly tinged yellow; carpal region and underwing-coverts bright yellow; iris whitish to grey; bill greyish above and at tip, flesh-coloured below and on cutting edges; legs dull grey-brown. Sexes alike. Juvenile undescribed. Race *viridiceps* has less grey on crown than nominate, paler and more whitish on underparts, with greenish wash on breast paler and less extensive; *juruanus* has head and nape strongly overlaid with olive-brown, is generally paler above than nominate, with throat and breast paler, less pale yellow on side of breast, and underwing-coverts and inner edges of remiges paler yellow. Voice. Song a slightly downslurred "peer" note repeated at rate of about one per second, 20 times or more in a sequence; similar to that of *H. flavipes*, but weaker and faster.
Habitat. Canopy of second-growth woodland, humid forest, scrubby *várzea*, and permanently flooded areas, especially where canopy lower; from near sea-level to 400 m.
Food and Feeding. Food small insects. Forages in canopy and vines, staying mostly in outer foliage, often hanging upside-down to glean from leaves. Often in mixed flocks.
Breeding. No information.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Uncommon and local in Venezuela; fairly common to common in other parts of range. Common but localized in Pacaya-Samiria National Reserve, in Peru. Occurs in several other protected areas.
Bibliography. Begazo & Valqui (1998), Hilty (2003), Hilty & Brown (1986), Parker *et al.* (1996), Ridgely & Tudor (1989), Todd (1929a), Zimmer (1942).

42. Ashy-headed Greenlet
Hylophilus pectoralis

French: Viréon à tête cendrée **German**: Aschkopfvireo **Spanish**: Verdillo Cabecigris

Taxonomy. *Hylophilus pectoralis* P. L. Sclater, 1866, Vila Beda de Mato Grosso, River Guaporé, Brazil.
Monotypic.
Distribution. NE Venezuela (Delta Amacuro), Guyana, N Suriname, N French Guiana, N & C Brazil (E Amapá and lower R Amazon E to Maranhão, S to Mato Gross, Rondônia and W Goiás) and N Bolivia.

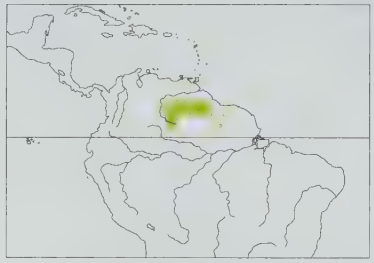


Descriptive notes. 12 cm; male 10·3–12·4 g, female 10·6–11·8 g. Forehead, crown and nape are dull grey, supercilium dull greyish-white, ear-coverts greyish; upperparts, including upperwing and tail, dull greenish, remiges and rectrices with brighter edgings; chin off-white, throat mottled greyish-white, chest greenish-yellow, brighter at side, belly dull white, flanks greyish; iris brown or orangey-brown; bill dark brown above, paler brown below; legs flesh-brown. Sexes alike. Juvenile is more buffy, less grey, on crown than adult. Voice. Song a persistent, rapidly delivered "peeer-peeer-peeer-pre-e-e-e-e", the latter part a characteristic trill. Male may sing while incubating.
Habitat. Deciduous forest, second growth, plantations, gardens, edges of mangrove forest; sea-level to 400 m.
Food and Feeding. Food, identified from Suriname specimens, mostly insects: Lepidoptera larvae, Orthoptera, beetles (Coleoptera), ants (Formicidae), bugs (Hemiptera, including homopterans); some vegetable matter, i.e. berries of mistletoe (Loranthaceae). Active feeder in outer foliage, often in mixed flocks.
Breeding. Season extended, in Suriname nest with eggs in early Jan and newly fledged young in mid-Sept. Nest built by both sexes, an open cup woven between two branches. Clutch 2 eggs, white, with blackish spots at blunt end; incubation by both sexes. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Common or abundant in some parts of range, e.g. Suriname. Only one record in Venezuela, a specimen from S part of Delta Amacuro (near mouth of R Orinoco). Adaptable; able to exist in modified habitats.
Bibliography. Haverschmidt & Mees (1994), Hilty (2003), Ridgely & Tudor (1989), Todd (1929a).

43. Tepui Greenlet
Hylophilus sclateri

French: Viréon des tépuis **German**: Tepuivireo **Spanish**: Verdillo de Tepuí

Taxonomy. *Hylophilus sclateri* Salvin and Godman, 1883, Roraima, British Guiana; error = Venezuela.
Monotypic.
Distribution. S Venezuela (Bolívar, Amazonas), SW Guyana and N Brazil (Roraima); recently recorded C Suriname (Tafelberg).
Descriptive notes. 12 cm; 10–12·5 g. Male has crown and nape grey, forehead and lores tinged with buff, paler grey on side of head; upperparts olive-green, upperwing contrastingly grey, primaries and secondaries finely edged paler grey on outer webs; rectrices deep grey, paler edgings on outer webs; chin and throat white, contrasting with yellow chest; side of chest and flanks greenish-yellow, belly dull white, vent white or yellow-tinged white; iris grey or white; bill rather dark brownish above, flesh-coloured below and on cutting edges; legs fleshy-grey to pink. Female is like male, but with less well-defined chestband. Juvenile has dark iris. Voice. Song described as a short, clear whistled "suuuwéééeeuu", rising and then quickly falling, repeated rapidly. Calls include nasal downslurred scold.

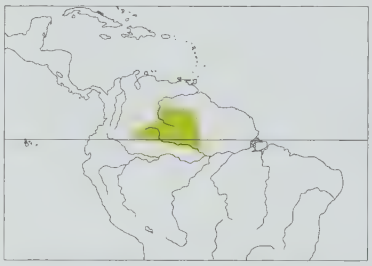


Habitat. Humid and wet montane forest and forest borders; 600–2000 m.
Food and Feeding. Few data. No information on diet. Forages energetically in canopy or upper levels of forest, lower down in forest edge; hangs upside-down. Frequently in mixed flocks.
Breeding. No information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tepuis EBA. Quite common in suitable habitat; rare in Suriname, where first record in 2005, on Tafelberg (the only tepui in Suriname). Much of this species' habitat is protected by its remoteness; some areas of its range lie within national parks, although some of these are poorly protected.
Bibliography. Hilty (2003), Ridgely & Tudor (1989), Todd (1929a).

44. Brown-headed Greenlet
Hylophilus brunneiceps

French: Viréon brunâtre **German**: Braunkopfvireo **Spanish**: Verdillo Cabecicastaño

Taxonomy. *Hylophilus brunneiceps* P. L. Sclater, 1866, Ypanema, central Brazil; error = Rio Vaupés, Amazonas, north Brazil.
Race *inornatus* of *H. hypoxanthus*, occurring S of R Amazon, was formerly treated as a race of present species. Monotypic.
Distribution. S Venezuela (Amazonas and Bolívar), E Colombia (E Vichada, Guainía and Vaupés) and NW Brazil (R Negro drainage in Roraima and N Amazonas, E to W bank of R Negro near Manaus).

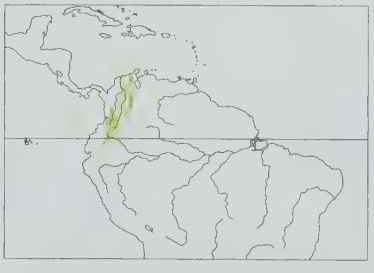


Descriptive notes. 11·4–11·5 cm; 8–11·5 g. Crown is brown or dull sepia with faint yellowish wash, contrasting with olive-green upperparts; primaries and secondaries dark greyish, narrow greenish-olive edgings on outer webs; tail olive-green; side of head dull brownish, throat and upper breast dirty white, tinged olive-buff; lower breast and belly grey-white, flanks yellowish, vent pale greenish-yellow; iris grey or whitish, sometimes dark (possibly juvenile); bill brown above, pinkish below; legs pink. Sexes alike. Juvenile undescribed. Voice. Territorial song a loud, slow "seeeeearn, seeeeearn", each note inflected downwards, at rate of 1 note per second; when agitated, a series of twitters, then 4–5 soft notes and a louder, descending series of notes, much repeated.
Habitat. Savanna woodland, scrubby low-canopy forest on sandy soil, blackwater areas, and borders of tall *várzea* forest and stream borders.
Food and Feeding. Recorded food items insects and caterpillars. Forages actively, 5–12 m up, in leafy areas. Hangs upside-down to forage from tips of clumps of leaves at ends of branches; sometimes hovers to pick items from undersides of leaves. In pairs or families; sometimes in mixed flocks.
Breeding. No information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Not well known; appears to be fairly uncommon to uncommon in much of range.
Bibliography. Hilty (2003), Hilty & Brown (1986), Ridgely & Tudor (1989), Zimmer (1942).

45. Rufous-naped Greenlet
Hylophilus semibrunneus

French: Viréon à nuque rousse **German**: Rostnackenvireo **Spanish**: Verdillo Nuquirrufo

Taxonomy. *H[ylophilus] semi-brunneus* Lafresnaye, 1845, "Bogotá", Colombia.
Has been thought to form a superspecies with *H. aurantiifrons*. Monotypic.
Distribution. Sierra de Perijá (on NW Venezuela–N Colombia border); also disjunctly in Colombia in Santander, and from Norte de Santander S to Cundinamarca, in W Andes in Valle de Cauca and Cauca, and from Huila S to N Ecuador (Napo and Pastaza).



Descriptive notes. 12·5–13 cm; 10·2–12·6 g. Crown, nape and posterior ear-coverts dark rufous-brown, becoming contrastingly olive-green on back, upperwing and tail; primaries, secondaries and rectrices edged paler greenish; lores, supercilium and area below eye off-white; throat dirty white; underparts dull whitish, tinged buffy rufous on side of breast, with diffuse chestband; flanks pale greenish-yellow, vent and underwing-coverts pale yellow; iris brown; bill mostly dark greyish above, paler, flesh-coloured below; legs leaden blue. Sexes alike. Juvenile not yet formally described. Voice. Song described as a fast series of notes, "wa-chee-ra-dit-it", rising in pitch.
Habitat. Humid montane forest and second growth, mostly at 1000–2100 m; as low as 450 m in Venezuela.

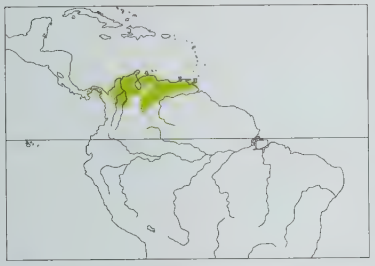
Food and Feeding. No recorded data on diet. Forages actively in outer foliage, from middle levels to just under canopy. Singly, in pairs and in family groups, often in mixed flocks.
Breeding. Birds in breeding condition in Mar–Jul in Sierra de Perijá and C Andes; recently fledged young in Mar in W Andes. No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Generally rather uncommon and local. Range includes several reserves and protected areas, e.g. Sierra de Perijá National Park, in Venezuela.
Bibliography. Hilty (2003), Hilty & Brown (1986), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Todd (1929a).

46. Golden-fronted Greenlet

Hylophilus aurantiifrons

French: Viréon à front d'or **German**: Goldstirnvireo **Spanish**: Verdillo Luisucho
Other common names: Lawrence's Greenlet

Taxonomy. *Hylophilus aurantiifrons* Lawrence, 1862, Panama Railroad, Panama.
Has been thought to form a superspecies with *H. semibrunneus*. Three subspecies recognized.
Subspecies and Distribution.
H. a. aurantiifrons Lawrence, 1862 – E Panama (E from W Panamá province) and N Colombia.
H. a. helvinus Wetmore & Phelps, Jr, 1956 – NW Venezuela (W Zulia S to N Mérida and S Táchira).
H. a. saturatus (Hellmayr, 1906) – E Colombia (Arauca, Boyacá), N Venezuela (E from E Zulia, S to R Apure and R Orinoco), and Trinidad.



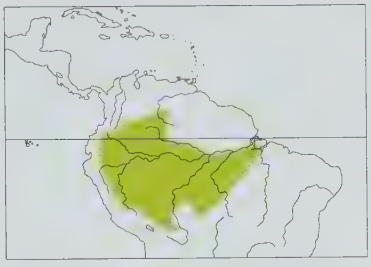
Descriptive notes. 11–12 cm; 7·5–12 g, mean 9·5 g. Nominate race has top of head buffy brown, forehead more olive-ochre; upperparts greenish-brown, becoming more yellowish-green on rump; upperwing-coverts and shoulders dull greenish-brown; primaries and secondaries dull blackish-grey, narrow greenish edgings on outer webs (giving greenish appearance to closed wing); rectrices dull olive-green; chin and throat dull whitish-buff, chest dull greyish-yellow, brighter at side; lower belly and vent yellowish; iris brown or black; bill mostly dusky horn above, flesh-coloured below; legs greyish-brown or plumbeous. Sexes alike. Juvenile not yet formally described. Race *saturatus* is similar to nominate, but underparts more brightly coloured, with stronger buffy or ochraceous wash on chest; *helvinus* is closer to previous, but decidedly darker above, darker reddish-brown on crown, brownish wash on side of neck and upper breast darker and more extensive, flanks greener, undertail-coverts darker yellow. Voice. Song a short, quick semi-musical "de-wichy-de-wéeter", repeated. Calls include double note, "chee-vee", and chattering or chirping note, sometimes speeded up into a scolding like that of a chickadee (*Poecile*).
Habitat. Dry scrub, woodland edges, and second growth; also borders of more humid woodland, gallery forest, gardens and similar. Sea-level to 700 m; in Venezuela to 1300 m.
Food and Feeding. Food small insects and spiders (Araneae). Forages usually fairly low down. Very active, often hanging upside-down to glean from undersides of leaves. In pairs or in groups up to six individuals; often in mixed flocks.
Breeding. Nests described only from Trinidad, where season from Jul (possibly Apr) to Oct; birds in breeding condition and juveniles seen in Aug in Colombia. Nest, built by both sexes, a deep cup of leaves, stems and grass, suspended by its rim 1·6–10 m above ground in horizontal fork in branch or vine. Clutch 3 eggs, white with sparse brown spotting; no information on incubation and nestling periods. Nests frequently parasitized by Shiny Cowbird (*Molothrus bonariensis*).
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Quite common over much of range; common in Venezuela. Appears able to adapt to some man-modified habitats, e.g. gardens and plantations.
Bibliography. ffrench (1991), Hilty (2003), Hilty & Brown (1986), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Todd (1929a).

47. Dusky-capped Greenlet

Hylophilus hypoxanthus

French: Viréon à ventre jaune **German**: Braunstirnvireo **Spanish**: Verdillo Ventriamarillo
Other common names: Yellow-bellied Greenlet (*flaviventris*); Amazon Greenlet (*inornatus*)

Taxonomy. *Hylophilus hypoxanthus* Pelzeln, 1868, Rio Içanna and Rio Vaupés, upper Rio Negro, Brazil.
Race *inornatus* was formerly treated as a race of *H. brunneiceps*. Six subspecies recognized.
Subspecies and Distribution.
H. h. hypoxanthus Pelzeln, 1868 – SE Colombia (Vaupés and Guainía), SW Venezuela (Amazonas), and NW Brazil (S to R Solimões).
H. h. fuscicapillus P. L. Sclater & Salvin, 1880 – E Ecuador and N Peru (S to R Marañón).
H. h. flaviventris Cabanis, 1873 – C Peru from San Martín (possibly from NC Loreto) S to Ayacucho.
H. h. ictericus Bond, 1953 – W Brazil (upper R Juruá), extreme SE Peru (Puno) and N Bolivia (La Paz, Beni and Cochabamba).
H. h. albigula (Chapman, 1921) – N Brazil S of R Amazon (from R Purús E to R Iriri and R Xingu).
H. h. inornatus (E. Snethlage, 1914) – N Brazil S of R Amazon (from R Tapajós E to R Tocantins, S of Itaituba).
Descriptive notes. 11·5–12 cm; 17 g. Nominate race has forehead, crown and nape dull olive-brown, becoming buffy olive on back, upperwing and shoulders, and brighter yellowish-olive on rump and tail; primaries and secondaries dull blackish-grey, greenish edgings on outer webs (giving greenish-brown appearance to closed wing); rectrices with brighter edgings on outer webs and at base; chin and throat dull buffy whitish; underparts, including underwing-coverts, pale yellow with slight buffy wash, inner (concealed) edges of remiges and rectrices pale dull yellow; iris grey-brown; bill dark brown above, pale brown or pinkish below; legs grey. Sexes alike. Juvenile undescribed. Race *fuscicapillus* is much browner on upperparts than nominate, only rump greenish, has throat pale yellow, underparts strongly yellow, usually no buffy colour on breast; *flaviventris* is duller brown on upperparts, with citrine tinge on back, has throat and often upper part of chest whitish, belly strongly yellow; *ictericus* is closest to previous, but upperparts brighter yellow, belly more strongly yellow than on *fuscicapillus*; *albigula* is similar to *fuscicapillus*, but crown darker and contrasting more with back, underparts paler, with more extensive white on upper chest; *inornatus* has top of head sepia-brown, back similar but brighter, becoming olive on rump, has chin and throat light grey, breast greyish-olive, belly light grey with olive wash, both breast and belly mixed with yellow. Voice. A snappy "whitchy-whéét-wééu", with the emphasis on the last 2 notes, alternating with "pu-whitchy-wééu"; call a wheezy "dee-dee".
Habitat. Canopy and upper levels of humid forest, both *terra firma* and *várzea*. Generally in lowlands, down to near sea-level; up to 200 m or more in Venezuela and to 1100 m in Peru.



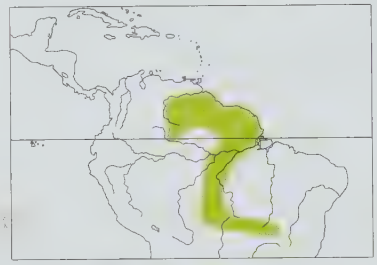
Food and Feeding. Recorded dietary items insects, including caterpillars. Forages actively in upper levels of forest, often hanging upside-down while gleaning from leaves; often sings while feeding. Frequently in mixed flocks.
Breeding. No information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Not well known, as easily overlooked. In some parts of range apparently fairly common.
Bibliography. Hilty (2003), Hilty & Brown (1986), Ridgely & Tudor (1989), Schulenberg *et al.* (2007), Todd (1929a), Zimmer (1942).

48. Buff-cheeked Greenlet

Hylophilus muscicapinus

French: Viréon fardé **German**: Braunwangenvireo **Spanish**: Verdillo Atrapamoscas
Other common names: Buff-chested Greenlet; Grey-fronted Greenlet (*griseifrons*)

Taxonomy. *Hylophilus muscicapinus* P. L. Sclater and Salvin, 1873, St Louis d'Oyapok, French Guiana.
Two subspecies recognized.
Subspecies and Distribution.
H. m. muscicapinus P. L. Sclater & Salvin, 1873 – S & E Venezuela (Amazonas, Bolívar), the Guianas, and N Brazil (S to N bank of R Amazon).
H. m. griseifrons (E. Snethlage, 1907) – Brazil S of R Amazon (from R Madeira E to R Tapajós, S to Mato Grosso and S Goiás) and extreme NE Bolivia.



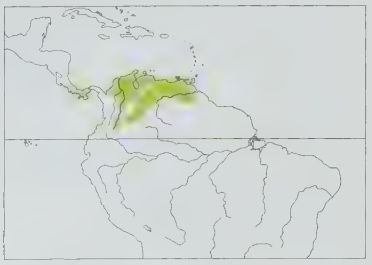
Descriptive notes. 11·5–12 cm; 9·5–13·5 g. Nominate race has dull buffy supercilium, dull buffy-brown side of face, with blackish-grey mottling on ear-coverts; forehead grey-brown, crown and nape clear blue-grey, back and shoulders greenish, becoming brighter on rump; primaries and secondaries dull blackish-grey, broad greenish edgings on outer webs (giving yellowish-green appearance to closed wing); rectrices dull greenish; chin off-white, chest dull greyish-buff, belly dull greyish-white, upper flanks dull yellowish; iris sepia, brown or grey; bill blackish above, flesh-coloured below; legs pale flesh-coloured or light grey. Sexes alike. Juvenile apparently undescribed. Race *griseifrons* is brighter green above than nominate, has side of head and supercilium deeper buffy rufous, forehead pure grey without buffy tinge, throat and breast more buffy. Voice. Song a loud, snappy "whitchy-ta-whééu", reminiscent of that of a New World warbler (Parulidae), frequently repeated.
Habitat. Canopy and middle levels of humid forest, both *terra firme* and *várzea*; less numerous in tall moist forest.
Food and Feeding. Recorded food items in Suriname insects (Orthoptera) and spiders (Araneae). Forages in outer foliage, sometimes hanging upside-down. Found in pairs and in small parties; very frequently in mixed flocks, sometimes with other species of greenlet.
Breeding. Peak singing in Venezuela (Bolívar) Dec–May, presumably indicating breeding activity at that time. No other information.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Common to fairly common in parts of its range; common in Venezuela. Easily overlooked.
Bibliography. Haverschmidt & Mees (1994), Hilty (2003), Ridgely & Tudor (1989), Todd (1929a).

49. Scrub Greenlet

Hylophilus flavipes

French: Viréon à pattes claires **German**: Buschvireo **Spanish**: Verdillo Paticlaro
Other common names: Yellow-green Greenlet (*viridiflavus* and *xuthus*)

Taxonomy. *Hylophilus flavipes* Lafresnaye, 1845, "Bogotá", Colombia.
Forms a superspecies with *H. olivaceus* and sometimes considered conspecific. Central American races *viridiflavus* and *xuthus* differ vocally from South American ones, and may represent a separate species. Seven subspecies recognized.
Subspecies and Distribution.
H. f. viridiflavus Lawrence, 1862 – SW Costa Rica and Panama (Caribbean coast around Canal Zone, Pacific coast E to lower R Bayano).
H. f. xuthus Wetmore, 1957 – Coiba I, off SW Panama.
H. f. flavipes Lafresnaye, 1845 – N & W Colombia (Caribbean coast E to Santa Marta, and S in Magdalena Valley to Huila).
H. f. melleus Wetmore, 1941 – extreme N Colombia (Macuira Mts, at E tip of Guajira Peninsula).
H. f. galbanus Wetmore & Phelps, Jr, 1956 – N & E Colombia (E Santa Marta and R Rancheria valley E through Guajira Peninsula except E tip, and E Andes through W Arauca and Casanare to Meta) and NW Venezuela (W Zulia, Táchira, N Mérida, Barinas, Portuguesa).
H. f. acuticauda Lawrence, 1865 – N Venezuela (E Zulia E to Sucre, S to Apure and SE Bolívar; also Margarita I).
H. f. insularis P. L. Sclater, 1861 – Tobago I.



Descriptive notes. 11·4–12 cm; 9·5–14 g. Nominate race is dull olive-green above, slightly brighter on rump; flight-feathers blackish-grey, primaries and secondaries showing narrow greenish edging on outer webs (giving a greenish appearance to closed wing), tertials with broader greenish-yellow edgings; rectrices dull greenish-grey; chin and chest whitish-grey, belly pale yellowish; iris whitish or grey; bill greyish or greyish-pink above, more pink below; legs bluish or dusky flesh-coloured. Sexes alike. Juvenile (all races) has dark eye, bill black (at least in *viridiflavus*). Races differ mainly in general plumage tone and in eye colour: *viridiflavus* is generally duller and yellower below than nominate, iris white or pale yellow; *xuthus* is similar to previous, but buffier below, iris whitish; *melleus* is similar to nominate, but crown and back darker, more buff (less yellow) below, upper breast darker than lower breast; *galbanus* is whiter on abdomen, has breast and flanks buffier, with less yellow than nominate, iris white; *acuticauda* is duller than nominate, upperparts dull citrine, underparts deep olive-buff with little yellow tinge, iris dark; *insularis* is larger than last, with heavier bill, is deep greyish-olive above, head greyer, underparts deep olive-buff, flanks sometimes with greenish wash, iris dark. Voice. Song (in Venezuela) a penetrating series of 4–20 notes, "turee, turee, turee"; in Central America song a series of slurred or double notes, "chi-cheer, chi-cheer", slower in cadence than songs in South America. Calls include nasal scolding, "nyaa-nyaa-nyaa", and other harsh notes.

Habitat. In South America, arid scrub and lighter woodland, dry to moist forest (deciduous to semi-deciduous), gallery forest, and degraded scrubby areas with regenerating trees; sea-level to 1200 m. In Central America, found in dense low scrub, oil palm (*Elaeis guineensis*) plantations, and bamboo stands on abandoned banana plantations; sea-level to 900 m.

Food and Feeding. Food apparently mostly arthropods. Forages usually 2–8 m up in vegetation; feeds in slower, more vireo-like manner than other greenlets, often clinging upside-down. Sometimes in mixed flocks.

Breeding. Season Apr–Jul, also one nest in Dec, in Costa Rica; Jul–Oct, possibly from Apr, on Tobago. Nest in Costa Rica a flimsy hemispherical cup made from fine pale-coloured fibres, sometimes with green moss on outside, suspended by its rim 4–10 m up in slender horizontal fork of branch; on Tobago a deep cup of leaves, stems and grass, suspended from lateral fork 1·7–10 m above ground. Clutch in Costa Rica 2–3 eggs, white with fine spots of chocolate-brown; on Tobago 3 eggs, white with sparse brown spots. Frequent host of Shiny Cowbird (*Molothrus bonariensis*). No other information.

Movements. Apparently sedentary.

Status and Conservation. Not globally threatened. Often common or abundant. Adaptable; frequently found in highly modified or regenerating habitats.

Bibliography. ffrench (1973), Hilty (2003), Hilty & Brown (1986), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Todd (1929a), Wetmore (1941a), Wetmore & Phelps (1956), Zimmer (1942).

50. Olivaceous Greenlet

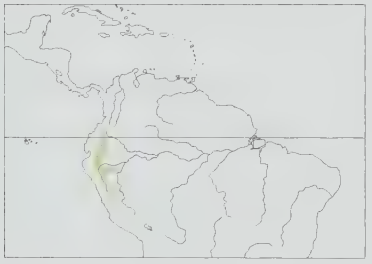
Hylophilus olivaceus

French: Viréon olivâtre **German**: Olivvireo **Spanish**: Verdillo Oliváceo

Taxonomy. *H.*[*ylophilus*] *olivaceus* Tschudi, 1844, Junín area, Peru.

Forms a superspecies with *H. flavipes* and sometimes considered conspecific. Monotypic.

Distribution. E slope of Andes in Ecuador (Napo S to at least Morona Santiago, perhaps to Zamora-Chinchipe) and Peru (San Martín, and from Huánuco S to N Junín).



Descriptive notes. 12 cm; 11–13 g. Top of head and entire upperparts, including upperwing and tail, are dull olive-green, appearing brighter and more yellowish on forehead; overall yellowish-olive below, slightly paler on chin and brighter yellow on belly; iris whitish; bill dull pink or brownish-pink; legs brownish-pink. Sexes alike. Juvenile undescribed. Voice. Song is described as a distinctive, loud "twee-twee-twee" or "suwee-suwee-suwee", with up to a dozen notes repeated rapidly.

Habitat. Inhabits forest edge, overgrown clearings, and second growth; recorded from 600 m up to 1700 m.

Food and Feeding. No data on items of diet. Usually found while foraging unobtrusively, alone or in pairs; occasionally in association with other species.

Breeding. Adults feeding newly fledged young in Jun in Peru (San Martín). No other information.

Movements. Apparently sedentary.

Status and Conservation. Not globally threatened. Uncommon to fairly common, but local, over much of range. Poorly known.

Bibliography. Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Schulenberg *et al.* (2007), Todd (1929a).

51. Tawny-crowned Greenlet

Hylophilus ochraceiceps

French: Viréon à calotte rousse **German**: Fuchsscheitelvireo **Spanish**: Verdillo Leonado
Other common names: Red-fronted Greenlet (*luteifrons*, *lutescens* and *rubrifrons*)

Taxonomy. *Hylophilus ochraceiceps* P. L. Sclater, 1860, Playa Vicente, Oaxaca, Mexico.

Sometimes suggested that dark-eyed "*rubrifrons* group" (including also *luteifrons* and *lutescens*) of Amazonia may represent a separate species, but no apparent distinctions in vocalizations between this group and birds in rest of species' range. Race *nelsoni* rather poorly differentiated, possibly only an intergrade between adjacent races (*pallidipectus* and *bulunensis*). Ten subspecies currently recognized.

Subspecies and Distribution.

H. o. ochraceiceps P. L. Sclater, 1860 – S Mexico (from S Veracruz and N Oaxaca) E, including most of Yucatán Peninsula, to N Guatemala and Belize.

H. o. pallidipectus (Ridgway, 1903) – S Guatemala and Honduras S on Caribbean slope to NW Panama (Bocas del Toro).

H. o. pacificus Parkes, 1991 – Pacific slope of Costa Rica (S from Carara) and W Panama (E to W Chiriquí).

H. o. nelsoni (Todd, 1929) – Panama from Chiriquí E to W Darién.

H. o. bulunensis E. J. O. Hartert, 1902 – E Panama (Darién) and adjacent W Colombia S to NW Ecuador (Esmeraldas).

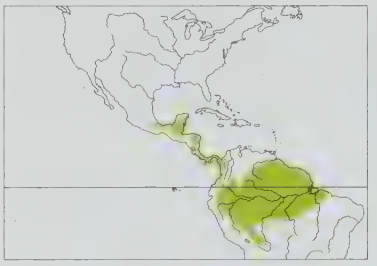
H. o. ferrugineifrons P. L. Sclater, 1862 – SE Venezuela (Amazonas, Bolívar except E) and adjacent W Guyana, SE & E Colombia (S from Meta) and E Ecuador (E of Andes), NE Peru and NW Brazil (Roraima W of R Negro, S to R Juruá and R Purús).

H. o. viridior (Todd, 1929) – S Peru and N Bolivia (E to Santa Cruz).

H. o. luteifrons P. L. Sclater, 1881 – SE Venezuela (E Bolívar), the Guianas, and N Brazil (E from R Branco, S to R Amazon).

H. o. lutescens (E. Snethlage, 1914) – NC Brazil S of R Amazon (R Madeira E to R Xingu).

H. o. rubrifrons P. L. Sclater & Salvin, 1867 – NE Brazil S of R Amazon (R Tocantins and NE Pará).



Descriptive notes. 11–12·5 cm; 8·5–13 g. Nominate race has crown yellow-brown, lighter and more yellowish at front (especially above bill), upperparts olive-brown, becoming slightly more greenish on rump; primaries and secondaries dull greyish-black, buff-brown edgings on outer webs (giving general buff-brown colour on closed wing), rectrices dull brown with cinnamon-brown edgings; ear-coverts dull greyish, chin mottled greyish-white, throat dull grey with faint yellow-green suffusion; chest ochraceous, becoming brighter yellow on centre of belly and dull yellowish-grey on flanks, vent dull greyish-yellow; underwing-coverts and carpal area dull yellow; iris pale grey; bill grey, paler below; legs flesh-coloured. Sexes alike. Juvenile has iris darker, head and upperparts vinous-tinged, underparts ochre. Race *pallidipectus* is very similar to nominate, but breast decidedly more pale, dull buffy olive (rather than rich ochraceous), yellow of abdomen and vent paler, flanks more grey, rump more green (contrasting more with back); *pacificus* has throat purer and darker grey than previous, underparts darker, with distinct breastband, underwing (carpal area, axillaries and underwing-coverts) paler yellow, rump more greenish; *nelsoni* is very like *pallidipectus* but greener, and is browner than following race; *bulunensis* has grey confined to chin and sometimes upper throat, with underparts greyish-green, brightest on breast and greyest on flanks, back dull greenish-olive and contrasting with orange-brown crown; *ferrugineifrons* has underparts generally dull whitish, more or less heavily washed with olivaceous, with throat paler, more whitish, iris colour apparently variable (white to grey to brown), bill blackish above and pale below; *viridior* is of a brighter, purer yellowish-green above, forehead more pale russet, rectrices paler and less brown; *luteifrons* is dark citrine above, darker olivaceous on crown, with forehead and area above lores tinged dull buffy yellow, crissum and underwing-coverts deep buff, iris brownish, upper mandible blackish; *lutescens* has upperparts citrine-green, no tawny on crown, tail pale brown, underparts uniformly washed primrose-yellow, iris dark; *rubrifrons* has upperparts more brownish than last, tail darker brown, iris dark. Voice. Song in Mexico a high, plaintive, insect-like whining "wheee" or "swee", repeated a variable number of times, sometimes preceded by brief trill; call a harsh, nasal "doy-doy-doy", repeated many times. In Costa Rica, a high, clear, penetrating whistle. In Peru, song a clear, descending (or occasionally ascending) whistle; call a low, mewing churring chatter, each note rising, or a nasal "naaa".

Habitat. Humid evergreen or semi-deciduous forest; in Suriname interior forest; rare or absent in scrubby sandy forest. From sea-level up to 1200 m in Central America and Peru; to 1600 m in Venezuela.

Food and Feeding. Food mostly arthropods, including roaches (Blattodea), caterpillars, ants (Formicidae) and spiders (Araneae); also small fleshy fruits. Feeds mostly in lower or middle levels of forest; active, often hanging upside-down. Frequently in mixed flocks with parulid warblers, tyrant-flycatchers (Tyrannidae) and others; in Belize, seems to flock especially with Red-crowned Ant-tanagers (*Habia rubica*).

Breeding. A nest with eggs in Apr and one with young in May in Costa Rica. Nest in Costa Rica a sturdy hemispherical cup with outer covering of moss, a layer of fine fibres, a thicker layer of seed down, and lining of fine fibres, attached by its rim 2–7 m up in horizontal fork of branch; nests in South America apparently undescribed. Clutch 2 eggs, white, marked with purplish and grey; incubation probably by female, no information on duration; chicks fed by both parents, nestling period 13–14 days.

Movements. Probably sedentary; populations in S Veracruz (Mexico) appear to vary in abundance during course of year, suggesting possible local movement.

Status and Conservation. Not globally threatened. Common or fairly common in many parts of its range; easily overlooked. Seems not to occur in small patches of forest, and is therefore susceptible to habitat fragmentation due to patchwork clearance for slash-and-burn agriculture.

Bibliography. Antongiovanni & Metzger (2004), Haverschmidt & Mees (1994), Hilty (2003), Hilty & Brown (1986), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Schulenberg *et al.* (2007), Skutch (1960), Stiles & Skutch (1989), Todd (1929a), Willis (1960), Zimmer (1942).

52. Lesser Greenlet

Hylophilus decurtatus

French: Viréon menu **German**: Graukappenvireo **Spanish**: Verdillo Menor
Other common names: Grey-headed Greenlet (N races)

Taxonomy. *Sylvicola decurtata* Bonaparte, 1838, Guatemala.

S races *darienensis* and *minor* were formerly regarded as constituting a separate species, but hybridization with nominate occurs in overlap zone in C Panama. Six subspecies recognized.

Subspecies and Distribution.

H. d. brevipennis (Giraud, 1851) – E Mexico (SE San Luis Potosí, N & C Veracruz, N Oaxaca, S Chiapas).

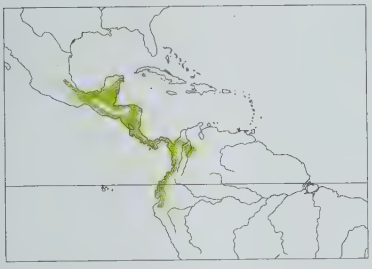
H. d. dickermani Parkes, 1991 – SE Mexico (S Veracruz E to Tabasco, N Chiapas and W Campeche).

H. d. phillipsi Parkes, 1991 – SE Mexico (E Campeche and Quintana Roo) and N Belize.

H. d. decurtatus (Bonaparte, 1838) – S Belize and Guatemala S to C Panama.

H. d. darienensis (Griscom, 1927) – C Panama E to NW Colombia (E to Santander).

H. d. minor Berlepsch & Taczanowski, 1884 – Pacific lowlands from W Colombia S to extreme NW Peru (Tumbes).



Descriptive notes. 9·4–10·2 cm; 6·6–10·3 g. Nominate race has top and side of head grey-blue, lores greyish, whitish eyering and often a narrow paler supraloral stripe; upperparts bright dark olive-green, rump olive-green; primaries and secondaries dark greyish, bright greenish on outer webs (giving green colour to closed wing), rectrices greyish-green; chin whitish, throat pale grey, chest very pale lemon-yellow, belly whitish, flanks and vent greenish-yellow; axillaries and underwing-coverts yellow; iris dark brown; bill dark grey above, pale grey to horn below; legs pale grey or leaden blue. Sexes alike. Juvenile is pale brownish-olive on crown, with side of head dull buff, back dull olive-green, throat and chest tinged buffy. Race *brevipennis* has crown pure grey, contrasting with grass-green back, pale lores and ear-coverts, flanks brighter green and axillaries richer yellow than nominate; *dickermani* has back darker, duller green (contrasting less with crown), extensive green on flanks, white throat but little or no white on underparts, axillaries duller yellow; *phillipsi* is duller and greyer above than other races, crown sometimes tinged brown, flanks and undertail-coverts paler, axillaries pale yellow; *darienensis* has crown washed with olive, little or no contrast with back; *minor* is more brightly coloured than last, greenish-yellow of sides and flanks darker and more extensive. Voice. Song described as a pleasant, rather quiet series of 2–3 phrases, continuously repeated and then changing into different motif, "chi-chi-cher cher cher"; female may sometimes sing with shortened version of same type. Calls include a faint "churr" or a dry, rolled rattle, and various harsh, scolding nasal notes.

Habitat. Humid, evergreen forest, forest edge and semi-deciduous forest, from sea-level to 1000 m; occasionally higher, to 1200 m in Costa Rica and 1700 m in Panama. Occurs also in drier deciduous forest in Peru.

Food and Feeding. Food mostly invertebrates; some arillate seeds (*Alchornea*) also taken. Nestling diet apparently invertebrates only, i.e. winged and larval insects, including caterpillars. Active restless forager, mostly in canopy, also lower down or in bushes in second growth. Forages mostly in green foliage; also investigates curled-up dead leaves, sometimes hanging upside-down. Usually in pairs or family groups; frequently in mixed flocks.

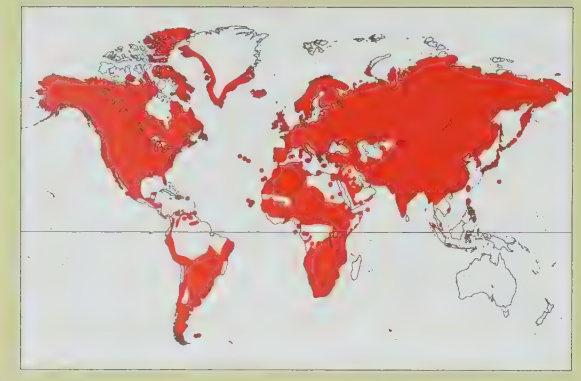
Breeding. Breeding from Mar and nest-building as late as end Jun in Belize; nests Feb–May in Costa Rica; birds in breeding condition in May in NW Colombia. Nest a deep cup or pouch made from dead leaves, bamboo strips and grasses, lined with fine vegetable fibres, attached by its rim with cobwebs and fine plant fibres to narrow twigs 4–14 m above ground in fork of branch. Clutch 2 eggs, white with little gloss, heavily spotted and blotched, especially around blunt end, with pale brown; incubation, probably by female alone, c. 16 days; small chicks brooded by female, young fed by both sexes, nestling period c. 12 days.

Movements. Apparently sedentary.

Status and Conservation. Not globally threatened. Common or abundant over much of its range. Able to adapt to modified habitats, including regenerating forest.

Bibliography. Howell & Webb (1995), Jones (2003), Phillips (1991), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Russell (1964), Skutch (1960), Stiles & Skutch (1989), Todd (1929a), Winker *et al.* (1994).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family FRINGILLIDAE (FINCHES)





- Small to medium-sized passerines with relatively to very stout, conical bill; plumage highly variable, often colourful.
- 9–25 cm.
- Holarctic, Neotropical, Afrotropical and Oriental Regions; introduced in Australasia.
- Almost all habitats; most species in mixed woods, thickets and adjacent semi-open areas, forest edges and clearings with mosaic of grassland, shrubs and small trees, also farmland, especially stubble, orchards, plantations, parks, gardens and tree-lined suburban streets.
- 29 genera, 144 species, 406 taxa.
- 11 species threatened; 1 species and 1 subspecies extinct since 1600.

Systematics

The finches, as presently defined, comprise two distinct subfamilies, Fringillinae and Carduelinae, sometimes regarded instead as tribes, Fringillini and Carduelini. Nevertheless, the systematics of the "seed-eaters", small to medium-sized passerines with a relatively stout conical bill and largely vegetarian habits, have long been in a state of flux and, with increasing insights from molecular studies, remain so. It is, therefore, unlikely that the present family classification will stand long into the future. Indeed, one species currently included, Przevalski's Rosefinch (*Urocynchramus pylzowi*), has recently been shown by J. Groth to merit, on genetic and morphological grounds, its own monotypic family, Urocynchramidae, as suggested as long ago as 1918; it has ten full primaries, not the nine of all other "true" finches. On the other hand, there is now strong molecular evidence that the Hawaiian honeycreepers (Drepanididae) represent an offshoot of the true finches, and that the genera *Euphonia* and *Chlorophonia*, traditionally placed in the tanager family (Thraupidae), represent another.

Certainly, the English vernacular name of "finch" has been applied to members of as many as nine other seemingly distinct taxonomic groups of birds, all of which eat seeds. These are the buntings and New World sparrows (Emberizidae); the tanagers, now commonly including the Caribbean "bullfinches" in the genera *Melopyrrha* and *Loxigilla*, and the Galapagos finches in the subfamily Geospizinae; the cardinals (Cardinalidae); the weavers (Ploceidae), including the buffalo-weavers in the subfamily Bubalornithinae; the waxbills (Estrildidae); the whydahs and indigobirds (Viduidae); and the sparrows (Passeridae). A particular confusion exists in the last group owing to the presence within it of what are called "snowfinches" in English and *Montifringilla* in Latin, yet the scientific specific epithet *montifringilla*, which means "mountain-finch", is applied to one of the true finches, while the *Leucosticte* mountain-finches are also, indeed, true finches. The above-mentioned groups form the assemblage of songbirds known as the "nine-primaried oscines", traditionally regarded as incorporating the Fringillidae finches as presently restricted, the Hawaiian honeycreepers, the buntings and American sparrows, the New World warblers (Parulidae), the tanagers, the cardinals, the New World blackbirds and orioles (Icteridae), and the Olive Warbler (*Peucedramus taeniatus*), the last placed in the monotypic family Peucedramidae. Many of the groups, however, are in some respects so close to each other that they were treated by C. G. Sibley and J. E. Ahlquist in a single family, Fringillidae, with two subfamilies, Fringillinae and Emberizinae, yielding a total of almost 700 species.

The finches as currently defined share details of skull morphology, have nine large primaries and twelve large tail feathers, and do not possess a crop, and in all cases the female exclusively has the role of nest-building, incubation of the eggs and brooding of the young. The small subfamily Fringillinae contains a single genus, *Fringilla*, comprising only three species, all around 15 cm in length, with a peaked crown, prominent shoulder markings and a rather long tail, and all rearing their nestlings entirely (or almost entirely) on arthropods. This last trait reflects a significant ecological difference from cardueline finches relating to



Subdivision of the Fringillidae

[Figure: Hilary Burn]

nestling diet, breeding pattern and behaviour. The subfamily Carduelinae holds 28 genera and, on present species-limit interpretations, some 130–145 species; in the present treatment, 141 species are recognized. Ranging from 9 cm to 25 cm in length, including the tail, these have a rounded crown, and they feed their nestlings largely with seeds. This subfamily has itself sometimes been subdivided into several seemingly well-defined groupings, based largely on ecology, behaviour and morphology, these including the typical carduelines (genera *Serinus*, *Carduelis* and *Loxia* among them), the desert finches (*Rhodopechys*, *Rhodospiza*, *Bucanetes* and *Eremopsaltria*), the bullfinches (*Pyrrhula* and, despite its English name, *Pinicola*), and the grosbeaks (*Coccothraustes*, *Eophona*, *Mycerobas* and *Hesperiphona*). In reality, however, there is a great need for substantially more molecular, morphological and behavioural evaluation of many very poorly known genera that sit in conventional lists between these groups, the positions of which are rather arbitrarily decided, and it would be unwise at this stage to be literally categorical about finch phylogenetics. An indication of the fragility of such an arrangement as the one above is that the genera *Bucanetes*, *Eremopsaltria*, *Pyrrhula* and *Pinicola* (as well as *Leucosticte*) are known to possess sublingual pouches for food storage when provisioning young, which suggests that they may well be derived from a relatively recent common ancestor and that a taxonomic subdivision of the "desert finches" is therefore likely to be mistaken.

Fringillid finches are represented naturally, but rather sparsely in terms of species numbers, in the Nearctic and the Neotropics, the latter involving mainly a radiation of the genus *Carduelis*, and in mainland Africa, again largely involving one significant and, on molecular evidence, rapid radiation, this time of the genus *Serinus*. A large percentage of the species, however, is found in the Palearctic and Oriental Regions, with the greatest variety of genera and a high number of species focused on the interface between these two biogeographical regions in the Himalayas and their associated mountains and plateaux. The family rapidly tails off in number in South-east Asia and the East Asian archipelagos, where it is represented by only three endemic species, the Vietnamese Greenfinch (*Carduelis monguilloti*), the White-cheeked Bullfinch (*Pyrrhula leucogenis*) and the Mountain Serin (*Serinus estherae*), and it reappears in Australasia only by virtue of human introductions of European species.

Key findings of recent molecular-genetic studies by B. Nguembock and co-workers, building on studies by R. van den Elzen, P. G. Ryan and, especially, A. Arnaiz-Villena and their respective co-workers, are that the conventional distinction between *Serinus*, defined principally in terms of its yellow patches of colour, brown streaking, general lack of wingstripe and rather more terrestrial behaviour, and *Carduelis*, which combines more colours, notably pinks and reds, bolder black and more extensive tracts of grey, with a stronger perching habit and more frequent presence of a wingstripe, is rather illusory. In the present treatment there are 37 species of *Serinus*, the great majority of them, 30, being Afrotropical, in which region the members of this genus become notably duller and streakier. It now appears, however, that these African species largely cluster into several clades and subclades for which the generic names *Ochrospiza*, *Dendrospiza* and *Crithagra* are available, leaving a few species, including the Cape Canary (*Serinus canicollis*), grouped in the "true *Serinus*" with, of course, the European Serin (*Serinus serinus*) and Red-fronted Serin (*Serinus pusillus*). Meanwhile, true *Serinus* appear to be far more closely related to certain members of *Carduelis*, perhaps unsurprisingly in the case of the Red-fronted Serin, given its resemblance to an overly dark Common Redpoll (*Carduelis flammea*). One extraordinary case illustrating how phenotypic variation can mask true affinity has, however, recently come to light through researches by M. Melo, who has found that the Sao Tome Grosbeak (*Neospiza concolor*), despite its great size and all-brown coloration, seems to be very closely related to the Principe Seedeater (*Serinus rufobrunneus*) and should, apparently, be included in the latter's genus.

Overall, modern opinion about the genus *Serinus* inclines to distribute its members with relative evenness between the genera mentioned above, together with *Poliospiza*, which serves a group of four species that has yet to be confirmed as monophyletic. The appropriate generic placement of certain taxa within this broken-down arrangement of *Serinus* still remains unclear, however, and this includes the position of the Principe Seedeater and hence the Sao Tome Grosbeak, as well as that of two perhaps relict geographical outliers, highly disjunct from the core *Serinus* range in Africa and the Middle East, namely the Tibetan Siskin (*Carduelis thibetana*), occurring from the eastern Himalayas to western China, and the Mountain Serin, with its bizarre and unique range in the mountains of Sumatra, Java and Sulawesi, in Indonesia, and Mindanao, in the Philippines. The Tibetan Siskin may belong in *Serinus*, and the Mountain Serin has, with perhaps greater justification in terms of phenotype, at times been put in



The subfamily Fringillinae contains a single genus, Fringilla, *with just three currently recognized species. However, the 14 races of the* **Common Chaffinch** *are considered to form three groups, each of which may merit full species status on grounds of morphological and genetic differences. The race* canariensis, *from the central Canary Islands of Tenerife and Gran Canaria, forms one such group with* ombriosa *and* palmae *from the south-west and north-west Canaries respectively. The larger and heavier-beaked Blue Chaffinch* (F. teydea) *is found in the Canary pine* (Pinus canariensis) *forests of Tenerife and Gran Canaria.*

[*Fringilla coelebs canariensis*, Aguamansa, Tenerife, Canary Islands. Photo: Rafael Armada]





In mainland Africa, the fringillid finches are mainly represented by the genus Serinus. *Thirty out of the 37 species of* Serinus *are Afrotropical, the result of a rapid radiation, according to molecular evidence. The name "serin" is derived from the Latin "*citrinus*", and refers to the yellow colour, as illustrated by the* ***Yellow Canary*** *of southern Africa. But elsewhere in Africa* Serinus *species are notably dull and streaky, characteristics shared by the* ***Yemen Serin****. Most African species appear to cluster into several clades, which may be more appropriately assigned their own genera. Mitochondrial-DNA analysis of the Black-faced Canary* (S. capistratus), *for example, indicates that it is only distantly related to other African* Serinus *species, and it has been proposed that it be placed in a separate genus,* Dendrospiza, *along with two of the five races of the African Citril* (S. citrinelloides). *The two European citril finches have already been transferred back from* Serinus *to* Carduelis. *Just a few "true"* Serinus *species would be left, including the European Serin* (S. serinus), *Red-fronted Serin* (S. pusillus), *Cape Canary* (S. canicollis) *and Yellow Canary.*

[Above: *Serinus flaviventris flaviventris*, Calvinia, South Africa. Photo: Hugh Chittenden.

Below: *Serinus menachensis*, Tawi Atayr, Oman. Photo: Hanne & Jens Eriksen]

Carduelis. Meanwhile, in the arrangement currently followed, three southern African species often placed in *Serinus*, namely the Cape Siskin (*Pseudochloroptila totta*), the Drakensberg Siskin (*Pseudochloroptila symonsi*) and the Black-headed Canary (*Alario alario*), are referred to two other genera. The first two differ from *Serinus* in their habit of nesting in cavities, while the last is highly distinctive in appearance, the male having a plumage pattern recalling that of a Reed Bunting (*Emberiza schoeniclus*). Moreover, although the African Citril (*Serinus citrinelloides*) remains in the genus *Serinus*, it is in line to be removed to *Dendrospiza*, while the two European citril finches have been transferred back to *Carduelis*.

In the study led by Nguembock, South American *Carduelis* finches, most of them boldly patterned in varying combinations of yellow and black, were found to be monophyletic and sufficiently distinct to be grouped together into the genus *Sporagra*. The Lesser Goldfinch (*Carduelis psaltria*) appeared something of an outlier, placed in its own genus *Pseudomitris*, although further study may indicate that other endemic North American *Carduelis* goldfinches also belong there. Meanwhile, the *Loxia* crossbills sat closest to the redpolls and the Eurasian Siskin (*Carduelis spinus*). In strong contrast, the greenfinches, currently treated as part of *Carduelis*, emerged as allies of the Oriole Finch (*Linurgus olivaceus*), as might intuitively be expected on the basis of the coloration of the latter's female, and this relationship, if corroborated, could require the resurrection of the genus *Chloris*. Another study has indicated that the Desert Finch (*Rhodospiza obsoleta*), too, is related to the greenfinches, a rather surprising finding. The relatively isolated positions of the Common Linnet (*Carduelis cannabina*) and the redpolls would suggest that linnets, distinguished by, among other things, the presence of a white flash in the primaries and hence including the Twite (*Carduelis flavirostris*), require the reinstatement of the genus *Linaria* and the redpolls that of *Acanthis*.

While some of these insights will, inevitably, be altered by future research, they do show a degree of concordance with other findings, notably those of A. Arnaiz-Villena and co-workers, whose studies similarly indicated the proximity of crossbills to redpolls, the clustering into one clade of *Pyrrhula*, *Pinicola* and *Carpodacus*, along with *Leucosticte*, and the independent lineage of the greenfinches. One intriguing genus the position of which would be illuminated by molecular analysis is *Rhynchostruthus*, comprising the Somali (*Rhynchostruthus louisae*), Arabian (*Rhynchostruthus percivali*) and Socotra Grosbeaks (*Rhynchostruthus socotranus*), previously treated as conspecific under the vernacular name of "Golden-winged Grosbeak". The "grosbeak" appearance is probably no good guide to relationships, just as it is not for the Sao Tome Grosbeak. Rather than being a relative of the Asian grosbeaks, *Rhynchostruthus* is more likely, with its greenfinch-like display-flight and a song recalling that of a European Goldfinch (*Carduelis carduelis*), to be a modified relative of *Carduelis* or even, perhaps, of the large-billed *Serinus* of Africa, such as the Northern Grosbeak-canary (*Serinus donaldsoni*), which are now thought to deserve recognition under *Crithagra*.

The position of what in this sequence is a near-relative, the monotypic Spectacled Finch (*Callacanthis burtoni*), remains unclear. In plumage pattern, this species resembles a cross between a *Carpodacus* rosefinch and a *Eophona* grosbeak. According to recent molecular work, however, the genera with which it is usually associated form a general taxonomic group; many of these genera have a centre of distribution in the Himalo–Tibetan mountain region, and each has members showing some pink or red in the plumage, both of which qualifiers *Callacanthis* fits. The high-elevation *Leucosticte* forms a group with the dry-country *Bucanetes* and *Eremopsaltria*, and is closely related to a clade containing all except one Old World *Carpodacus* along with two monotypic genera, *Uragus* and *Haematospiza*, which, despite the distinctiveness of their respective plumages, appear genetically to be *Carpodacus* rosefinches. The position of what is here the monotypic genus *Rhodopechys*, represented by the Crimson-winged Finch (*Rhodopechys sanguineus*), has not been investigated. The extinct Bonin Grosbeak (*Chaunoproctus ferreorostris*) appears outwardly to have derived from *Carpodacus*, while the



Confined to the highlands of Lesotho and a small adjacent area of east-central South Africa, the ***Drakensberg Siskin*** *was long considered a race of the Cape Siskin* (Pseudochloroptila totta). *The two species are very similar, distinguished mainly by the white tips on the primaries and tail feathers of the Cape Siskin. However, their ranges are separated by several hundred kilometres. Formerly included in* Serinus, *the two species were moved to their own genus on grounds of morphology, different courtship displays, and their habit, unlike any* Serinus *species, of nesting in cavities in rocks, cliffs and trees.*

[*Pseudochloroptila symonsi*, Sani Pass, South Africa. Photo: Hugh Chittenden]



The race leucolaemus *of the* ***Black-headed Canary*** *can have variable amounts of white on its head, some individuals showing more white than black. The nominate form has a solid jet black head and bib, with a broad white half-collar extending from the nape to the side of the breast. The two races have been treated as separate species, but they intergrade in north-west South Africa. In both races the plumage is strikingly reminiscent of buntings (Emberizidae). Formerly placed in* Serinus, *where it stood out among the other, generally drab and streaked, African "canaries", the Black-headed Canary now occupies the monospecific genus* Alario.

[*Alario alario leucolaemus*, Calvinia, South Africa. Photo: Hugh Chittenden]

New World *Carpodacus* appear to be more distantly related and may merit a genus of their own, *Burrica*.

The Dark-breasted Rosefinch (*Carpodacus nipalensis*), however, is genetically anomalous and appears to be entirely unrelated to its congeners. There is speculation that it may in fact be fringilline, rather than cardueline, in its affinities, and the genus *Procarduelis* is available to accommodate it. Two species often included in *Carpodacus* and on morphological evidence closely related, the Red-fronted Rosefinch (*Pyrrhospiza punicea*) and Roborovski's Rosefinch (*Kozlowia roborowskii*), are retained in separate genera on the basis of the curved culmen, ridged lower mandible, strong feet and slightly notched tail of *Pyrrhospiza*, and the thin pointed bill, long wings and short legs of *Kozlowia*. The monotypic Crimson-browed Finch (*Propyrrhula subhimachala*) fits with *Carpodacus* in all except its large size, and the modern view is that it is more closely related to rosefinches than it is to *Pinicola*, a genus in which it is often placed.



Currently placed in the monotypic genus Linurgus, *the* ***Oriole Finch*** *may be close to some Palearctic species currently occupying* Carduelis*; the female is very similar in plumage coloration to the European Greenfinch* (C. chloris). *The four races of the Oriole Finch have quite disjunct distributions, and the males show some strong plumage differences, such as the absence of a yellow collar in* prigoginei, *and the bright golden-yellow back of* elgonensis. *A more detailed and comprehensive analysis of all populations is needed to determine whether more than one species is involved.*

[*Linurgus olivaceus olivaceus*, Mt Cameroon, Cameroon. Photo: Ketil Knudsen]

Despite the reddish, slightly stippled plumage of the male, the Pine Grosbeak (*Pinicola enucleator*) is not particularly close to the *Carpodacus* rosefinches. The structure of its bill, short, deep, and with a decurved culmen overlapping the lower mandible, points instead to a close affinity, supported by DNA evidence, with the bullfinches in the genus *Pyrrhula*, all seven species of which share several distinctive characters: a sharply defined black cap or black face, always including the lores and chin, a black or blue-black tail and wings with a pale wingbar on the greater coverts, clear-cut white on the rump, and soft plain grey, buff, orange or pink in the remaining plumage. All the species in this group have notably soft body feathering, which in the case of the Pine Grosbeak, at least, is important in thermoregulation. In the analysis by Nguembock and colleagues, the highly distinctive Gold-naped Finch (*Pyrrhoplectes epauletta*), which in plumage pattern and colour resembles a *Tachyphonus* tanager more than it does a finch, was found to be most closely related to *Pyrrhula*.

The strikingly large-billed carduelines in the Old World genera *Coccothraustes*, *Eophona* and *Mycerobas* and the New World *Hesperiphona* appear to represent a deep branch in the cardueline clade. Molecular and morphological evidence indicates a close relationship of *Eophona* and *Mycerobas*, and the similarity in male plumages between the Black-and-yellow Grosbeak (*Mycerobas icterioides*) and the Hooded Grosbeak (*Hesperiphona abeillei*) suggests a possible strong link. However, there is also at least a superficial morphological similarity between *Coccothraustes* and *Hesperiphona*, such that the two species in the latter genus have been treated in the former, rather than in *Mycerobas*. *Coccothraustes*, with its curiously modified wing feathers, short tail, unusual overall plumage pattern, very quiet song and rather unusual egg coloration, is ostensibly the most

anomalous of these grosbeaks, although in one molecular study it grouped closely with *Eophona*.

Species limits among the finches are, as with other bird families, constantly being redrawn. G. M. Kirwan and co-authors, for example, have recently advanced plausible cases to be made for the splitting of the Crimson-winged Finch into two species, and their proposed split of the "Golden-winged Grosbeak" into three has already been adopted in the present treatment, while P. C. Rasmussen has set out fairly dramatic alterations to the number of species of Asian *Carpodacus* rosefinches, elevating no fewer than five subspecies to species level. Some cases are so borderline that they prompt widespread debate and analysis, using different evidence and criteria. The splitting-off of the Mediterranean populations of the Citril Finch (*Carduelis citrinella*) under the name of Corsican Finch (*Carduelis corsicana*) on grounds of plumage, vocal, ecological and molecular differences has been contested, with strong arguments on both sides; in reality, the Corsican Finch is not ecologically so different from the Citril Finch, at least in some populations, and the differences in its voice can be regarded as being at the dialectal level. The case of another insular West Palearctic taxon, the Azores Bullfinch (*Pyrrhula murina*), clearly an offshoot of the Eurasian Bullfinch (*Pyrrhula pyrrhula*), is interesting. Although it is morphologically distinctive, its status as a full species, and, incidentally, a highly threatened one, is still not accepted in some quarters owing to the absence of a confirmatory peer-reviewed publication.

Since there is no clear threshold of genetic distance by which taxa can be measured for species or subspecies status, molecular work alone is not likely to resolve this and many other species-level matters. Nevertheless, it can provide compelling insights, as in the case of the *Leucosticte* rosy-finches of North America, where recent DNA studies have revealed high levels of genetic similarity among the three species admitted in the present treatment, the Grey-crowned Rosy-finch (*Leucosticte tephrocotis*), Black Rosy-finch (*Leucosticte atrata*) and Brown-capped Rosy-finch (*Leucosticte australis*), with the recommendation that all three be re-merged into a single species under the name *Leucosticte tephrocotis*. Similar suggestions have been made for the existence of a single species of redpoll. Although in parts of their ranges where the different redpoll species meet they do not hybridize, this may merely be a consequence of their migratory habits in those areas; in other areas, repeated studies have found that the taxa intergrade and exhibit no constant morphological or genetic characters enabling them to be separated at the species level.



The large-billed "grosbeak" appearance is not a reliable guide to taxonomic relationships. The songs, calls and slow-winged display-flights of the ***Socotra Grosbeak*** *and its congeners suggest a close relationship with* Carduelis *finches, such as the Yemen Linnet* (C. yemenensis) *and the European Greenfinch* (C. chloris). *The three* Rhynchostruthus *grosbeaks—Socotra, Somali* (R. louisae) *and Arabian* (R. percivali)*—were all formerly lumped to form a single species, the "Golden-winged Grosbeak".*

[*Rhynchostruthus socotranus*, Wadi Ayhaft, Socotra. Photo: Jon Hornbuckle]

An exceptionally interesting case is presented by the Scottish Crossbill (*Loxia scotica*), and, indeed, by crossbills in general. *Loxia* crossbills are conifer-seed specialists whose bill morphology and body size are related to the size and structure of the cones on which



Phylogenetic analysis suggests that the ***Yellow-breasted Greenfinch*** *may form a superspecies with the European* (C. chloris), *Oriental* (C. sinica), *Black-headed* (C. ambigua) *and Vietnamese Greenfinches* (C. monguilloti). *These species are not only closest to one another, but may also be only distantly related to other taxa currently placed in* Carduelis. *The resurrection of the greenfinch genus* Chloris *has been proposed. The Oriole Finch* (Linurgus olivaceus), *currently in a monotypic genus, seems to have more affinities with these species than with other* Carduelis *finches, and could also warrant inclusion in* Chloris.

[*Carduelis spinoides spinoides*, Tibet. Photo: Pingzhao Luo]



*The relationship between the **Arctic Redpoll** and the Common Redpoll* (Carduelis flammea) *is complex. The Arctic Redpoll has been regarded as a race or colour morph of the Common Redpoll, and the two species hybridize in Norway. The Lesser Redpoll* (C. cabaret) *has similarly been regarded as a morph of the Common, and these two have been known to hybridize. Mitochondrial-DNA analysis suggests the three are closely related sister species, or form a superspecies. Another school of thought is that the redpolls should continue to be regarded as a single species, since they exhibit no constant genetic characters enabling them to be separated at the species level, and some populations include plumage morphs characteristic of the different "species", plus intermediate forms. Arctic Redpolls are generally, but not always, paler than Common Redpolls—whence the alternative name Hoary Redpoll. Other field characters used to separate them include the white rump of the adult and first-winter male Arctic Redpoll, and the short stubby bill partly hidden by longer, denser frontal feathering. Common and Arctic Redpolls both have body feathers which are soft-tipped and elongate to trap air efficiently against the body, providing insulation against the cold.*

[*Carduelis hornemanni exilipes*,
Inari, Finland.
Photo: Markus Varesvuo]



The American Goldfinch (Carduelis tristis) *is unusual among finches in that it replaces its body plumage in the spring. Most finches completely replace their feathers in a single moult at the end of breeding, and the changes at the start of the next breeding season result from the abrasion of the dull tips of the feathers, exposing the brighter colours underneath. In* ***Lawrence's Goldfinch****, for example, the yellow breast feathers of the males are unusually resistant to wear, so that the yellow on the breast appears to expand and brighten, as the less durable grey feathers surrounding them abrade.*

[*Carduelis lawrencei*, Riverside County, California, USA. Photo: Brian E. Small]

they feed. Moreover, the birds' flight and excitement calls co-vary with body size, allowing different taxa or different populations to be separated, at least in sonagraphic analysis. In North America, work by Groth has revealed the existence of many different forms of crossbill which seem to preserve their identity through specialization on particular species of conifer. In 2009 a newly discovered form, the "South Hills Crossbill" was described as a new species "*Loxia sinesciuris*", on the basis of small but well-maintained differences, developed largely because of absence of competition for pine (*Pinus*) cones from squirrels (Sciuridae). Whether the ornithological community in general will ultimately class this form as a valid species or merely another "type" remains to be seen. In the Western Palearctic, the existence of two species, the Red Crossbill (*Loxia curvirostra*), specializing on Norway spruce (*Picea abies*), and the Parrot Crossbill (*Loxia pytyopsittacus*), specializing on Scots pine (*Pinus sylvestris*), has long been acknowledged, but acceptance of the existence of a third species, the Scottish Crossbill, intermediate in bill size, continues to be slow in coming. Extensive work by R. W. Summers and co-workers has succeeded in establishing that, first, there are virtually no genetic differences between Red, Scottish and Parrot Crossbills, but that, second, assortative mating by Scottish Crossbills, demonstrated by call-type matching within mated pairs, takes place in areas of sympatry with populations of Parrot and Red Crossbills.

Even so, such assortative mating is not absolute, and there is enough genetic exchange with Parrot Crossbills to argue that species status for the Scottish Crossbill is still unachieved. There remains the question of the other large-billed crossbills, all currently considered subspecies of the Red Crossbill, which live isolated in montane pine areas of the Mediterranean region, namely *corsicana* in Corsica, *balearica* in the Balearic Islands, *poliogyna* in North Africa, *guillemardi* on Cyprus and *mariae* in south-west Crimea, along with other large-billed forms on several Asian mountain ranges. All these forms could have as much justification of species status as does the Scottish Crossbill and, unlike the latter, they do not come into contact with the Parrot Crossbill. Moreover, it is possible to put another construction on the evidence, by reference to the concepts of demes and of resource polymorphism, a condition exhibited by, for example, the Black-bellied Seedcracker (*Pyrenestes ostrinus*), a member of Estrildidae. Populations—demes—of crossbills have adapted their bill morphology to the extraction of seeds from different cones according to geographical variation in tree species, and in so doing they are clearly evolving along independent evolutionary trajectories, selection favouring birds of different bill sizes in different regions. On the other hand, the pronounced fluctuations in cone production typical of many conifer species result in large-scale movements of these semi-specialized demes into regions where different cones are available. In such situations, selection may act against overly specialized bills, and individuals may at times gain from mating with birds possessing different-sized bills. Moreover, since young finches tend to adopt the calls of their parents or mates, what appears as assortative mating by means of voice type may, in fact, represent a degree of vocal copying. Recent studies by P. Edelaar, M. I. Förschler, E. Kalko, K. B. Sewall, and A. Borras and co-workers show that multiple vocal types exist within crossbill populations, not just among the established subspecies, but the discovery of an increasing number of these types is generating increasing uncertainty that each can possess a taxonomic identity, rendering the notion of a resource-polymorphic species considerably more attractive as an explanation of the phenomenon. Under this explanation, all *Loxia* crossbills without white wingbars, even the Parrot Crossbill, should be considered to be members of one and the same species.

Morphological Aspects

Fringilline and cardueline finches range in size from 9 cm to 25 cm and in mass from 8 g to 99 g. Both subfamilies exhibit slight sexual size dimorphism, females being fractionally smaller than males, and both have fairly long, blunt-pointed wings and scutellate tarsi, booted at the side and ridged at the rear; the open, oval nostrils are situated near the base of the bill, partly covered by feathers, and with weakly developed rictal and nasal bristles. The bill type, rather long with a straight culmen, the tail type, fairly long and slightly forked, and the notable sexual dimorphism in plumage found in fringillines sit within the spectrum of



Phylogenetic analysis indicates that the South American siskins are only distantly related to their Old World namesakes, and may warrant a genus of their own. Speciation probably started with a north-to-south separation along the Andean spine, with a second split around the Peruvian Andes. The ***Black Siskin****, apparently one of the most recent species, is sister species of the Yellow-bellied Siskin* (Carduelis xanthogastra). *The males of most of these species are predominantly yellow and black, with black hoods of varying extents. In the Black Siskin, the yellow is reduced to wing-flashes and the undertail-coverts and vent.*

[*Carduelis atrata*, Titicaca, Bolivia. Photo: Jussi Vakkala]

variation found in carduelines; in the latter, the bill, though typical of seed-eaters, is widely variable in form and function, the tail ranges from stubby to long, and is rounded, squared, notched or lightly forked in shape, while the dimorphism in plumage colour is slight, as shown by the European Goldfinch, to very striking, as in the Eurasian Bullfinch. The fringilline leg, however, is relatively long, and the foot is not adapted to grasp food or cling to vegetation, a key feature of the Carduelinae and a condition most highly developed in the crossbills of the genus *Loxia*.

In terms of plumage coloration, the English names tell it all. The names "redpoll", "rosefinch", "greenfinch" and "goldfinch" define certain genera and groups; moreover, the word "serin" is a corruption of the Latin *citrinus*, from which is derived "citril". In addition, species are frequently defined by single colours: yellow, brimstone, saffron, orange, red, scarlet, purple, brown, blue, black, black-and-yellow and, rather lonely in this parade, olivaceous. Of course, although one or two come close, no species is of solely one colour. In fact, the most immediately striking thing about many finches is the combinations and contrasts of many colours that they show. These are sometimes very bold, as in the genera *Fringilla*, *Rhynchostruthus*, *Coccothraustes*, *Mycerobas*, *Eophona*, *Hesperiphona*, *Pyrrhula* and *Pyrrhoplectes*, thus mainly in species associated with extensive tree cover, but they can also be relatively subtle, with combinations of softer and grading colours that reflect the constraints imposed by selection through the need for a degree of camouflage in more open country. Finches are commonly brownish, olive or grey on the upperparts, sometimes with darker streaking and/or a relatively distinctive rump in white or shades of yellow or pink, and yellowish, buffy and/or whitish on the underparts, often with streaking. The head and throat, however, typically show a stronger pattern involving the colours black, red and yellow, and a variously demarcated crown, cap, forehead, mask, cheek, chin or hood. The wings frequently exhibit bars and patches of yellow, white or pink, and this is true, to a lesser extent, of the tail, where the markings are typically on the outer feathers. In the case of juveniles, which are still more in need of camouflage, the plumage is usually browner or greyer, marked with dusky streaks, and lacking contrastingly coloured patches except in the wings and tail, although the juvenile Hawfinch (*Coccothraustes coccothraustes*) differs in having light barring, rather than streaking.

In certain species, the colour of males, particularly red, is influenced by diet, owing to the effects of carotenoids. This was demonstrated dramatically by a population of the House Finch (*Carpodacus mexicanus*) on Hawaii, which, following its introduction there in the 1870s, rapidly lost the typical rosy-red hue of its ancestors and became, instead, dingy orange in colour, causing J. Grinnell to give it the scientific name *Carpodacus mutans*



The Leucosticte *mountain-finches and rosy-finches have been found to be genetically close to other genera of arid environments, such as the Trumpeter Finch* (Bucanetes githagineus) *and the Old World* Carpodacus *rosefinches. In the breeding season they develop two pouches under the lower jaw for carrying food to the young, a feature they share with bullfinches* (Pyrrhula) *and the Pine Grosbeak* (Pinicola enucleator), *among others.* Leucosticte *has a centre of radiation in the Himalo–Tibetan mountain region. Three of the Asian species, including* ***Brandt's Mountain-finch****, are very widely distributed. The fourth, Sillem's Mountain-finch* (L. sillemi) *is known only from two specimens from south-west China.*

[*Leucosticte brandti brandti*, May-Saz, Kyrgyzstan. Photo: Hanne & Jens Eriksen]

in the belief that it had evolved into a new species. In a similar way, the descendants of eleven yellow canaries released on Midway Atoll all turned white. In both cases, the change was due to the absence of carotenoids in the foods that the species encountered in their new environments. At about the same time as these introductions were being made, bird-fanciers seeking to produce red canaries discovered that particular foods could have the reverse effects, persisting at least until the next moult, when a new set of feathers was grown. Carotenoids are important for their anti-oxidant properties, and since, in birds, they also provide plumage colour, particularly in males, they could also serve as an honest signal of health: work by G. E. Hill has shown that male House Finches infested with feather mites or infected with avian pox are less brightly coloured than those that are not, presumably because the afflicted males are diverting a proportion of their carotenoids into some form of systemic physiological defence. This circumstance allows females to discriminate the quality of their potential mates, and supposedly they always seek the reddest males that they can find.

Variation in the red colour of the plumage is found also in certain other species, including the Pine Grosbeak and the several species of crossbill. An explanation for the differences in crossbill coloration, however, remains elusive. Most males possess reddish plumage, but a good proportion show a range of other hues from orange to yellowish-green and even bronze, and some are variegated in these colours, sometimes on individual feathers. These latter individuals have often moulted over a period that includes early July, while birds that moult before that time largely acquire yellowish feathers and those that moult after that time are mainly red. Since birds of the year fall into the group that moults before July, they are commonly yellowish, and it cannot therefore be said with confidence that yellowish plumage is a condition produced by age alone. Early July, however, is the period when new conifer cones become available to the birds, and it may well be that it is the carotenoid content of fresh young seeds that produces this interesting pattern of colour variation. Certainly, male crossbills in captivity invariably turn yellow when they moult. The same holds in captivity for the red patches in the plumage of the Common Linnet, the Twite and Common and Arctic Redpolls (*Carduelis hornemanni*), while the red breast of male Eurasian Bullfinches turns into a paler pink. E. del Val and co-workers proposed in a recent study that the liver might act as the main site for the synthesis of the red carotenoids, responsible for the amount of red coloration in crossbills.

All adult finches undergo a single complete replacement of the feathers following breeding each year, beginning around the time of fledging and independence of the last brood. The flight-feathers are replaced sequentially and symmetrically, from the innermost of the nine primaries outwards to the wingtip; when the first few primaries are fully regrown, moult of the six secondaries begins and proceeds from the feather next to the innermost primary, inwards towards the body, the tertials moulting in the order of central, inner and then outer feather. All other feathers, including the rectrices, are replaced within the period of the wing moult. Moult of the twelve rectrices usually begins with the two central feathers and proceeds outwards in pairs, although sometimes other sequences occur and these also may become asymmetrical. After moult, many species are more cryptic owing to the pale dull tips on the head and body feathers, and they typically recover their brighter breeding plumage by abrasion, rather than by a pre-breeding moult, although an exception to this pattern is provided by the American Goldfinch (*Carduelis tristis*), which replaces its body plumage in the spring. In the three fringillines, intensification of spring plumage colours can be accompanied by hormonally driven changes in bill colour. The bill of the male Common Chaffinch (*Fringilla coelebs*) changes from dull white to bluish metal-grey, that of the male Brambling (*Fringilla montifringilla*) from yellowish to blackish, and the bill of the male Blue Chaffinch (*Fringilla teydea*) from greyish to pale blue. In the females, the colour changes are less marked.

The moulting season can be remarkably protracted, sometimes lasting for longer than the breeding season. This is partly because individual finches happen to take a long time over this process, and partly because the end of breeding by individuals within a species can be greatly staggered, leading to wide variation in the dates when they begin to moult. As an extreme example, in southern England adult European Greenfinches (*Carduelis chloris*) take some twelve weeks to moult fully, and may start the process anywhere within a 13-week window, so that moulting individuals can be found during a period of 25 weeks, or a frac-



*The **Black Rosy-finch** and its North American congeners, the Grey-crowned* (Leucosticte tephrocotis) *and Brown-capped Rosy-finches* (L. australis)*, are sometimes considered conspecific with the Asian Rosy-finch* (L. arctoa)*. Recent analysis of mitochondrial DNA indicates that there is indeed close genetic similarity among the four. A different analysis concluded that the three North American forms should be treated as forming a single species. Hybridization has been recorded between the Black and Grey-crowned Rosy-finches.*

[*Leucosticte atrata*, Bernalillo County, New Mexico, USA. Photo: Brian E. Small]

tion under half the year. Crossbills, with their ecology largely detached from the conditions that govern other species, are particularly variable, different individuals moulting at different times, although, in irruption years (see Movements), most delay the moult in late summer in order to migrate. Other finches take less long: the European Goldfinch around eleven weeks, and the Lesser Redpoll (*Carduelis cabaret*) around eight. Moult duration, however, is in part a reflection of latitude: in the USA, House Finches in California can take as long as 17 weeks to complete the moult.

Latitude also affects post-juvenile moult, as does the date of fledging. Typically, young from early broods start 1–2 months after fledging, and young from late broods within two weeks of fledging. Occasional late-fledged juveniles begin to replace their body feathers before their first-generation flight-feathers and tail feathers have yet hardened. In subtropical and tropical regions, post-juvenile moult can involve a complete or near-complete replacement of feathers, and this is true also for a small proportion of cardueline finches in Mediterranean latitudes, such as the European Goldfinch and European Greenfinch. For most temperate species, however, the post-juvenile moult is typically partial, restricted to the body and wing-coverts, the latter including the median coverts and some or all of the inner greater coverts. This fact enables first-year individuals to be distinguished in the hand from older ones by the small juvenile feathers that have been retained. After the next moult, a year later, any remaining juvenile feathers are replaced, so that, from then onwards, the different age groups can no longer be distinguished by plumage.

For most species, the juvenile plumage is superficially similar to the adult female plumage, but some fringillids, such as the European Goldfinch, have a juvenile plumage that is quite different from that of either adult. In some cases, particularly the *Carpodacus* rosefinches, the first-year plumage may differ in other respects, for example in showing less red than that of older birds. The reasons for this are obscure, as are the factors which cause the Common Rosefinch (*Carpodacus erythrinus*) to migrate out of its summer quarters before it undertakes its annual moult, a circumstance not yet found with any other species of true finch. The explanation for this behaviour may lie in the length of migration, for the species is an obligate long-distance migrant travelling from temperate and boreal breeding areas to winter grounds in the subtropics, while most finches that occupy these same breeding areas are short-distance migrants which winter within the temperate zone. In its annual cycle, the Common Rosefinch is like some long-distance sylviid warblers (Sylviidae) and other birds which similarly postpone the moult until after their arrival in distant wintering areas.

Certain other plumage features of a few finch species are worth mentioning. Pine Grosbeaks, capable of enduring considerable cold so long as food supplies remain good, possess a dense fluffy feathering as a form of insulation; the same is true of Common and Arctic Redpolls, the body feathers of which are soft-tipped and elongate to trap air efficiently against the body. European Goldfinches have short, stiff, dense feathers in the red "blaze" that surrounds the bill, presumably as a special adaptation to shield the face from the sharp spines and prickles of the dry flowerheads into which the bird inserts its bill to obtain seeds. Hawfinches possess a beautiful structure of the wings, unknown in any other finch and, indeed, with no real equivalent in any other bird species: the secondaries are square-tipped and appear sheared off in an abrupt line, allowing greater visibility on the folded wing to the notched and recurved tips of the inner four primaries, which sit in a row over the outer five, looking rather like part of a toothed saw. These modifications are common to the sexes and appear to be important in courtship, when the wings are extended and displayed to the prospective partner; they are, however, far more strongly developed on males than on females, and on older males than on younger ones.

The Hawfinch is, of course, better known for its enormous conical bill, which it uses to crush large hard tree fruits, but the bills of all finches share certain characteristics: they are conical or with a light inward curve of both mandibles to a sharp tip, and have straight cutting edges and internal modifications for the efficient processing of hard seeds. The skull, jaw musculature and gizzard are commensurately well developed. Inside the cutting edge of the upper mandible is an internal ridge, one on each side of the palate, so that the cutting edge of the lower mandible fits into the groove between the upper mandible's outer edge and the inner ridge. The groove is wider basally than it is distally, and the internal ridge does not descend as low as the cutting edge of the upper mandible. This arrangement allows a seed to be clamped in the groove by the lower mandible, near the base of the bill if



In the 1960s it was suggested that since the ***Spectacled Finch*** *bears a resemblance to the European Goldfinch* (Carduelis carduelis)*, it might be a Palearctic relict evolved from an ancestral goldfinch. Its plumage pattern also looks like a cross between a* Carpodacus *rosefinch and a* Eophona *grosbeak. Recent molecular work places it close to a group of finch genera that occur in rather extreme and arid environments, including* Carpodacus *and the* Leucosticte *mountain-finches. Like the Spectacled Finch, several other species in this group belong to monotypic genera, including the Long-tailed Rosefinch* (Uragus sibiricus) *and the Mongolian Finch* (Eremopsaltria mongolica).

[*Callacanthis burtoni*, Naini Tal, India. Photo: Jon Hornbuckle]



The nominate form of the ***Crimson-winged Finch*** *breeds in montane areas from the Levant and Turkey eastwards to Central Asia and north-west China. The race* alienus *is found in similar high-altitude habitats in north-west Africa. An analysis mainly based on museum skins found that, while close in general morphology, ecology and habits, the races are more strongly separated in size and shape than previously thought, especially the females. They are also easily distinguishable in most plumages, "with only first-summer males liable to any confusion at their only point of contact, the museum cabinet!" Pending molecular analysis, the researchers make a strong case for the two "races" to be treated as full species.*

[*Rhodopechys sanguineus alienus*, Oukaimeden, Morocco. Photo: Daniele Occhiato]

the seed is large and nearer the tip if it is small, the tongue also pressing it outwards against the inside cutting edge of the upper mandible. The lower mandible splits the husk and works between the husk and the kernel, the tongue now rotating the seed, so that the husk is peeled off outside the bill and the kernel is positioned to drop into the mouth and be swallowed. This entire process takes up to a few seconds, and a bird can hold several small seeds at a time in its bill while de-husking them one after the other. Small, soft unripe seeds, taken directly from the developing seedhead, are normally swallowed whole, several at a time, without prior de-husking.

Larger-billed finches consume a wider variety of seeds than do smaller-billed finches, largely because they are able to do so. Naturally, however, there is a trade-off in efficiency, which means that there is a correlation between the size of bill and the size of seeds preferred. In the case of the Hawfinch, the bill is even more specialized than is that of other finches. Behind the pair of ridges on the palate is a pair of finely serrated horny knobs, matched by



The "desert finches" continue to divide taxonomists. The ***Mongolian Finch*** *has sometimes been placed in* Rhodopechys *with the Crimson-winged Finch* (R. sanguineus), *the Trumpeter Finch* (Bucanetes githagineus) *and the Desert Finch* (Rhodospiza obsoleta), *although all now occupy monospecific genera. As the "Mongolian Trumpeter Finch", it has also been placed in* Bucanetes. *Mongolian and Trumpeter Finches, like* Leucosticte *mountain-finches and* Pyrrhula *bullfinches, develop pouches under their tongues for carrying food to their young, suggesting a recent ancestor different from the other "desert finches".*

[*Eremopsaltria mongolica*, Almaty, Kazakhstan. Photo: Neil Bowman/FLPA]



A sandy-coloured finch with pink-and-black wings, living in arid and semi-arid places, the ***Desert Finch*** *has long been included in the "desert finch" genus* Rhodopechys. *But some workers have remarked on the similarity of the shape of its head and bill to those of the European Greenfinch* (Carduelis chloris), *its greenfinch-like posture as it perches, upright, in trees, and its greenfinch-like vocalizations. Molecular-genetic analysis indicates that it is not closely related to* Rhodopechys, *and that its affinities may indeed be with the* Carduelis *greenfinches. In fact, the Desert Finch or an extinct sister species may be the ancestor of the greenfinch radiation. The Desert Finch is found from Turkey and the Middle East to northern China and western Pakistan. Despite its name, it is less often found in truly arid environments than other so-called "desert finches". Prior to the late 1950s, it was an irregular winter visitor to Israel. A breeding population is now established and locally common, following the development of irrigated agriculture at the edges of desert areas. It has also increased in Jordan and northern Arabia, and was first recorded breeding in north-east Egypt in 1994.*

[*Rhodospiza obsoleta*, Almaty, Kazakhstan. Photo: Neil Bowman/FLPA]



Differing from all other finches and buntings (Emberizidae) in the possession of a tenth primary, ***Przevalski's Rosefinch*** *may belong in its own monotypic family, Urocynchramidae. It is similar in size, some plumage features, and its disproportionately long tail, to the Long-tailed Rosefinch* (Uragus sibiricus). *But in its bill structure, horny palate and song, it resembles the Reed Bunting* (Emberiza schoeniclus), *and it has sometimes been classed as a bunting. Mitochondrial-DNA analysis suggests that Przevalski's Rosefinch is a relict member of a lineage that is as old as, or older than, other families of finches.*

[*Urocynchramus pylzowi*, Qinghai, China. Photo: John & Jemi Holmes]

a similar pair in the lower jaw. Smaller seeds are de-husked in the grooves, as described above, but larger seeds are held between the four knobs, and the strain of cracking them is shared by both sides of the bill, distributing the shock more evenly over the skull. These knobs, incidentally, develop only in the bird's first winter, after the skull has fully ossified, so that before then only softer seeds can be eaten. A force of 27–43 kg is needed to crack a cherry (*Prunus*) stone and one of 48–72 kg to crack an olive (*Olea*) stone, all from a bird itself weighing just 0·05 kg. The muscles that produce these forces form bulges on each side of the bird's head, making it look swollen-cheeked.

Smaller-billed and even relatively slender-billed species may likewise possess well-developed musculature for bill pressure. In these cases, it is as much for opening the bill as for closing it, since the species require a gaping movement in order to lever apart the bracts of cones and other seedheads, first inserting the conical bill into the narrow aperture to begin the process of widening it, then forcing the mandibles apart to increase the effect, and finally using the mandible tips in the manner of tweezers to extract the seeds. European Goldfinches and various siskins have a notably sharp point on the bill for precisely this purpose. By way of contrast and anomaly, the bills of the Pine Grosbeak and the various bullfinches are short, broad, rounded and sharp-edged, all adaptations for cutting off and eating buds, a diet which, at least in the case of the Eurasian Bullfinch, also requires a considerable elongation of the gut.

Among all the finches, and indeed among all the birds in the world (with the possible exception of the barely comparable case of the *Loxops* Hawaiian honeycreepers), crossbills are unique in possessing oppositionally curved tips of the mandibles which strongly overlap when the bill is closed, and which allow the bird to lever out seeds from hard-closed conifer cones. The crossbill's lower mandible twists either to the right or to the left of the upper one, and the jaw muscles are larger on the side to which the lower jaw is deflected. The jaw is specially hinged to allow the lower mandible to move laterally in relation to the upper one, and the tongue has an extra piece of cartilage for scooping the seed. The ratio of "left-over-right" morphs to "right-over-left" morphs is generally 1:1, but it is not known how this ratio is maintained. Fledglings have to wait until day 27 before the lower mandible starts to curve to one side or the other, day 38 before the development is good enough to extract seeds, and day 45 before a degree of self-sufficiency reduces the provisioning pressure on the parents.

Provisioning pressure on some species of cardueline finch is relieved by the development in the breeding season of special gular pouches in which food for the young is stored and carried. The individual bird has two such pouches, positioned under the lower jaw, each with a separate opening on the right or left of the tongue. When full, they give the bird a swollen-throated appearance. They are found in bullfinches, the Pine Grosbeak, certain *Leucosticte* rosy-finches and the Trumpeter Finch (*Bucanetes githagineus*). The reasons for the evolution of these structures in these particular genera are far from clear, but they may suggest a close affinity between them. Other carduelines appear to make do with their distensible gullet for the same purpose of carrying food to their offspring. In general, seeds are unevenly distributed in the environment, and finches have therefore to travel varying but sometimes considerable distances to discover patches from which to bring back food for their nestlings: the evolution of food-storage capability has presumably been a response to this circumstance. In all members of the family, however, the distensible gullet is used also for personal survival, in that it is crammed with seeds at times during the day, and particularly each night before roosting, the bird using this food supply, along with body fat accumulated during the daytime, in order to survive the night. If a finch is caught at dusk, the packed gullet and its contents can be seen if the feathers on the back of the neck are blown aside. This storage facility is especially important for high-latitude species, such as redpolls, during the long, freezing nights of midwinter. Each night, before going to roost, these birds pack the gullet with their staple, high-calory diet of birch (*Betula*) seeds, which, intriguingly, they digest more efficiently at colder temperatures. This feeding adaptation, combined with the plumage

modification mentioned above and the habit of snow-hole roosting (see General Habits), means that redpolls need to deposit extra fat only when the temperatures fall below –12°C.

For other species, the need to deposit fat may be more pressing. Weights of finches generally increase daily by up to 10% from the minimum, and annually by up to 25%. As an example, the weights of the Eurasian Bullfinch are, very roughly, inversely related to food availability, daylength and temperature. Thus, in southern England, the birds are lightest, at 22 g, in July, and are heaviest, weighing 26 g, in January. In winter, the bullfinch modifies its foraging time according mainly to temperature: the colder the weather, the heavier the bird becomes. This is because, in winter, the bullfinches have to get through as many as 16 hours of darkness, and naturally the energy requirements necessary to thermoregulate over such long periods fluctuate with ambient temperature. During the breeding cycle, however, the female is always heavier than the male, partly because of the extra weight of her ovary and oviduct, and partly because of the extra body reserve of fat and protein that she carries at this time. Both sexes lose weight in the course of feeding their young, and then steadily gain weight during the moult and into the winter period. Their young fledge at around 18 g, and gradually increase to around 22 g, at which point they, like their parents, commence moult.

Habitat

As members of a family that has evolved to exploit a wide variety of seeds within largely temperate regions, finches are most typically birds of habitats which show strong seasonal changes. These habitats produce food in localized flushes, and finches are adapted to move between them, taking advantage of temporarily rich resources before dispersing in search of the next crop of seeds, tracking the different foodplants as they set seed at different times of year. Thus, the lives of finches are so tightly bound up with the foods which they eat that descriptions of habitat and, indeed, of migrations are inevitably subtexts for descriptions of foraging areas. For example, the annual cycle of the Eurasian Siskin in Britain follows a pattern in which the species breeds in conifers, feeding there until the seeds are depleted in May–June, and then switches to thistles and other herbaceous plants available on nearby open land. After breeding, it moves into birches in late summer and autumn, before dispersing more widely to areas of alder (*Alnus*), where it spends the winter, feeding first from the cones on the trees and then on fallen seed on the ground. On warm days in winter, however, if conifer cones are available nearby, the birds move back to this food source, reverting to alders on days when conifer cones close again. If no conifer cones are available locally, Eurasian Siskins remain on alders all winter, except for those which visit gardens for peanuts (*Arachis hypogaea*), niger seeds (*Guizotia abyssinica*) and other seeds provided by householders. During the course of a year, their habitats thus include coniferous and deciduous forests, open land near forest, and often also towns and villages.

The itinerant finch, therefore, is not necessarily a strong migrant, although it can be. For the most part, the birds move relatively small distances in the course of a year between patches of food-yielding habitat, and exploit locally available seeds. The consequence is that finch habitat is commonly rather varied, embracing many different combinations and types. The majority of species utilize mixed woods of conifer and deciduous species, riverine thickets and adjacent semi-open areas, forest edges and clearings where grassland, bushes, shrubs and small berry-bearing trees form mosaics, and also anthropogenic landscapes that mimic such conditions; the latter include pastures, cultivated fields, especially seed-rich stubbles, hedgerows, orchards, plantations, parks, gardens and tree-lined suburban streets. The commoner species, such as the Common Chaffinch, Brambling, European Serin, European Greenfinch, American Goldfinch, European Goldfinch and Common Rosefinch, exhibit this catholic flexibility and capacity, which is, of course, the explanation for their commonness.

Even so, closer study of these species reveals that habitat selection still persists within the landscapes that we generalize as their preferred domains. Thus, the Eurasian Bullfinch can be found at densities of 50 pairs per km² in tall deciduous scrub in Britain, but at only 15 pairs per km² in spruce forests in Finland. Similarly, the Common Chaffinch, which breeds in all kinds of woodland, generally lives at highest density in deciduous formations, at medium density in spruce woods, and at lowest density in pine forest, largely as a reflection of the degree of insect availability. Dutch researchers discovered that pine-dwelling



With widely separated ranges in the Middle East, Afghanistan, western China and central China, the four races of the ***Pale Rosefinch*** *may represent different species. They differ in size, in the amount of pink in the plumage, and in the shape and size of the bill. The race* beicki, *for example, the most remote from the nominate, has a shorter and more conical bill and a pronounced whitish eyebrow, and lacks pink except on the rump. The Pale Rosefinch nests in cavities in cliffs and rocks. In a survey of St Katherine Protectorate, Sinai, Egypt, estimates for Pale (or Sinai) Rosefinch numbers had to be adjusted because so many of the birds were congregating to feed on seeds in camel dung along the transect route.*

[*Carpodacus synoicus synoicus*,
Ein Netaphim, Israel.
Photo: David Jirovsky]



Most Asian rosefinches are birds of high-altitude habitats. The ***Three-banded Rosefinch*** *is found in undergrowth and thickets between 2100 m and 3050 m in south-central China. Its range may not include the north-east Indian subcontinent, as was previously thought. This species is generally rather sluggish and silent. An exception to the rather specialized niches exploited by most of this genus is the Common Rosefinch* (Carpodacus erythrinus)*, which has embraced a broad range of lowland and montane habitats. In the early nineteenth century, the Common Rosefinch began to spread westward, and has bred in many western European countries, usually at altitudes below 200 m.*

[*Carpodacus trifasciatus*, Sichuan, China. Photo: He Yi]

Common Chaffinches tended to be yearlings that had been excluded from deciduous woodland by older birds, and the densities of the pine breeders varied far more dramatically from year to year as a consequence of the variation in overall population size. Other pressures can, however, overturn these patterns: in Finnish pine woods the snow melts faster than it does under spruce and, as a consequence of the pressure to breed early, these relatively poor-quality habitats become occupied by breeding birds earlier and often more completely than the better-quality but later-available spruce stands. Where Common Chaffinches breed outside woodland, they nevertheless concentrate in places where tall trees provide suitable conditions, such as parks and gardens, at the junction of three or four mature hedges, or where a hedge meets a copse.

Many species of finch find these habitat conditions at middle elevations in hills and mountains, where variations in terrain, temperature and precipitation create a natural patchwork of vegetation types that produces a strong range of plants yielding seeds



The nominate race of the ***Great Rosefinch*** *is geographically isolated from the other races,* severtzovi, diabolicus *and* kobdensis. *These three other races resemble each other, and differ from the nominate in their plumage, breeding habitat and perhaps also vocalizations. As a result, since 2005 the three have been treated in many quarters as a separate species, the "Spotted Great Rosefinch". It is reckoned that nominate* rubicilla *might actually be more closely related to the Streaked Rosefinch* (Carpodacus rubicilloides).

[*Carpodacus rubicilla severtzovi*, Tingri, Tibet. Photo: Dong Lei]



The race frontalis *of the* ***House Finch*** *is one of eleven subspecies currently recognized. But body size, bill shape, wing and tarsus length and the amount of red in male plumage vary greatly, and the present division of races may not be sustainable. Molecular-genetic analysis strongly suggests that the American* Carpodacus *species are part of a different radiation from that of the Asian* Carpodacus. *Relationships between Old and New World species can be complicated: for example, North America's Purple Finch* (C. purpureus) *is considered to form a superspecies with the Common Rosefinch* (C. erythrinus) *of Europe and Asia.*

[*Carpodacus mexicanus frontalis*,
Cincinnati, Ohio, USA.
Photo: Brian Jorg]

of suitable sizes. Many African and Arabian canaries of the genus *Serinus*, most Asian and North and South American siskins in *Carduelis* and most *Carpodacus* rosefinches conform to this pattern, reflecting significant radiations in these genera to take advantage of the niches available in such habitat mosaics. Among finches with the largest bills, those in the genera *Eophona*, *Mycerobas* and *Hesperiphona* tend to be montane in distribution and generally more confined to true forest and woodland, albeit with a broken or open canopy, although the Hawfinch, in *Coccothraustes*, has penetrated to sea-level and into areas where trees are far more scattered.

Winter habitat selection by species at more temperate latitudes and altitudes tends to involve a greater use of more open country, the birds being less closely tied to tree cover. Cultivated land is highly attractive for the many seeds to be gleaned from the ground and from low weeds, which can concentrate flocks of finches, sometimes in striking numbers. Even so, these birds do not usually allow themselves to stray too far out from the cover of trees and bushes, even if only a low hedge. This is because they are less manoeuvrable and less camouflaged than pipits (*Anthus*) or larks (Alaudidae), so they present increasingly vulnerable targets to small hawks (Accipitridae) and falcons (Falconidae) with increasing distance from cover. It is chiefly the largest flocks that feed farthest from cover, and in large flocks the chance of any one individual being caught during a hawk attack is much reduced. The compact nature of Twite flocks on winter saltmarshes bears witness to this exposure to predation, in an expression of what evolutionary biologists call the "geometry of the selfish herd". This species demonstrated the flexibility of many of the family when it took to wintering in bombed-out Berlin and Hamburg after the Second World War, feeding on the seeds of weeds that then grew in profusion. More interestingly, as these and other cities in northern Germany were rebuilt, the foraging areas were lost, but the species continued to find good roosting habitat on the roofs of many of the taller buildings, flighting out each day to feed in the periurban fields.

In sub-Saharan Africa, the family is represented almost exclusively by a close-knit and generally very similar-looking subset of the genus *Serinus*, some montane, as noted above, but some occupying areas down to sea-level. These latter species sometimes exhibit the same habitat choice, as demonstrated by the Streaky-headed Seedeater (*Serinus gularis*) and the slightly misnamed Forest Canary (*Serinus scotops*), but a good number are to be found in rather drier and relatively more open country. The Cape Canary, Yellow Canary (*Serinus flaviventris*) and White-throated Canary (*Serinus albogularis*), for example, extend into wooded grasslands, fynbos, coastal dunes and beaches; the White-rumped Seedeater (*Serinus leucopygius*), Black-throated Canary (*Serinus atrogularis*) and Yellow-fronted Canary (*Serinus mozambicus*) are largely savanna species, the Lemon-breasted Canary (*Serinus citrinipectus*) favouring *Hyphaene* palm savannas; the White-bellied Canary (*Serinus dorsostriatus*),



Often included in Carpodacus, *the* ***Red-fronted Rosefinch*** *differs from the rosefinches of that genus in its curved culmen and ridged lower mandible, longer wings and tail, and strong feet with curved claws. The male of this species does not appear to acquire its red face and breast until it enters its third year, in the moult following its second summer. Second-summer males are pink on the chin, the side of the throat and the belly. Male Red-fronted Rosefinches are not recorded as breeding in their first year, when their plumage resembles that of the female.*

[*Pyrrhospiza punicea longirostris*,
Wolong Nature Reserve,
Sichuan, China.
Photo: Zhang Ming]

Northern Grosbeak-canary and Southern Grosbeak-canary (*Serinus buchanani*) are birds more of dry acacia (*Acacia*) scrub; and the Protea Canary (*Serinus leucopterus*) favours scrub, fynbos and *Protea* shrubs, although it occurs also in forest. Two species, the Black-faced Canary (*Serinus capistratus*) and Black-eared Seedeater (*Serinus mennelli*), appear to be strictly woodland-dwellers, although the latter favours sites near water, and one, the Kipengere Seedeater (*Serinus melanochrous*), is known exclusively from forest, as is the extraordinary Sao Tome Grosbeak, which has recently been shown to be possibly an aberrant *Serinus* (see Systematics). Perhaps the most specialized of this radiation, however, is the Papyrus Canary (*Serinus koliensis*), which is almost entirely restricted to papyrus (*Cyperus papyrus*) swamps, although it also forages in adjacent farmland.

A single African *Serinus* has extensively colonized lands above the tree-line. The Ethiopian Siskin (*Serinus nigriceps*), endemic to Ethiopia, occupies open moorland, grassy areas of giant heath (*Erica*), alchemillas (*Alchemilla*) and giant lobelias (*Lobelia*), and the edges of cultivation at up to 4100 m. Another Ethiopian endemic, the Ankober Serin (*Carduelis ankoberensis*), is more completely detached from trees, occupying windswept cliffs and rock faces with grassy areas and stunted heath, with patches of pasture and crops, at up to 4250 m. In the Andean Siskin (*Carduelis spinescens*), Thick-billed Siskin (*Carduelis crassirostris*) and Black Siskin (*Carduelis atrata*), South America likewise has a small handful of species that reach beyond the tree-line into *páramo*, Andean steppe and even *puna* grasslands. A single South-east Asian *Serinus*, in fact, the only one in the region, the Mountain Serin, has managed the same thing on three islands in Indonesia and one in the Philippines, while in Eurasia the Twite is the only *Carduelis* whose breeding distribution is centred on moorland and high grassland, including the Tibetan Plateau.

It is, however, in the Himalayas and their high-elevation hinterland that the most specialized montane finches are to be found. The seven members of the genus *Leucosticte*, the mountain-finches and rosy-finches, occupy open boulder-strewn alpine meadows, scree slopes, montane tundra, stony plateaux, snowfields, high-elevation lakeshores and glacial moraines, one species, Brandt's Mountain-finch (*Leucosticte brandti*), reaching as high as 6000 m. How seven such species have evolved to exploit separate niches in a landscape that seems so highly constrained is a point of great interest, although they are not all sympatric, but they are, in any case, not the only high-elevation finches of the region. Also present are two monotypic genera, represented by the Red-fronted Rosefinch, which breeds almost to the limit of vegetation up to 5700 m, and Roborovski's Rosefinch, which occupies desolate stony regions up to 5400 m, as well as the Streaked Rosefinch (*Carpodacus rubicilloides*), which, of all the 19 members of its genus, reaches the highest areas, at 5200 m, and makes the least use of woody vegetation cover.

Four other finches, all seemingly rather closely related, have adapted to similar landscapes in Central Asia, but in generally



Endemic to the northern Qinghai–Tibetan plateau, ***Roborovski's Rosefinch*** *is found in barren rocky areas and alpine grassland at 4300–5200 m, usually in areas shunned by all other bird species. The difficulty of the terrain may account for the paucity of records, and the species may be locally not uncommon. Roborovski's Rosefinch is often included in* Carpodacus, *but its long thin bill, long wings, short legs and shuffling gait are unlike that genus.*

[*Kozlowia roborowskii*, Qinghai, China. Photo: John & Jemi Holmes]



With its strikingly large, heavy bill and "bull-neck", this male ***Parrot Crossbill*** *is unmistakable, but smaller individuals can converge in size and proportions with large Scottish Crossbills* (Loxia scotica) *and Red Crossbills* (L. curvirostra). *Genetic studies indicate limited differences among the three species in Europe. The Parrot Crossbill has hybridized with both these congeners, although differences in bill size and calls seem enough to prevent widespread interbreeding. Across the USA and western Canada, at least eight types of Red Crossbill flight call have been identified, allied to differences in bill size or shape, which may form the basis for reproductive isolation. Similar work in Europe has identified other vocal types.*

[*Loxia pytyopsittacus*, Porvoo, Finland. Photo: Markus Varesvuo]



All seven bullfinch species share a number of plumage characteristics, including a sharply defined black cap (sometimes extending to the face), a white wingbar and rump, and a black tail. Their beaks are short and deep, with a curved culmen overlapping the lower mandible. The nine subspecies of the ***Eurasian Bullfinch*** *differ mainly in size and the brightness of male plumage colours, being largest and brightest in the north of the range, and dullest and brownest in the south-west. Both sexes sing, and they share a wide repertoire of calls. The pair-bond usually endures beyond one season.*

[*Pyrrhula pyrrhula pyrrhula*, Kuusamo, Finland. Photo: Markus Varesvuo]

far drier and hotter semi-desert conditions, often with sandier substrates. These are the Crimson-winged Finch, Trumpeter Finch, Mongolian Finch (*Eremopsaltria mongolica*) and Desert Finch. The first two of these also have African distributions, and the Trumpeter Finch penetrates the Sahara, where it is found around oases and in villages and gardens.

Pine forest, however, is the habitat that has produced perhaps the most interesting and unusual specializations among the finches. On Tenerife and Gran Canaria, in the Canary Islands, the Blue Chaffinch is restricted to forests of Canary pine (*Pinus canariensis*) that occupy the islands' middle elevations, although it is typically at its highest abundance in areas where broadleaf undergrowth provides cover and more foraging potential. These are the very few tracts of pines in the Western Palearctic, and perhaps in the entire Holarctic Region, which do not hold crossbills, which are found almost continuously in pines and other conifers in a broad ring extending eastwards from North Africa through Europe and Asia to northern North America. The five



The name "grosbeak" has been applied to large-billed birds from a number of genera. Genetic evidence indicates that the Sao Tome Grosbeak (Neospiza concolor) *may belong in* Serinus, *and that the Pine Grosbeak* (Pinicola enucleator) *is close to the bullfinches* (Pyrrhula). *The* Eophona *and* Mycerobas *grosbeaks however have been shown to be closely related. Birds of both these genera, including the* ***Japanese Grosbeak****, have also been called "hawfinches", and in the past were assigned to the genus* Coccothraustes. *But the Hawfinch* (C. coccothraustes) *is phylogenetically unrelated to them; its relationship with the New World* Hesperiphona *grosbeaks has not been tested.*

[*Eophona personata personata*, Aichi, Japan. Photo: Tadao Shimba]



Bold and striking colour patterns are mainly found in species which spend much of their lives under cover, such as bullfinches (Pyrrhula) *and the* ***Gold-naped Finch****. Found in dense undergrowth and thickets, including bamboo, the Gold-naped Finch is an unobtrusive bird which forages methodically, and often sits motionless in bushes. Mitochondrial-DNA analysis suggests a close relationship with the bullfinches.*

[*Pyrrhoplectes epauletta*, Eaglenest Wildlife Sanctuary, Arunachal Pradesh, India. Photo: Bernard Van Elegem]

species recognized in the present treatment all occupy coniferous forests and woodlands. The Scottish Crossbill breeds in stands of Scots pine, as does the Parrot Crossbill. The Two-barred Crossbill (*Loxia leucoptera*) depends predominantly on larches, mainly the Siberian larch (*Larix sibirica*) and Daurian larch (*Larix dahurica*), but in some regions also on spruces and firs (*Abies*) growing in mixed coniferous forests, whereas the Hispaniolan Crossbill (*Loxia megaplaga*), until recently treated as conspecific with it, lives all year mainly in forests of Hispaniolan pine (*Pinus occidentalis*). The hugely successful Red Crossbill is adapted to various species of pine, spruce, hemlock (*Tsuga*) and douglas-fir (*Pseudotsuga*), such that subspecies and demes commonly divide up on the basis of the particular conifer species they are best adapted to exploit.

General Habits

The flight of finches is typically undulating, with periodic brief closure of the wings, at speeds which can appear quite leisurely, although this impression may be deceptive. More heavily built species such as the Hawfinch achieve considerable momentum in their flights, but when covering longer distances their undulations may be more pronounced and thus give the illusion of slower progress. Smaller finches can fly with equal purposiveness, but when foraging they also show a light dancing character to the flight as they prospect for a perch on a foodplant or jink between one patch of food and another.

On the ground, all finches hop, although the three members of the genus *Fringilla* and the seven mountain-finches and rosy-finches in *Leucosticte* often demonstrate also the ability to walk and run. This greater flexibility of locomotion in these two genera optimizes their foraging capacity on terrestrial substrates, where most carduelines less frequently venture. Members of *Fringilla* and *Leucosticte* also differ from other finches in using the horizontal nodding gait typically shown by chickens and pigeons (Columbidae): the neck jerks forward and retracts as the body moves onward, thereby keeping the head and eye still for a split second, presumably in order to allow that greater visual fixation that a ground-foraging bird requires in order to avoid missing a food item. Carduelines, in contrast with fringillines, possess the ability to perch and grip in parts of trees that fringillines, with their ground-adapted undercarriage, avoid, and the smaller, lighter species can hold on to vertical surfaces and even hang upside-down, an advantage familiar to anyone watching European Goldfinches or Eurasian Siskins as they feed from a string of nuts in a garden while the Common Chaffinches are usually left to hop about below, picking up fragments that the other two species drop as they peck their food and pull it through the string webbing. Crossbills, although relatively heavy, have developed strong legs and toes in order to hang from twigs to reach pine cones, and to clamp them firmly against a branch while working them with the bill; like parrots (Psittacidae), they use the bill to grip bark when clambering in awkward spots.

It is when feeding that finches most frequently exhibit aggressive behaviour. Three types of posture are used in confrontations. A head-forward threat consists of a lunging crouch with the neck stretched forward, the bill open and calling or, in *Fringilla* and *Coccothraustes*, snapping, with the wings raised or fluttered. In a supplanting attack, an individual suddenly sleeks its plumage, flies at its chosen victim and lands in the space left by the latter's rapid escape—something easily, and best, observed at a birdfeeder, where a single highly concentrated food resource provides a constant flashpoint over the matter of access, a problem less frequently encountered in nature. Simple avoidance behaviour involves constant readjustment of position, often accompanied by a submissive posture with feathers fluffed, neck retracted and back turned, if a more aggressive bird comes too close. In most cases, these squabbles are extremely short-lived, and the dispute is simply a matter of one finch asserting its individual space at another's expense, as when Common Chaffinches and Bramblings find themselves a little too tightly packed while feeding on beechmast (*Fagus*).

When preening, all finches head-scratch by the indirect method, which is usual for passerines, and they bathe in the typical stand-in manner. There is record of a crossbill in Scotland dive-bathing from a perch. Sunning behaviour is also typical of passerines, and anting activity is carried out by both subfamilies, although for fringillines it has rarely been reported and for carduelines has been recorded only in captivity and only for the tree-dwelling genera *Coccothraustes*, *Hesperiphona* and *Eophona*; when offered the opportunity, neither *Serinus* nor *Carduelis* performed anting. No species has been seen to allopreen in the wild or in captivity, and, despite the sociability of



Fringillids do not huddle or "clump", as many species of estrildid finches do; instead they maintain a short distance between individuals. In contrast to the territorial Fringilla *species, the carduelines finches are mostly social throughout the year. In the breeding season, the* ***Citril Finch****, like several other* Carduelis *species, sometimes forms small neighbourhood groups, with nests often only a few metres apart. In winter, Citril Finches can be found in flocks of several hundred individuals.*

[*Carduelis citrinella*, Dornaque, Teruel, Spain. Photo: Rodrigo Pérez Grijalbo]

carduelines, all finches maintain a short individual distance in every context, the only apparent exception being a record of roosting Red Crossbills huddling together.

Roosting by finches is frequently communal. When in the process of breeding, these birds commonly roost alone, in pairs or in small groups. For the rest of the year, however, many species will form larger gatherings, particularly in temperate climates, sometimes resulting in roosts of hundreds or even thousands of individuals. The species that form the largest roosts are those which appear to face the greatest challenge in finding food in the landscape, as they tend to range much farther within it from day to day, such as European Greenfinches, Common Linnets, migrant Common Chaffinches and Bramblings, and it may well be that communal roosting is valuable to finches as a means of gauging the whereabouts of foraging areas from the behaviour of other members of the roost. Bramblings are particularly celebrated for the size of their roosts, and several recorded in different years in Switzerland in areas with abundant beechmast have been estimated to hold more than 10 million individuals, often with peak numbers in January–February. The roosts themselves were situated in sheltered conifer forests, towards which birds could be seen converging in streams from different directions from mid-afternoon on. In stark contrast, finches which take more evenly distributed foods, such as are found in field margins and on woodland trees, tend to form relatively small and more transient roosts.

Roosting birds require habitat that offers both shelter from the weather and security against predation. Finches choose relatively sturdy evergreen vegetation, not too tall, protected if possible against the wind and cold, but offering lines of escape and visual and physical cover, such as patches of young conifers, rhododendron (*Rhododendron*) bushes, tall gorse (*Ulex*) clumps, bushy undergrowth inside woodland, dense thickets along streams and scrub on slopes. A few species make use of tall marsh vegetation, Twites often retreating into reedbeds and Papyrus Canaries into papyrus swamps, although the Twite famously roosts, or for many decades roosted, on buildings in old bombed-out large cities in post-1945 Germany (see Habitat). The Black Rosy-finch has the intriguing habit of roosting communally in caves, mine shafts and barns, and on cliffs amid clusters of Cliff Swallow (*Petrochelidon pyrrhonota*) nests. Even more intriguingly, redpolls in northern latitudes, especially Arctic Redpolls, burrow into snow at night in order to create a micro-climate warmer than the temperatures to which they would otherwise be exposed in the open and which occasionally fall below –60°C.

For an hour or so before nightfall, many species of finch exhibit a distinctive kind of behaviour, gathering near their communal roost-sites, which they often use from one winter to the next. Typically, they perch on nearby treetops or fly in nervous circles, and in larger flocks they sometimes perform co-ordinated if generally unspectacular convolutions over the site. They may alight again and again in the treetops, usually calling excitedly, before resuming their wheeling flights. Eventually, after landing again, they cease calling and make a sudden decisive silent drop from their exposed perches into the thicker, lower vegetation. They sleep on one or both legs, with the body feathers fluffed up and the bill and face tucked into the dorsal plumage. Although perches are often traditional, utilized on many successive nights by the same individual, a bird will often shift between established roosts, so that the composition and strength of these varies from night to night and from week to week. The case of the Pine Grosbeak, however, is of great interest: in the west of its North American range, these grosbeaks have been found to roost assortatively by dialect, so that those from the same area of origin stay together. Such communal roosting, together with the pre-roost assemblies, is unknown for some species, such as the Eurasian Bullfinch.

At dawn, the roost breaks up into parties of birds that make their way to feeding areas. Two species, the Arabian and Socotra Grosbeaks, make a daily journey from high-lying areas, where they sleep, to lower ground, where they feed, but this pattern





In the winter of 2004, residents of the village of Planina in eastern Slovenia were startled by the arrival of a flock estimated to contain one million ***Bramblings****, which gathered to roost every evening, completely filling all the large trees in the area. Up to ten million Bramblings and more have been estimated at roost-sites in Switzerland, for example at Vaulruz in the canton of Freiburg, from late December 1999 to April 2000. These huge concentrations of birds are linked to the relative abundance of beechmast* (Fagus)*, a mainstay of this species during the winter, although large numbers have also been reported in maize-growing regions of France. Irruptions of Bramblings also follow successful breeding seasons, when numbers increase beyond the capacity of the local resources to support them. A study of a winter roost of several hundred thousand Bramblings found a higher proportion of females and lighter-weight birds at the periphery than at the centre of the roost. Competition for positions in the roost was strong: birds closer to the centre were better sheltered and protected from predators.*

[Above: *Fringilla montifringilla*, Lödersdorf, Austria. Photo: Otto Samwald.

Below: *Fringilla montifringilla*, Helsinki, Finland. Photo: Markus Varesvuo]

may be followed, as yet undetected, by other finches, for example in the Himalayas. Foraging finches tend to be well co-ordinated in their ranging movements during the morning, but towards the middle of the day, when sufficient food has been consumed, the cohesiveness of the flocks becomes looser and birds break into more individual patterns of activity, going off to drink, bathe, preen and loaf. In northern latitudes, this quiet period of activity may last for seven hours or longer at mid-summer, for four hours in the autumn and for a mere hour at mid-winter; when birds are in moult, they use this time simply to skulk silently in cover, keeping as far out of harm's way as possible. The midday period, however, is used also by individuals seeking contact with others, moving between groups. Feeding activity recommences in the afternoon and flocks cohere in the process, but these break down again as parties and groups move off to roosting sites to reassemble for the night.

The sociability of finches helps them to find their typically patchy food, and passing birds use feeding individuals as cues to join them. Because food in summer is generally more evenly distributed and easier to find, many finches are at their least gregarious when breeding. The three fringilline finches are typically solitary at this time, and those in non-migratory populations often retain some contact with their territory even over the winter. Cardueline species are variable: the bullfinches and grosbeaks tend to be solitary breeders, assembling in small parties in autumn and winter only; the serins, siskins, goldfinches, linnets, redpolls, and the desert-dwelling and mountain-dwelling species, in contrast, form flocks both inside and outside the breeding season, in some cases undertaking foraging missions together, and in others, involving mostly the more desert-adapted species, forming groups to attend water sources. In winter, when food abundance declines and its patchiness increases, the concentrations of these finches grow larger. The act of feeding in flocks when exposed in open country also permits elevated vigilance against attack by predators, since there is then more chance that at least one individual will be scanning with the head up, rather than feeding with the head down. The species living in the most open conditions, such as the Twite and the Plain Mountain-finch (*Leucosticte nemoricola*), form some of the most densely packed flocks and perform the tightest aerial manoeuvres. In sudden danger, a special alarm call, not far-carrying, brings the entire flock into the air in a relatively dense pack, making for the nearest shelter.

Voice

As finches are for the most part highly sociable species, it is unsurprising that they should have developed considerable vocabularies by which to communicate, their vocal patterns varying with the behavioural ecology of the species. Fringilline finches, which hold breeding-and-feeding territories, produce clear loud stereotyped songs that widely broadcast evidence of the individual's presence and availability, and they have a suite of distinct calls of different types that serve in various contexts. One of these, the well-known "chink-call" of the Common Chaffinch, heard from individuals of both sexes in the spring and associated with mild alarm, territory establishment and contact between pair-members, is almost certainly responsible for the word "finch" itself, appearing in weak disguise in many languages across Europe, such as "fink" in Germanic and Scandinavian languages, "pinson" and similar words in Latin-derived languages, "pinka" and "wink" in Slavic, and so on.

Typical cardueline finches, which generally defend much smaller territories around nests, sing at, near and sometimes far outside these territories, producing longer, more conversational songs, the elements of which seem frequently to be the basis of the calls that the birds use throughout the year in various social contexts, so that the distinctiveness of song and call is often far less clear-cut. This kind of generalization, however, arises from an incomplete knowledge of the songs and calls of all species of finch, and appears not to hold for certain taxa, such as the *Eophona* and *Mycerobas* grosbeaks, which have songs seemingly as distinctive and clear-cut as those of *Fringilla*.

For only a few members of the family, mostly in the genus *Carpodacus* in Asia, is the song not known. Virtually every other finch delivers its song from a prominent perch: a treetop, hedgetop, high bare branch, chimney, roof, wire or fence post, or, if the



*This male **Ethiopian Siskin** is keeping a wary eye open for airborne predators. This species is restricted to open forest, giant heath and grassy moorland in the north and central highlands of Ethiopia, a zone renowned for its assemblages of breeding and wintering raptors. When finches of woodland and other enclosed habitats venture out onto fields to feed in winter, they rarely stray far from cover. The largest flocks stray farthest. However, a study of migratory flocks of Bramblings* (Fringilla montifringilla) *and Common Chaffinches* (Fringilla coelebs) *at a stopover site in southern Sweden found no correlation between larger flocks and reduced risk of an individual being predated: attack frequency and predator success increased with flock size.*

[*Serinus nigriceps*, Bale Mountains National Park, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



Most if not all fringillid finches employ the head-forward threat display. At its lowest intensity, this involves facing the opponent with legs flexed, neck extended and beak closed. In more serious encounters, one or both wings are raised, and the neck is lowered, with the beak towards the opponent. In the highest intensity display, the raised wings are spread or fluttered, the tail cocked, and the neck retracted, ready for pecking. The main aggressor may hop towards the other bird, flicking its tail. If physical contact results, pecking is directed at the nearest part of the opponent; birds avoid serious injury by turning sideways, presenting the wing feathers. Turning sideways indicates submission, or at least a wish to avoid aggression. Conversely, facing the opponent indicates the intention to attack. In the case of the ***Red-fronted Serin****, turning away also hides all or part of the red forehead, perhaps reducing the level of provocation. Unpaired male Red-fronted Serins display competitively in the presence of a female. Several males may display simultaneously, singing with their crown and forehead feathers prominently raised, their wings drooped and partly spread, and their tails slightly raised; they may also swivel the body to left and right.*

[*Serinus pusillus*, Georgia. Photo: Neil Bowman/ FLPA]





*During the breeding season, the male **Common Chaffinch** will fight to establish and defend his territory, but at other times most of the aggressive encounters take place when simple chance or limited access to resources, such as food or water, bring the birds too close together. Rather than having an abrupt threshold, the area of personal space around a Common Chaffinch consists of a zone within which the likelihood of aggression gradually increases. Studies found that the "50 per cent distance", at which there is an even chance of two birds fighting or tolerating each other, varied from 7 cm in all-female flocks to 21–25 cm in all-male flocks. In mixed flocks, males allowed females to come closer than other males. However, when the breast feathers of females were dyed pink, they were treated like males. Male chaffinches may also use their white wing patches in encounters with other males: in experiments, birds exposed more of their white "epaulettes" in response to larger wing patches on a stuffed bird. Such signals may play a part in establishing hierarchies and reducing aggression. In Eurasian Siskins* (Carduelis spinus), *a large black bib is a badge of dominance, and a bird's status can be manipulated artificially by enlarging or reducing it. In highly social carduelline finches these signals may involve a trade-off. Siskins prefer to feed with smaller-bibbed, subordinate birds; the fact that most yearlings have small bibs may ensure that potentially dominant males do not become socially isolated.*

[*Fringilla coelebs coelebs*, Pusztaszer, Hungary. Photos: Markus Varesvuo]

terrain is largely empty, the tallest of the low bushes or the most prominent of stones or rocks. The Arabian and Socotra Grosbeaks, the Eurasian Bullfinch and the Brown Bullfinch (*Pyrrhula nipalensis*) are reported as preferring to sing from a hidden position, the first three from inside a bush and the last from the cover of the subcanopy, but otherwise finches are very public songsters. Many typical cardueline finches also perform song flights, making themselves even more conspicuous. These are of two basic, mutually exclusive types, one a stiff-winged "butterfly" flight, usually relatively low in the air in the immediate vicinity of the potential nest-site, and the other a higher, deeply undulating flight over a rather wider area. Song-flight displays have been documented for nine species of *Serinus*, eleven of *Carduelis*, three of *Leucosticte*, the Trumpeter Finch, the Mongolian Finch, four *Carpodacus* species, four *Loxia*, the Arabian and Socotra Grosbeaks and the Crimson-winged Finch. Many of them have not been described in enough detail to be classified as being of one or the other type, but the majority of those that have are of the butterfly type; high undulating flights are known for the redpolls and the Crimson-winged Finch.

In the case of the three fringilline finches, the songs are rather short, frequently repeated and never given in flight. Only the male sings, and he uses song to establish possession of a territory and to attract a mate; his song therefore serves both to deter other males and to attract females. As fincheneers in Belgium know (see Relationship with Man), Common Chaffinches sing most strongly, most frequently, when unmated and confronted with a rival. It has been computed that an unmated Common Chaffinch will sing every 7–15 seconds for most of the day, thus on average six times in a minute, 360 times per hour, and more than 3300 times in a 12-hour day, with short pauses every so often in order to feed. Once a male Common Chaffinch has paired up, his songs become far less insistent.

Although the song of the Common Chaffinch is highly stereotyped, it contains subtle variations that allow for individual recognition. The study of song acquisition by birds for many years focused on the Common Chaffinch as the experimental animal, and some interesting discoveries were made concerning the influence of the auditory environment over time on the development of repertoire. In one experiment, groups of young males that had been isolated as nestlings developed much simpler songs than normal, but each group had its own distinct identity, indicating that the birds had learnt from each other. In another, males reared by their own parents but isolated in their first winter developed near-normal songs. The Common Chaffinch thus acquires its repertoire in its first months of life, while breeding is going on around it, and late-fledged males may therefore have the poorest vocabularies. The species can, however, modify its repertoire by further listening and learning when it sets up its own territory and begins to sing in its first spring. It is this second stage of learning that shapes the particular dialect that the bird develops, through counter-singing against and copying of neighbours in a given area. Since birds reoccupy territories from year to year, relatively stable dialects result in the areas where territories extensively abut each other.

These dialects consist of variations in timbre, intonation and structure, and each male, through the copying process, will have two or three, and sometimes as many as six, slightly different songs in his repertoire, not necessarily easy for the human ear to pick up, and not necessarily shared with any neighbour. Typically, a singing bird will deliver each song type up to 20 times in succession and then switch to another. If he is engaged in counter-singing against another male, however, he will persist with the song type that most matches that of his rival. Since Common Chaffinches tend not to disperse far from their natal areas, regional differences steadily accumulate, and populations that are isolated by areas of inappropriate habitat tend inevitably to develop the more distinctive dialects; those on the Canary Islands are relatively simplified. Even so, some dialects are duplicated in different pockets of the species' range, presumably as a result of one or more individuals from one dialect area leapfrogging several others to immigrate into a third or fourth area, thereby forming a geographical mosaic. Dialectal differences have also been found in the "rain-call" of the male Common Chaffinch, an often-grating, persistent monosyllable that seems to some degree to be associated with deteriorating weather and is heard through the breeding period, but it is not clear if the boundaries for song dialects and rain-call dialects are precisely the same. Many dialect areas have small physical boundaries such as fields, streets or railway lines.

The only other finches for which dialects appear to have been discovered are two North American species, Cassin's Finch (*Carpodacus cassinii*) and the House Finch. The former breeds



In comfort and maintenance behaviour, such as wing-stretching, the ***Common Linnet*** *and other members of the family are typical passerines. Young fringillids begin to develop this behaviour at a very early age. Common Chaffinches* (Fringilla coelebs) *make their first preening movements at just five days old, before they have any plumage to preen. By nine days old they are preening efficiently, drawing their sprouting primaries through the bill, and paying attention to their breasts and flanks, in sessions of up to 30 seconds. Wing-flapping and wing-stretching begin at about eight days old.*

[*Carduelis cannabina cannabina*, Skjern, Denmark. Photo: Hanne & Jens Eriksen]



*As this **Pine Siskin** demonstrates, finches scratch by the indirect method, lifting the leg over the wing. In a study of the maintenance behaviour of captive American Goldfinches* (Carduelis tristis)*, the head and wings received most attention with the tail feathers being preened infrequently. These birds spent up to 17% of the time under observation preening, although the figure is likely to be much less for wild birds, which need to forage. However, time available for comfort and maintenance behaviour varies with latitude and season. In the Arctic midsummer, finches may spend up to seven hours preening, bathing and loafing.*

[*Carduelis pinus pinus*, Glencoe, Illinois, USA. Photo: Rob Curtis/ The Early Birder]

in loose colonies which develop separate vocal identities from their neighbours, and the latter has, curiously, acquired dialects in its feral eastern populations without apparently having done so in its natural western ones. It is, however, possible that local and regional variations in songs and calls are in fact widespread in the family, but simply remain to be detected. It is presumably likely to happen only with species which are relatively site-faithful year after year in their breeding area, and which exhibit a degree of territoriality.

Clearly, if finches learn their songs from hearing their neighbours early in life, they must have inbuilt imitative faculties, and work by P. Mundinger established the extent to which carduelines learn calls from each other. Mimicry of other species, however, is not pronounced among the Fringillidae. It has been reported for just ten species, 7% of the total. These are the Pine Grosbeak of the Holarctic and the Great Rosefinch (*Carpodacus rubicilla*) of the Caucasus and Central Asia, along with four African congeners, namely the White-throated Canary,



*Although a dry-country species which can survive without water for long periods, the **Black-throated Canary** is usually found not far from water-holes, which it visits regularly to drink and bathe. Fringillids do not appear to dust-bathe, but House Finches* (Carpodacus mexicanus) *have been described bathing in snow. As many as 15 House Finches took turns in groups of three and four. They behaved exactly as though bathing in water, pressing their breasts into the snow, with the back and head plumage erected, and fluttering their wings to fling snow over their bodies.*

[*Serinus atrogularis atrogularis*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]

Reichard's Seedeater (*Serinus reichardi*), the Streaky-headed Seedeater and the Protea Canary, and, in a cluster that seems unlikely to be merely random, four species endemic in western North America, namely the Lesser Goldfinch, Lawrence's Goldfinch (*Carduelis lawrencei*), the Purple Finch (*Carpodacus purpureus*) and, again, Cassin's Finch. The Protea Canary and Lawrence's Goldfinch appear to be the best of these mimics, the last known to copy at least 40 sounds of other bird species and sometimes to produce songs which consist of nothing else. The Lesser Goldfinch is interesting for the fact that it adopts songs that it hears on its wintering grounds.

All of the above are, of course, cardueline finches, which typically defend only small territories around the nest. Mimicry by these species is therefore unlikely to involve the "Beau Geste hypothesis", since the intention cannot be to defend key resources through the illusion that an area is already saturated with singers. Presumably, it does, instead, play some part in demonstrating the condition of the singer, both as a deterrent to other males and as a stimulant to females. Certainly, song by domesticated canaries can incite the process of ovulation in females, and for various finch species it can also, as the pair-bond develops, act as a direct sexual stimulus: bird-fanciers wanting to hybridize two species take advantage of this circumstance, by getting a male in one cage to sing to a female of the same species in another, in order to make her solicit copulation so that she can then be mounted by a male of another species with which she is housed. In a study by D. Kroodsma, isolated female canaries hearing rich song repertoires built their nests more quickly and laid more eggs than ones that heard poor song repertoires. The key to this stimulus, however, lies in particular double-note trills in the song, involving two simultaneous frequencies: these require great muscle coordination that cannot be faked, so the trills serve as a signal of the singer's true quality. Given that finches which nest in clusters can hear one another, it is not clear if females unmated to a good singer are also stimulated by his song; it is possible, however, that breeding synchrony confers advantages that benefit all the members of such clusters.

Song of the majority of typical carduelines is commonly described with the use of the words "varied", "rapid", "jumble", "buzzy", "melodious", "hoarse", "twittering", "chattering", "warbling" and "trills". The very word "siskin" comes from German *Zeisig*, probably related to the French *zizi* , as in *Bruant zizi*, the Cirl Bunting (*Emberiza cirlus*), and derived from the trilling calls of the bird, with "-kin" added to indicate something small; similarly, "twite" comes from the words "twitter" and "tweet". As these names suggest, human vocabularies can only greatly simplify and vaguely approximate to the sounds and structures of these songs, which frequently form too quick and too complex a cascade of notes to be captured in transcription. They are generally less stereotyped, more protracted and quieter than fringilline songs, and not restricted to the breeding season, or the nest-site, although they are commonest and strongest at the time of breeding. Furthermore, for a few cardueline species it has been established that females, too, sometimes sing, the European Greenfinch, the House Finch and the Eurasian Bullfinch being three such examples. For some species, on some occasions, singing among carduelines may have a communal character. This has been noted, for instance, for the European Goldfinch, Common Linnet, Socotra Grosbeak, Cape Canary and Ankober Serin, and outside the breeding season it may be a characteristic of many finch species, evidently as a means of achieving social cohesion. In the winter months, for example, on warm afternoons and prior to roosting, males may sometimes sit in groups and sing softly among themselves, perhaps signalling their body condition and physical status, or attracting other individuals to the location. These songs often incorporate some or most of the everyday calls of the species, and sometimes the distinction between singing and calling by carduelines can become rather blurred.

In contrast, calls of fringillines seem far more clear-cut and organized for different contexts. In winter, the Common Chaffinch has just two calls, the "tüp" flight call and the "chink" contact call, and both sexes give them. In the breeding season, however, the male and female acquire one further shared call, a strong "zzzz" in aggression used against intruders close to the nest, while the male adds four more to his exclusive repertoire, two of them specialized alert calls, one for aerial predators and one the somewhat mysterious rain-call, and two of them for courtship. The female, in the breeding season, develops a single unique call which she uses when ready to copulate.

Intriguing and unexpected vocalizations are emitted by several members of the Fringillidae. The eponymous Trumpeter Finch differs from all other finches in producing extraordinary nasal wheezing tin-trumpet calls. The Eurasian Bullfinch, for all its



Bathing in semi-freezing water is just one of the challenges faced by the ***Collared Grosbeak****, which rarely descends below 1800 m, even in the harshest winters. It is the largest member of Fringillidae, and large size, which reduces relative surface area, is one way of adapting to life at higher altitudes and latitudes. The Evening Grosbeak* (Hesperiphona vespertina)*, another large finch, has evolved the capacity for varying levels of metabolism, and can tolerate temperatures down to –20°C. Among the smaller finches, Common Redpolls* (Carduelis flammea) *can tolerate temperatures as low as –27°C, thanks to the insulating qualities of their plumage.*

[*Mycerobas affinis*. Kangding, Sichuan, China. Photo: Zhou Huaming]



*The song of the male **Brambling** is given from a prominent perch, with head back, crown feathers raised, and wings drooping. A short jumble of twitters, trills and flute-like notes, terminating in a much louder, drawn-out wheeze, the song is persistently repeated with barely a break. The bird often makes small jumps between song bouts, sometimes reversing its position on the perch. In the three fringilline finches, only the male sings, to establish a territory and to attract a mate. Prior to their return to the breeding grounds, several male Bramblings may sing in chorus.*

[*Fringilla montifringilla*, Finland.
Photo: Daniele Occhiato]

glorious colour and pattern, gives a very quiet song that carries only a few metres; its much more familiar flat piping whistle is used for contact, and single individuals will come to imitations of this call and are easily caught. The White-winged Grosbeak (*Mycerobas carnipes*) is unusually noisy for a finch, although the songs of all *Mycerobas* grosbeaks are loud and clear, and thus out of line with the great majority of cardueline finch songs. Are these grosbeaks more strongly territorial than others in the subfamily?

Food and Feeding

Finches are specialized to varying degrees as seed-eaters. There is a certain amount of niche separation from emberizid buntings and sparrows, which tend towards grass-seed specialization supplemented by insects for protein, which is present at only low levels in grass seeds. Finches are more adapted to feed on the seeds of dicotyledonous plants, which are richer in protein but harder to crack, and consequently they have a rather different



Although relatively few finches incorporate the calls and songs of other species into their own, two New World species, the Lesser (Carduelis psaltria) *and Lawrence's Goldfinches* (C. lawrencei), *are well-known song mimics. The **American Goldfinch** was long thought to avoid such mimicry, but recently song of this species was found to incorporate several clear and unmistakeable phrases borrowed from the Song Sparrow* (Melospiza melodia) *and the Northern Flicker* (Colaptes auratus).

[*Carduelis tristis tristis*, New York, USA.
Photo: Marie Read]



Almost entirely silent outside the breeding season, the male ***Common Rosefinch*** *often begins to sing in early spring before departing for its breeding ground. Several studies have shown finch songs to have both inherited and learned components. During the first weeks of their lives, they learn from their parents or neighbours. Most of the fine details of the song of young male Common Chaffinches* (Fringilla coelebs) *are learned from neighbouring territory-holders in their first breeding season. In this way, local dialects are established and passed on.*

[*Carpodacus erythrinus erythrinus*, Finland. Photo: Daniele Occhiato/ AGAMI]

bill structure (see also Morphological Aspects), as well as a generally reduced dependence on invertebrates, although the fringilline finches do consume plenty of arthropods. The bill is adapted for holding seeds, the tongue being used to turn them and shell them so that the kernel alone can be swallowed, and for cardueline finches the bill serves also as a specialized tool for the extraction of seeds from the seedheads of plants, with different shapes and sizes in finches related directly to the different shapes and sizes of seeds and the physical defences which the plant has developed against "predation". Many members of the genera *Serinus*, *Carduelis* and *Leucosticte*, however, also feed extensively on grass seeds, and most finches readily take them opportunistically, particularly outside the breeding season, when protein requirements are lower.

The finch species with the broadest diets are perhaps inevitably the most successful ones in terms of abundance. The Common Chaffinch is one of the commonest birds within its range in the Old World, and has been found to eat the seeds of more than



The vocalizations that give the ***Trumpeter Finch*** *its name are included within its song. This is an open-country species, and the song is given either from the ground, or in a song flight. Trumpeter Finches are inconspicuous birds which draw attention to themselves with their distinctive calls, although these are difficult to locate. The outwardly similar Mongolian Finch* (Eremopsaltria mongolica), *was formerly considered congeneric. It is a much quieter bird, generally silent outside the breeding season, apart from some soft calls, and a constant twittering when foraging in flocks.*

[*Bucanetes githagineus amantum*, Fuerteventura, Canary Islands. Photo: Roger Tidman/ FLPA]



*The **Grey-crowned Rosy-finch**, like most other finches of open, treeless environments, feeds almost exclusively on the ground. Finches are broadly adapted to be seed-eaters, with varying degrees of specialization to deal with particular kinds of seed, but most species are able to exploit a range of seasonally available foods. Early studies of the race* littoralis *of the Grey-crowned Rosy-finch found that its diet varied from almost exclusively seeds in winter, to more than 50% insect food in summer.*

[*Leucosticte tephrocotis littoralis*,
British Columbia, Canada.
Photo: Glenn Bartley]

100 species of plant. Its inability as a fringilline finch to use its feet to grip small angled stems, matched by its inability to open a seedhead, compels it to a life of foraging 80% of the time on the ground and, apart from the occasional flycatching foray, 20% amid the horizontal twigs of trees, gathering its food in quick sharp pecks at the substrate over which it works. Its diet consists mainly of the fallen seeds of common weeds such as *Polygonum*, *Brassica*, *Sinapis*, *Chenopodium*, *Stellaria* and *Cerastium*, but it also readily consumes spilt grain and other seeds in open fields, and fallen seeds and mast under trees in gardens, woodlands and forests. Moreover, together with its congener, the Brambling, another superabundant species in its breeding range, it is the most insectivorous of finches, taking many types of small terrestrial invertebrate, such as grasshoppers (Orthoptera), cockroaches (Blattodea), bugs (Hemiptera), beetles (Coleoptera), flies (Diptera), myriapods (Myriapoda), snails (Gastropoda) and earthworms (Oligochaeta). The relatively long tail of these two species perhaps enhances their aerial manoeuvrability, allowing them



The bills of all finches share certain characteristics, including straight cutting edges and internal modifications for the efficient processing of the hard seeds of dicotyledonous plants. Many members of the genera Serinus, Carduelis *and* Leucosticte *also feed extensively on grass seeds. During summer, the **Syrian Serin** eats the seeds of canary grass* (Phalaris canariensis) *and many fruiting perennials, with some insects. In contrast, in winter it depends almost entirely on the seeds of the mugwort* Artemisia sieberi, *which makes up 96–99% of its diet in December and January.*

[*Serinus syriacus*,
Eilat, Israel.
Photo: Markus Varesvuo]



The small bill of the ***Twite*** *is well adapted to taking the seeds of weeds such as daisies, thistles and dandelions (Asteraceae). In winter, Twites often congregate where a particular kind of seed is abundant. Along the shores of the Waddenzee, they specialize on the seeds of glasswort* (Salicornia) *and sea-blite* (Suaeda maritima). *A substantial proportion of Britain's Twite population winters in Caithness, in northern Scotland, where the birds can be found feeding on the seeds and stubble of oilseed rape* (Brassica).

[*Carduelis flavirostris flavirostris*, Helsinki, Finland. Photo: Markus Varesvuo]

to catch flying insects and even to spring up and snatch conifer seeds as they fall through the air. Both the Common Chaffinch and the Brambling feed their young largely on caterpillars (Lepidoptera) picked from the leaves of trees.

Some cardueline finches can almost match the fringillines in abundance, suggesting an almost equivalent range of foods. The European Greenfinch has been recorded as feeding on over 100 genera of plants, while both the Common Linnet and the European Goldfinch have been found to eat more than 75. The last two are largely weed specialists, although the name "linnet" derives from the Old English "line twige" meaning "flax-twister" ("flax" in Latin being *Linum*), and was probably acquired when flax was widely grown as a crop, just as the scientific name *cannabina* reflects the bird's fondness for hemp (*Cannabis*), doubtless when that, too, was widely cultivated. European Goldfinches are more fully adapted to foraging on the seeds of the Asteraceae (or Compositae), a huge family of flowering plants, focusing on thistles, dandelions (*Taraxacum*) and other weedy



In winter, some populations of the ***Asian Rosy-finch*** *move from their high-mountain breeding grounds to valleys and lowlands, where they can be found at the edge of cultivated areas, feeding on weed seeds or, as here, spilled grain. The Grey-crowned Rosy-finch* (Leucosticte tephrocotis) *was studied during two successive winters. Snowfall and cover were similar during both winters, but Jan–July precipitation was 23% below normal in 1977, and 50% above normal in 1978. Following the dry spring, the finches were forced further onto the prairies in search of food, whereas more rain in 1978 produced more seeds, and taller plants, enabling the birds to remain close to the mountains.*

[*Leucosticte arctoa brunneonucha*, Hokkaido, Japan. Photo: Pete Morris]



Often seen feeding high in the canopy, perching conspicuously at the very end of a branch, the ***Scarlet Finch*** *eats a variety of seeds, buds, berries and catkins. The feet of cardueline finches are well adapted to clinging to vegetation, and some also use their feet to manipulate their food. European Goldfinches* (Carduelis carduelis) *and Eurasian Siskins* (C. spinus) *can use their bills to pull in inaccessible twigs, which they then clamp with their feet. In the laboratory, some individuals of both species are able to adapt this behaviour to pull up strings with food on the end. The feet of the ground-feeding fringilline finches, by contrast, are not well adapted for grasping or clinging.*

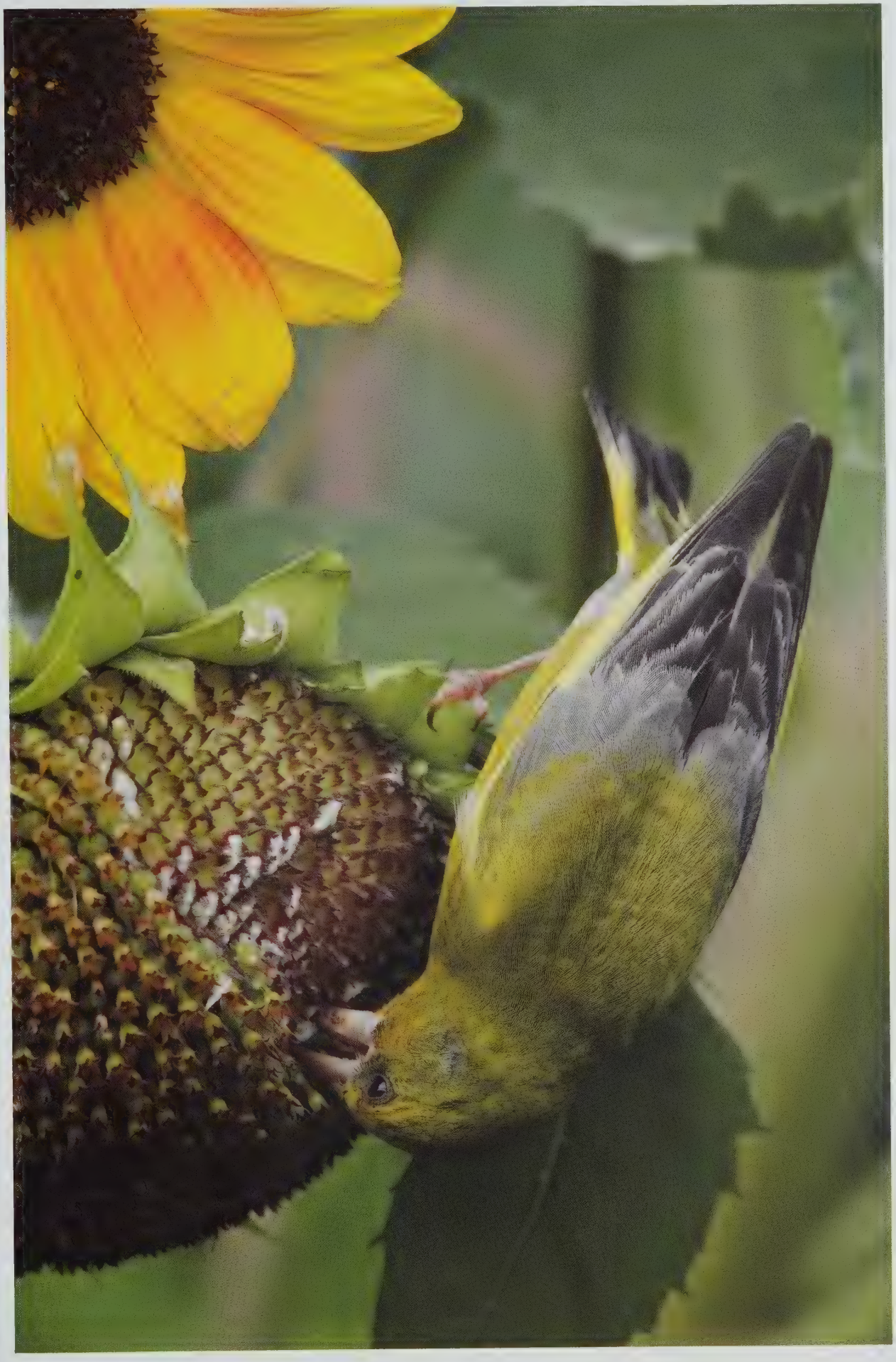
[*Haematospiza sipahi*, Yunnan, China. Photo: Li Liwei]

species, and this food preference accounts for the abundance of these birds in the pasturelands so prevalent in parts of southern Europe. On the other hand, all finches have clearly preferred foods, generally fewer than ten or even five species, and six in the case of the Common Linnet in temperate Europe, and these provide the bulk of the diet. Thus, in an English mixed deciduous wood, although 80% of tree species and 50% of herbaceous plants at one time or another provided food for Eurasian Bullfinches, the birds did not take foods simply in proportion to their abundance, and some of the least common yielded a substantial part of the species' diet.

The key to these preferences evidently lies in the nutritional value of the seeds of individual plant species and their seasonal availability, but also in the degree of adaptation that has been required to exploit them. Seeds occur naturally in two different substrates, depending on the time in the annual cycle: first on the plant while ripening, and then on the ground. Moreover, some seedheads remain tightly closed while the seeds are ripening, considerable skill being required of a bird to break into them, and they do not open to release their seeds until they are ripe. Some fringillid species, notably in the woodland genera *Loxia* and *Pyrrhula*, feed mainly or exclusively from vegetation, and rarely pick up seeds from the ground. Equally, a few species, particularly those of the most open environments, feed almost exclusively on the ground, these including the two desert finches in *Bucanetes* and *Eremopsaltria*, several *Leucosticte* mountain-finches or rosy-finches, and some *Carpodacus* rosefinches. In contrast, a high proportion of the family, certainly the majority, feed both arboreally and on low herbaceous plants, as well as terrestrially, as may be expected of seed-eating birds that typically occupy mixed habitats with trees, bushes and patches of open land. How they divide their foraging activities between substrates varies with species and depends on the accessibility of the seeds, both on the plant and on the ground, and on the body mass and leg musculature of the forager.

For all plants, a bird requires substantial physical endeavour of one type or another to reach the seeds. The larger-billed species tend simply to use the brute force of their jaws to obtain their needs from the hardest kernels. Such species, which include the fringilline finches, the grosbeaks in the genera *Pinicola*, *Coccothraustes*, *Eophona* and *Hesperiphona*, and their closer relations, cannot use their feet to assist in this process, nor can bullfinches. Some species, however, among them the European Serin, Common Linnet, Twite, European Goldfinch, Common Redpoll and European Greenfinch, have the capacity to hold down plant stems with the foot in order to forage on the seeds more efficiently, landing half-way up, where a firm initial grip can be established, and then working their way upwards until the stem bends to the ground and stability, in the form of the bird's weight, allows feeding to proceed. Moreover, a few fringillids, among them the crossbills, the Common and Arctic Redpolls, the Eurasian Siskin and the European Goldfinch, have evolved the specialization by which the foot is used as a clamp for the food itself, so that the bill can work directly on the extraction and processing of the seeds.

Real food specialization is rare among finches. In the breeding season, Thick-billed Siskins feed almost exclusively on *Polylepis* seeds, buds and shoots, and another high-elevation species, Przevalski's Rosefinch, which may not be a true finch at all (see Systematics), strongly favours the small seeds of one of its choice habitats, *Potentilla tenuifolia*. Some species have evident strong preferences. The Common Redpoll, for example, is very closely tied to birch as a food resource, but even this species is known to exploit more than 50 genera of plants. Similarly, the European Serin in Spain concentrates on the wall rocket (*Diplotaxis virgata*) during the breeding season, but the ranges of bird and plant do not coincide exactly, so that, farther north in its range, this serin depends on other resources. Clearly, the differently shaped bills and associated body sizes of finches give selective advantages for foraging on different-sized seeds, and extracting them from different types of seedheads, but there is always a spectrum of available plant species that any one finch species can exploit, with varying degrees of efficiency. The case of the two recently separated European "citrils" (see Systemat-



The most abundant finch species tend to be those with the broadest diets. The ***European Greenfinch*** *has been recorded feeding on over 100 genera of plants, and quickly learns to take advantage of new food sources, for instance sunflower* (Helianthus) *crops in the field, or sunflower seeds in garden birdfeeders. Sunflowers have actually been found to make a poor "conservation crop" for this and other farmland seedeaters, because the seeds are exhausted long before the most critical period, in late winter; kale* (Crambe) *and quinoa* (Chenopodium quinoa), *which retain their seeds, are much better. European Greenfinches are versatile foragers, feeding on the ground, in low shrubs and at all levels in trees, clinging acrobatically to extract seeds from downward-facing seedheads, as here, and sliding down plant stems and strings. When food is in short supply, European Greenfinches can be aggressive to one another, and to other species. Lower status members of flocks have been found to carry larger reserves of fat than dominant birds in winter, which helps them cope with the toughest times, when they may be kept away from food sources. Dominant birds are able to increase their reserves temporarily in response to severe weather. The European Greenfinch is introduced to New Zealand.*

[*Carduelis chloris chloris*, Hamilton, New Zealand. Photo: Neil Fitzgerald]

ics), with virtually no difference in bill size or shape, is instructive: breeding populations of the continental montane Citril Finch depend chiefly on pine and dandelion seeds, whereas those of the insular lowland Corsican Finch consume mainly shepherd's purse (*Capsella*) on Corsica, rosemary (*Rosmarinus*) on Capraia, and pine seeds, much as do Citril Finches, on Sardinia. These ecological differences are evidently facultative, and not indicative of any significant phylogenetic divergence.

By far the most specialized of all finches are the crossbills, the bills of which are adapted to prise apart the bracts of closed conifer cones in order to release the seeds, which are then collected by the tongue, acting as an extensile scoop. Again, however, bill morphology is adapted to particular conifer species. The Two-barred Crossbill, with its relatively slender bill, targets the softer cones of larch, whereas the Red Crossbill, armed with a medium-sized bill, focuses, at least in northern Europe, on the medium-tough cones of spruce, and the Scottish Crossbill and Parrot Crossbill, with their stouter, deeper bills, concentrate on the large hard cones of pine. Thus, each of these species is adapted to a particular tree species, although the Red Crossbill tends to be the most catholic, frequently feeding also from larch and pine. In a similar fashion, in North America, various subspecific populations of crossbills are associated with individual species of conifer, albeit with varying degrees of overlap. Yet even these highly specialized birds retain the capacity to switch to other foods. The bill can be used, for example, to extract insects from behind bark at one extreme and to chop into apples to reach the pips at the other. Furthermore, and astonishingly, the Red Crossbill has, like the Eurasian Siskin, been recorded as feeding from over 50 genera of plants, including such improbables as heather (*Calluna*), bilberry (*Vaccinium*), crowberry (*Empetrum*) and, indeed, even grasses, although its bill structure seriously restricts its foraging efficiency on the ground.

A crossbill gains access to its food first by detaching the cone with its bill and moving to a position on a branch where it can control the cone with its foot. If the bird in question has the lower mandible crossing to the right of the upper (see Morphological Aspects), it uses its right foot, and vice versa, and the cone is held upwards at a slight angle, so that the bird focuses on the top side nearer to it and inserts the bill tip into the inside top of a tight-lying scale. The downward-curving upper mandible presses on the inside of the scale while the upward-curving lower mandible presses sideways on the cone itself, so that the upper mandible is used as a lever, prising the scale more widely open and allowing the tongue to push into the aperture and hook out the seed. After several seeds have been liberated and swallowed, the cone is usually dropped to the ground, where it can be found with characteristic signs of damage in the form of frayed-edged, bent-open scales. Tell-tale signs of the continued presence of the birds in a tree are, as with parrots feeding invisibly in rainforest treetops, the occasional thud of a discarded cone and the less perceptible cracking as the scales are broken into.

The annual cycle of seed production in more seasonal regions means that finches experience strong temporal oscillations in food supply. The majority of seeds consumed by fringillids in northern temperate and boreal regions are produced in the spring and summer, from April to September, with a peak in abundance weighted towards the second half of this span. From the end of the growing season, the birds have a more or less fixed stock of food to last through the autumn and winter until the regrowth of spring. Thus, the trough comes approximately half a year after the peak, in February and March, at a time when late-winter frosts and snows can further restrict access to the sparse seed stocks that remain. Consequently, this is a period when many finches are mobile, in search of food, and when many are likely to succumb to starvation. It is also a time when numbers reach their peak at garden feeding stations. Curiously, however, the crossbills are liberated from this pattern, since the cycle of seed availability in conifers is staggered later in the year, at least in northern Europe. Thus, at the time of maximum hardship for other finches, and however heavy the frost and snow, crossbills are usually breeding, since the conifer seeds are available to them throughout the winter and be-



The nominate race of the ***Streaky Seedeater*** *forages actively on the ground and in low vegetation. It feeds on a range of small seeds, including tree lobelia* (Lobelia giberroa) *and agricultural weeds, and also on berries and insects. In cultivated areas and gardens, including those on the outskirts of large cities such as Nairobi, the Streaky Seedeater is regarded as something of a pest, because it is thought to damage growing crops and flowers. The race* whytii, *which has a smaller bill and longer legs than the nominate, is often treated as a full species. Its diet may differ: in a classification of sub-Saharan frugivores, "*Serinus whytii*" is classed as a partial frugivore, but the Streaky Seedeater as an opportunistic frugivore.*

[*Serinus striolatus striolatus*,
Lake Nakuru National Park, Kenya.
Photo: Adrian & Jane Binns/VIREO]



*The bill of the **European Goldfinch** comes to a sharp point, and the bird uses its mandibles like tweezers to extract the seeds from prickly seedheads such as teasels* (Dipsacus). *The red "blaze" that surrounds the bill consists of short, stiff feathers, which may serve to protect the eyes and face from the prickles. European Goldfinches prefer seeds in the milky, half-ripe state, and visit a succession of food plants as the growing season progresses. The energy content of seeds can vary considerably, and some, such as colt's-foot* (Tussilago farfara), *are such a poor source that they are only taken when better foods are unavailable. European Goldfinches introduced to Australia have spread widely, which might suggest that they are able to use their versatility to exploit different food plants in a new environment. However, when researchers studied the stomach contents of 240 birds collected near Melbourne, all but one of the 33 food plants they identified were exotic. Nineteen of them belonged to the Asteraceae (Compositae), the family of daisies, thistles and dandelions which makes up the bulk of the food of this species in Europe.*

[*Carduelis carduelis*, Girona, Spain. Photo: Jordi Bas]



Tree-seed crops fluctuate from year to year, and from region to region, so that a poor year in one region may coincide with abundant supplies elsewhere. A number of finches, including the ***Evening Grosbeak****, cover hundreds or thousands of kilometres in response to these fluctuations, and may rarely, if ever, return to the same breeding or wintering grounds. Evening Grosbeaks breed in American boreal forests, and move south or south-east in autumn. They come readily to bird feeding stations, which makes them easy to ring. Of 17,000 individuals ringed at a site in Pennsylvania, only 48 (0·003%) were recovered at the same site in subsequent winters.*

[*Hesperiphona vespertina vespertina*,
Saint-Lambert, Quebec, Canada.
Photo: Daniel Dupont]

come depleted only in the period when the warmth of spring in April or May causes the cones to open and shed their seed. Red Crossbills, dependent chiefly on spruce, have a period of several months over mid-summer when they may switch to pine seeds while the new spruce cones are forming, but they have the ability to test the new crop and, if the quantity is low, they will leave the area in which they have bred in search of regions with better crops; marked movements by this species are evident in the second half of summer, at a time when other finches are probably at their most sedentary, profiting from the half-ripe seeds of a succession of maturing foodplants.

Thus it is that in summer finches tend to forage widely over the countryside, as food is then in good supply and individuals have a strong chance of finding their needs without difficulty. This does not necessarily mean that the distances which they travel are short: carduelines may regularly forage up to 4 km from the nest if the rewards of a rich food patch outstrip the risks and costs of visiting it. In winter, in contrast, the birds tend to aggregate more and move together with a more concerted, deliberate cohesiveness. At this time, ground-foraging finches bunch closer, facing the wind and hopping in the same direction, individuals flying from the back of a flock, where seeds are depleted, to the front, where they are not, so that the whole activity has an organized rolling structure. Analogous behaviour is shown by arboreal Eurasian Siskins and Common Redpolls: the flock settles in a particular tree in order to forage, but after a time one or two individuals fly out over the others and perch in another tree, thereby initiating a steady slow stream of followers, so that a feeding session possesses a notable quality of rolling restless movement, an impression enhanced by the birds in each tree as they work their way down from the top in search of fruits that are already open and require minimum processing time.

For some species, however, the processing time is inevitably long, and as a consequence they have rather different patterns of foraging. The short, rounded bill of bullfinches and the Pine Grosbeak, for example, are adapted to the processing of softer, chewier foods such as buds, tree flowers, berries and other soft fruits, and these species tend to behave more placidly, perching unobtrusively for long periods in one tree rich in buds or berries, methodically munching their way through them until the source is depleted. Tell-tale remains of their feeding can be found on the ground below. When eating buds in orchards, the Eurasian Bullfinch typically starts at the outer tip of a branch and works its way inwards, craning to reach every bud possible, then flying up to another tip once it reaches older wood. It employs two types of bill movement when feeding. For most foods it nips off the object, whether bud, berry, pod, seed or capsule, crushes it lengthwise in the bill, swivels it with the tongue against the lower man-





The ability of finches to copy and learn from one another means that new food sources can be quickly and widely exploited. American sweetgum (Liquidambar styraciflua)*, a native of North and Central America, has been widely introduced elsewhere. In Buenos Aires, Argentina, it has become a particular favourite of the* ***Hooded Siskin****. The seeds are contained within the so-called "monkey ball". In north-west Europe, European Greenfinches* (Carduelis chloris) *have only recently begun to eat the unripe fruits of mezereon* (Daphne mezereum)*, a native species popular as a garden shrub, but the habit has spread quickly and was soon observed across the British Isles.*

[*Carduelis magellanica magellanica*,
Reserva Ecológica de Vicente López, La Lucila, Buenos Aires, Argentina.
Photos: James Lowen]



In contrast to the more conical bills of seed-eating finches, the short, rounded, sharp-edged bills of bullfinches are adapted to the processing of softer, chewier foods such as buds, flowers and berries. The ***Grey-headed Bullfinch*** *eats the buds and catkins of willow* (Salix) *and birch* (Betula), *and is also known to take nectar from rhododendron* (Rhododendron) *flowers. Buds are nipped off and nibbled in the beak to remove the scales, a more time-consuming process than the cracking and husking of seeds. Because they spend longer feeding in the same place, bullfinches appear less active than other finches, although they can be nimble and acrobatic when reaching less accessible buds and fruits.*

[*Pyrrhula erythaca erythaca*, Wolong Nature Reserve, Sichuan, China. Photo: Zhang Ming]

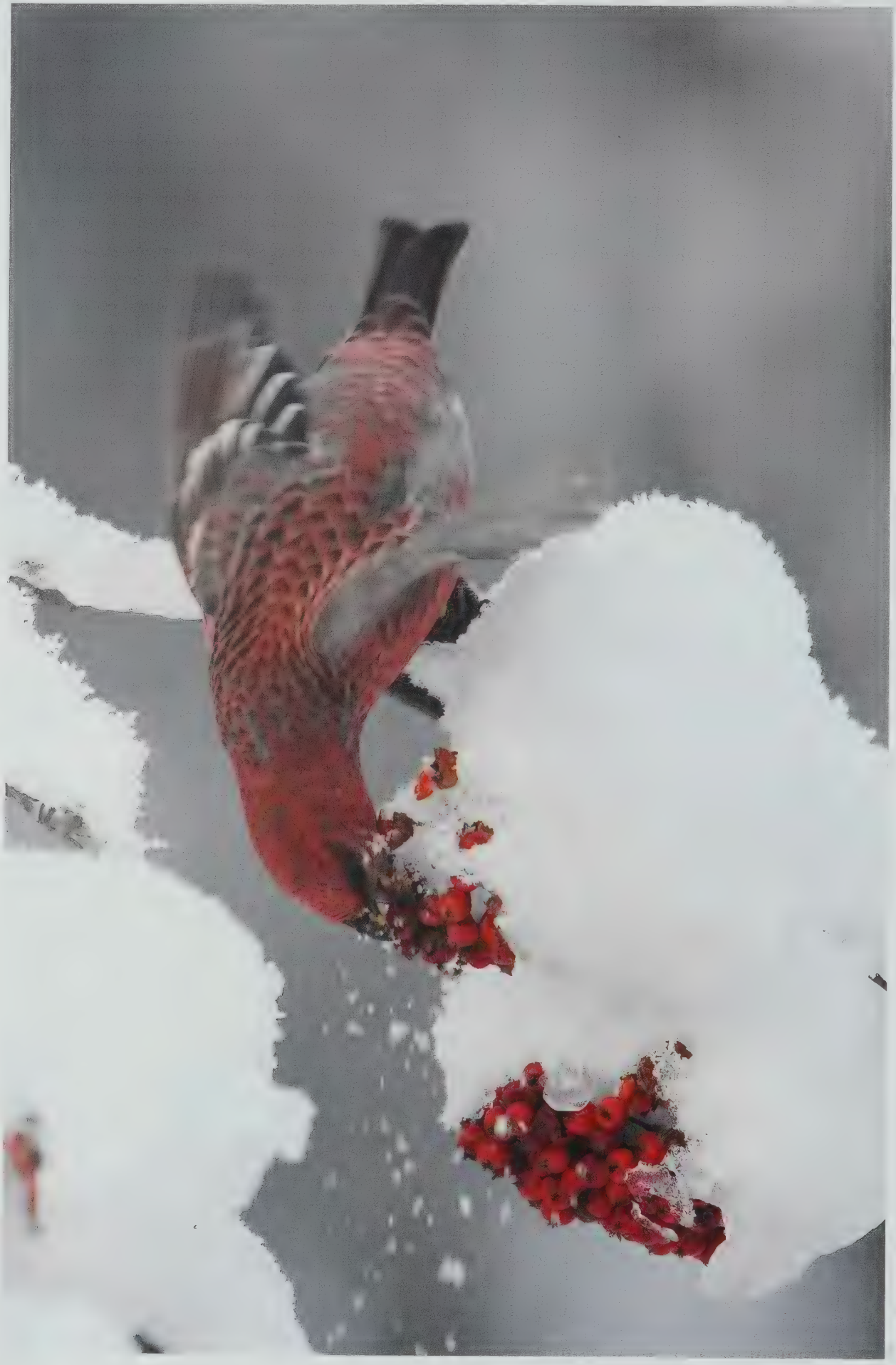
dible, and nibbles off the scales, shell or pulp. When dealing with soft-headed Asteraceae, however, it breaks into the seedhead from the side and snips off small parts of it, which it then rotates in the bill to extract the seeds.

The distances which breeding finches must travel in order to find food and/or the time that they need to obtain it have resulted in some interesting adaptations. While most cardueline finches cache food in the gullet and, along with a few drops of sipped water and some pieces of grit, regurgitate it into the open bills of their begging offspring, bullfinches share with the Pine Grosbeak, desert finches and at least one rosy-finch the unusual feature of two food-storage pouches, one on each side of the tongue, which develop only during the breeding season, and which allow a cubic centimetre of food to be delivered in one visit to the nestlings. This food consists of a mixture of seeds and invertebrates, including caterpillars, spiders (Araneae) and



Finches feeding on fleshy fruits generally act as seed predators. The ***Brown Bullfinch****, for example, nibbles off the pulp before swallowing and digesting the seeds. In Pakistan, the White-winged Grosbeak* (Mycerobas carnipes) *discards the pulp and feeds on the seeds of juniper* (Juniperus) *berries, in the usual finch way, but two other finch species, the Red-fronted Serin* (Serinus pusillus) *and the Common Rosefinch* (Carpodacus erythrinus), *eat only the pulp. The role, if any, of finches in seed dispersal needs further investigation.*

[*Pyrrhula nipalensis uchidai*, Amnashan, Taiwan. Photo: Pete Morris]



The bill of the ***Pine Grosbeak*** *is short and deep, and with a decurved culmen overlapping the lower mandible. This points to a possible close affinity with the bullfinches* (Pyrrhula)*, which is indeed supported by DNA evidence, and also by the Pine Grosbeak's diet and feeding behaviour. Flocks or individual birds will remain in the same tree for long periods, methodically removing all the buds, berries or shoots within reach. They eat the pulp as well as the seeds of berries, but discard the skin, and, like bullfinches, nip off buds and drop the scales. Although their movements are slow and deliberate, Pine Grosbeaks are agile and skilful foragers. They can use their hooked upper mandible when climbing, like crossbills* (Loxia)*. Rowan* (Sorbus aucuparia) *berries, spruce* (Picea) *cones and, in some parts of the range, juniper* (Juniperus) *berries are important autumn and winter foods. When these are in short supply on their home ground, Pine Grosbeaks may move hundreds of kilometres in search of alternatives. They sometimes appear in parks and towns where there are berry-bearing trees and shrubs. When their staple foods are abundant, they are sedentary, except in the northernmost parts of the range.*

[*Pinicola enucleator enucleator*, Liminka, Finland. Photo: Markus Varesvuo]



When feeding on fruit, the Japanese (Eophona personata) *and* ***Yellow-billed Grosbeaks*** *eat the seeds and discard the pulp and skins, which fall to the ground. Researchers in Kyoto, Japan used this fallen material to assess the impact of Japanese Grosbeaks on two tree species which rely on birds to disperse their seeds. The grosbeaks consumed both ripe and unripe seeds (identified by hard green pulp), but preferred the seeds of ripe fruit. They also fed on seeds which had fallen to the ground. Consumption increased sharply in September and October, with the arrival of larger numbers of grosbeaks from the north. Altogether, the grosbeaks took a substantially larger proportion of the crop than seed-dispersing frugivorous birds.*

[*Eophona migratoria sowerbyi*, Chengdu, Sichuan, China. Photos: Zhang Ming]

small snails, which the adults shell in the bill as if they were seeds. Hawfinches likewise provide a combination of seeds and invertebrates to their young, and this mixing of animal and vegetable food is probably widespread across the family, owing to the importance of protein to the rapid growth of nestlings. The proportions may not be even, with the animal component typically—although not always, as in the case of the Common Rosefinch—in the minority: for example, 10% of the food given to nestling European Greenfinches in the first five days after hatching may be animal, after which the proportion drops away steeply to nothing by the tenth day. Even so, some cardueline finches, including Eurasian Siskins, Common Redpolls, Common Linnets and various crossbills, have been known to rear their young on a diet entirely of seeds. In stark contrast, fringilline finches, which are unique within the family in holding all-purpose breeding territories within which they collect food for their offspring, are unique also in that the food which they gather for them is (almost) entirely animal; and because the foraging distances are so short, they have evolved no storage mechanism other than the bill for carrying food to the nest.

Food supplies have a big influence on the numbers, distributions and behaviour of finches. Some species can be present in thousands in localities offering an abundance of food, and totally absent from the same localities at times when food is scarce or unavailable. This is especially obvious with species which exploit tree-seed crops, which vary in size and distribution from year to year, but it is apparent also among species which feed on farmland weeds, the birds concentrating wherever their food is temporarily available. Furthermore, the numbers of many farmland species declined in Britain and other parts of western Europe during the period of agricultural intensification between the 1960s and 1990s, when their foods became progressively less available. Following years of herbicide use, most of the common weeds of arable land largely disappeared, as seed banks were depleted in the soil; stubble fields were ploughed soon after harvest, burying any spilled seeds which in previous years would have remained available on the soil surface; and hedges were removed or clipped short, reducing the abundance of hedgerow fruits. Many finches were adversely affected by these changes, and the most severe declines occurred among species such as the Common Linnet that depended most heavily on weed seeds.

Fortunately, however, this reduction of finch foods in the wider countryside coincided with a period of increased backyard feeding of birds by householders, and by the 1980s a wider range of seeds was marketed for the purpose. In Britain, peanuts became used in garden feeders from the 1950s, and almost immediately Common Chaffinches and European Greenfinches began to take them. Eurasian Siskins also began to exploit peanuts from the mid-1960s, coinciding with the provision of these foods in red string bags, which, some people suggested, looked like conifer cones. In later decades, sunflower (*Helianthus annuus*), niger and other seeds also became widely available. These seeds, too, were eaten by the same three species, but also by European Goldfinches, which began to utilize garden feeders extensively from the mid-1990s. Somewhat surprisingly, Eurasian Bullfinches have fed for several decades on sunflower seeds provided at garden feeders in continental Europe, but seldom do so in Britain, where there are records of this behaviour from only a few localities; similarly, redpolls regularly exploit feeders in North America, but rarely so in Europe. It seems that learning, copying behaviour and cultural traditions figure large in the feeding of finches, and in future years other species may well catch on to the use of garden feeders. There can be little doubt that the populations of some species are larger now than they would be in the absence of such supplements to the natural diet.

While garden feeding may have helped to sustain the populations of several finches through difficult periods, there have also been downsides, for garden feeders and drinkers provide ideal opportunities for the transmission of disease. Several pathogens are known to have spread in this way, and in the case of at least two species severe effects on regional population levels have been described. Mycoplasmosis has caused declines in the numbers of House Finches recently established in eastern North America, and trichomoniasis has caused severe declines in European Greenfinch numbers in parts of Britain. This protozoan disease is normally carried by pigeons, and European Greenfinches may have caught it from the doves that also visit garden feeders and drinkers.



The invasive alien prickly-pear (Opuntia) *is widespread in the Canary Islands. This* ***Island Canary*** *may be feeding on the seeds rather than the pulp; these birds take the seeds but reject the pulp of figs. Fully-ripe prickly pear seeds would almost certainly be too hard for the canary's bill to crack. Island Canaries also feed on nectar, and may be significant pollinators of some endemic plants, and also of agave* (Agave), *another invasive alien. Laboratory experiments have found that male canaries are much more willing than females to try out new foods, but because of their aggressiveness to other males, are poor demonstrators of the techniques needed to exploit the foods.*

[*Serinus canaria*,
El Tanque, Tenerife,
Canary Islands.
Photo: Rafael Armada]

Breeding

Finches are almost entirely socially monogamous, at least during each nesting season, but their breeding strategies divide up largely on phylogenetic lines. Fringilline finches are far more strongly territorial, and feed their young on invertebrates, with the result that breeding activity is compressed into a relatively short span when animal food reaches a peak in availability within the territory. Thus the Common Chaffinch, by feeding its young mainly on caterpillars, constrains its breeding season to the period of late spring and early summer, and is typically single-brooded. In contrast, cardueline finches, which feed their young largely on seeds, have far more extended breeding seasons, since they can exploit different seeding plants as these mature, and as a result typically have multiple broods. For example, the European Greenfinch can produce four broods in a year, and in the most extreme case crossbills, liberated from the effects of daylength changes that through their influence on vegetation regulate other finch species, may breed at any time of year and, at the local population level, continue for up to ten months, de-



Confirming that the most widespread and abundant of the finches are often those with the broadest diets, the ***Yellow-fronted Canary*** *supplements its diet of grass and weed seeds with tree fruits such as figs* (Ficus), *the seeds of* Eucalyptus, *the flowers and leaves of* Hibiscus, *the leaves of* Acacia karroo, *and a range of other trees and shrubs. Skilful and versatile foragers, they extract* Casuarina *seeds from the cones, and strip the outer casing of ripe* Sorghum. *Yellow-fronted Canaries also take insects and larvae they encounter opportunistically, and pursue termites in flight.*

[*Serinus mozambicus granti*,
Eshowe, KwaZulu-Natal,
South Africa.
Photo: Hugh Chittenden]

pending on the availability of conifer seeds, which can vary from species to species, region to region and year to year. Of course, individual pairs of crossbills are unlikely to breed continuously throughout a ten-month period, but different pairs in the population can breed in so staggered a fashion that the season becomes exceptionally protracted.

Annual variations in tree seed production in boreal forests exert a great influence on the breeding patterns of the finches, and not just crossbills, that dwell in them. The irruptive behaviour of crossbills, Evening Grosbeaks (*Hesperiphona vespertina*), Pine Grosbeaks and smaller carduelines, such as the Eurasian Siskin and Common Redpoll, is governed by the cropping patterns of trees, as birds leave areas where current crops are poor and concentrate in other areas where crops are good. In good years, survival and reproductive success tend to be high. For example, Eurasian Siskins and Common Redpolls can double the usual length of their breeding seasons in years of high spruce-seed output, and the former will make occasional and temporary northward expansions of range in apparent response to strong breeding success in previous years. On the other hand, in poor years for spruce seed, Eurasian Siskins forage more outside the forest, and hold back breeding towards the middle of the year, when seeds of herbaceous plants become available.

Such "boom-and-bust" economics are unknown to the Common Chaffinch. In this species, an older male usually returns to the same territory in successive years, and, indeed, often retains contact with it by feeding and roosting there in winter. He proclaims his reoccupation with the ringing "chink" calls (see Voice), and at the same time begins to sing. If he has spent the winter elsewhere, he commonly visits the site only in the morning, but as the spring intensifies he steadily becomes a day-round resident. He already knows where the good nest-sites are, and any visiting female is quickly treated to an urgent, ardent courtship which may even involve the male in pursuing her across several territories to entice her back.

A first-year Common Chaffinch, in contrast, has no such confidence, often being driven out of territories held by old males, and moving into an apparently unoccupied but suitable area with hesitant and unobtrusive behaviour. If unchallenged, he starts to rehearse the "chink" call and a subsong, a soft disorganized warbling, pausing to feed and flit uneasily between branches and bushes. The longer this goes on, the more open and conspicuous his choices of songperch become, and the more frequently will he pause to examine crutches and junctions in trees to assess them as potential nest-sites for the female that he hopes to attract. As his confidence builds, so his song develops and the area he patrols increases, until at some stage he encounters and is challenged by another male for control of a particular point, often a high songperch, and fighting ensues. The fights have two forms. If one male intrudes well inside another's territory, the occupant flies fast and directly at him, white wing-flashes conspicuous, seeking to supplant him from his perch until he retreats. If a male is simply testing the border between two territories, however, the



*This **House Finch** is feeding on cactus fruit. In a study of the relationship of the giant columnar cactus* Neobuxbaumia tetetzo *with frugivores, the House Finch, one of the most frequent visitors to the cactus, emerged as a seed predator, destroying the seeds either while attacking the fruit or during their passage through its gut. House Finches also fed on the flowers of the cactus. In the USA, the House Finch is regarded as a pest of orchards and fruit farms, eating blossoms and buds as well as fruit.*

[*Carpodacus mexicanus.* Photo: Wardene Weisser/ardea.com]



*In many carduelines, such as the **Vinaceous Rosefinch** and other rosefinches, plumage coloration varies with availability of carotenoids in the diet during post-breeding moult. The brightness of the reddish throat patches in male House Finches* (Carpodacus mexicanus) *of the race* frontalis *varies within and between populations, but these differences disappear when captive birds are fed a standardized diet.*

[*Carpodacus vinaceus formosanus,* Alisan, Chiayi, Taiwan. Photo: Yung-Fu Chen]





While stripping the outer coverings of aloe (Aloe) *flowers, the* ***Streaky-headed Seedeater*** *can pick up a certain amount of pollen which it may transfer to other plants. But this minor role as pollinator is far outweighed by the damage these birds do to the flowers. Aloes may be a seasonally important food for some populations of this species. In a winter study of an* Aloe marlothii *"forest" in the western part of the Suikerbosrand Nature Reserve, near Johannesburg, Streaky-headed Seedeater numbers increased while the plants were flowering. They were among the species that visited the plants most regularly to take nectar, and they also fed on the fruits. Streaky-headed Seedeaters take nectar from other flowers, either probing them, or piercing them at the base. These birds are versatile generalists, using their feet to hold down the seedheads of grasses or to clamp plucked fruit against branches while they peck out the seeds. The Protea Canary* (Serinus leucopterus) *of the South African fynbos is more of a specialist, taking seeds, buds, flowers, nectar and fruit mostly of the plant genus after which it is named.*

[*Serinus gularis humilis*, Addo Elephant National Park, South Africa. Photos: Hugh Chittenden]

confrontation is more ritualized, the two birds moving back and forth with a "head-up display" in which the head and neck are sleeked and extended, the bill 30° above horizontal, the breast feathers ruffled, and the wing-flashes fully exposed and enhanced by constant pivoting and wing-flicking.

An interested female moves into a territory usually a few days after the male begins full singing. As she explores the area she gives the "tüp" flight call. The male approaches her with wing-flashes exposed, flying underneath her in a slow undulating "moth-flight", then performs a "crouching-lopsided display", showing his wing-flash to maximum effect by slightly lifting his wing, which also reveals the colour of his flanks, and utters a special "ksiip" call. He attracts her into the centre of the territory with another moth-flight, and, if she follows, proceeds to show her around his estate. If she loses interest, he lets her go and resumes singing until another female appears, If she stays, however, he will often perform supplanting attacks on her, chasing her in fast dashing flight through the territory. The two suddenly break off and begin feeding, and in due course the female will begin her own investigation of places in which a nest could be placed.

Gradually, the female becomes the dominant partner. In England, it takes some six weeks from initial pair formation to the commencement of nesting, and in that time she develops an aggressiveness that allows her first call on food resources, which she needs for the forming of eggs. She builds the nest alone over several days, making as many as 20 visits in an hour, and well over a thousand visits in all, to the chosen site. She is followed assiduously by the male, but tends to keep him away from the nest tree itself, and only in the days following the completion of the nest does she solicit copulation, shivering and half-raising her wings and tail, and giving a "siip" call in a frenzied crescendo that can attract other males. The male in response confronts her with an "upright-lopsided display", with dancing movements around her until he mounts her. At the height of this mating behaviour, about 3–5 days before the first egg is laid, the pair may copulate six times per hour.

Common Chaffinch territory sizes vary with habitat, some being as small as 0·1 ha where food is abundant, but generally they cover around 0·7 ha in deciduous woodland and up to 3 ha in pines. Breeding, feeding, comfort behaviour and resting are all basically confined to the territory, but drinking and bathing often have to take place outside it, sometimes in other pairs' territories. These extra-territorial activities are usually surreptitious, so as not to provoke confrontations with other territory-holders, but after the start of incubation, which only the female undertakes, a territorial male will also pay furtive visits to neighbouring territories in search of extra-pair copulations. Moreover, some females, presumably cued by evidence of higher-quality males in adjacent territories, avoid their mates in the pre-laying period in order to copulate with a neighbour. Common Chaffinches also occasionally feed outside their territories, especially on neutral ground where conflicts can be avoided.

Cardueline finches, in contrast, typically do not hold all-purpose breeding territories but, instead, defend a small area around the nest. There are a few partial exceptions, such as the Common Rosefinch, and, of course, many of the tropical species have not been studied in sufficient detail to be certain. Generally, however, the carduelines spend very little time on territorial defence and self-advertisement, and indeed they have a reduced behav-



More than 50 plant genera figure among the recorded foods of the ***Eurasian Siskin****. But as with other finches, most of its food comes from a much more restricted list. In spring and summer, it is chiefly found feeding on spruce* (Picea) *and pine* (Pinus)*, using its slender bill to extract the seeds; it is unable to deal with closed cones. In autumn and winter, it turns its attention to alder* (Alnus)*, as here, and birch* (Betula)*. In irruption years, when seed crops fail, Eurasian Siskins can cover long distances in search of food. A bird ringed in Sweden was recovered 3000 km away in Iran, and others have been recorded at locations up to 3200 km apart in consecutive winters. In poor years for their main foods, they may delay breeding until alternative foods become available, and there is some evidence of mid-breeding-season movements to new areas by birds that have already bred. Conversely, in good years for spruce seeds, they may extend their breeding season to twice its normal length.*

[*Carduelis spinus*, Helsinki, Finland. Photo: Markus Varesvuo]

ioural vocabulary for territorialism but an increased one for communication and contact between pair-members, since individual recognition is of elevated importance for sociable, non-territorial species. Thus, special types of behaviour help to maintain the pair-bond, and the song patterns of the birds are more individually variable. Typically, from the time of pair formation, the partners stay together as a unit, the male accompanying the female wherever she goes, and staying close by while she builds the nest. Biologists term this behaviour "mate-guarding", because it helps to ensure that the female copulates only with her social partner, but, as with all such behaviour, it is not always foolproof (see below). Only during incubation and brooding does the male leave his female, as he forages for both of them, regurgitating food to the female on the nest.

Reduced territorialism means that several pairs can breed in close proximity to one another, and the evidence suggests that this is not necessarily something that is forced on them by circumstance, such as limited breeding sites or clustered food resources, but is positive social behaviour yielding benefits at least to certain, if not all, members of the group. Loose coloniality has been found to be practised by the Black-headed Canary and Hawfinch in the respective monotypic genera *Alario* and *Coccothraustes*, by all four "desert" finches in the monotypic genera *Rhodopechys*, *Bucanetes*, *Eremopsaltria* and *Rhodospiza*, by four of the five crossbills in *Loxia*, by five *Leucosticte* and six *Carpodacus*, both Old World and New World species, by seven members of *Serinus*, including the European Serin, and by 14 *Carduelis* species, including such familiar birds as the European Greenfinch, Eurasian Siskin, Pine Siskin (*Carduelis pinus*), American Goldfinch, European Goldfinch, Common Linnet, Twite and all three redpolls. A few species, including the Syrian Serin (*Serinus syriacus*) and Lawrence's Goldfinch, appear always to have been recorded as breeding colonially. On the other hand, reports of the fringilline Brambling nesting "colonially" are misleading: although singing individuals may sometimes gather together in the landscape, occasionally around colonies of Fieldfares (*Turdus pilaris*), whose aggressiveness may help to keep predators at bay, they are nonetheless still defending full breeding territories. Bramblings also concentrate to some extent in areas with high densities of autumn moth (*Epirrita autumnata*) caterpillars, which sometimes infest birch trees, feeding on the young leaves. Outbreaks occur in different areas in different years, causing many Bramblings to shift their nesting areas from year to year (see Movements).

Among European carduelines, at least, aggregations of pairs are often small. They may involve two or three pairs in the cases of the European Goldfinch, Eurasian Siskin, European Serin and Red Crossbill, and four to six pairs in the cases of the European Greenfinch, Common Linnet, Twite, Common Redpoll and Hawfinch, the last a curious case, since some Hawfinch pairs vigorously prevent other pairs from nesting near them. Twites also make a habit sometimes of nesting near Common Linnets. The grouping of nests may be in part for enhanced vigilance against predators and in part for obtaining cues on the locations of good feeding areas, since foraging by breeding finches is often done in flocks in pursuit of shifting local food abundances. These small colonies, however, are very transient, pairs often moving quite long distances to find a new nest-site for the next brood of the season. Such shifts are doubtless driven mainly by changes in food supply, most notably in the case of Common Redpolls, which, in years of good spruce seeding, break their northward migration to breed in spruce forest before moving several hundred kilometres onwards to breed for a second time in the pre-tundra birch belt. Sometimes, such changes relate to more local seasonal changes in food supplies or nesting cover: for example, European Goldfinches and Common Linnets nest early in conifers and common gorse (*Ulex europaeus*), respectively, and later also in deciduous shrubs.

A male carduelline finch usually finds and courts a female partner while the two are in a flock, and not by first staking out a territory. As early spring approaches, the males in the winter flock start to show signs of mild aggression towards one another, with supplanting and chasing manoeuvres, an increase in singing, and approaches made in various postures towards females, reaching out to touch or nibble the latter's bill. Females that nibble back signal their interest, and the attachment devel-



*The crossed mandibles of the **Red Crossbill** are capable of extracting seeds from closed as well as open cones. This enables the birds to exploit conifer seeds before they become available to other seed-eating finches, and to begin breeding earlier. Crossbills of all species insert their mandibles between the scales of the cone, using the upper mandible as a lever to prise them apart. The seeds are extracted using the spoon-shaped end of the tongue.*

[*Loxia curvirostra curvirostra*, Helsinki, Finland. Photo: Markus Varesvuo]







*This **Two-barred Crossbill** is carrying a small cone to a more convenient perch to extract the seeds. Larger cones may be left attached to the tree. Crossbills hold and manipulate the detached cones with their feet, holding them upwards at a slight angle. The different species, races and even populations of crossbills are adapted to different kinds of cone. The Two-barred Crossbill, with its relatively slender bill, targets softer cones such as those of larch* (Larix). *After taking a number of seeds, the crossbill will let the cone fall to the ground. Crossbills themselves would have extreme difficulty feeding on such fallen cones, although they have been recorded feeding on low growing plants and even grasses. Captive Red Crossbills* (Loxia curvirostra) *consumed an average of 925 seeds per day in winter, when the cones were mature and seeds of highest calorific value. They took 3000 seeds per day in July, when the cones were green, and 1550 in August, when they were semi-ripe. The figures are likely to be higher for wild birds, since the captive birds did not need to use energy in foraging, and were kept in warmer conditions.*

[Top and centre: *Loxia leucoptera leucoptera*, Chicago, Illinois, USA. Photos: Rob Curtis/ The Early Birder.

Bottom: *Loxia leucoptera leucoptera*, N Kentucky, USA. Photo: Dave Maslowski/ Maslowski Productions]



The attraction of carduelline (though apparently not fringilline) finches to salt and other minerals is well known. Observations have come mainly from North America, though the behaviour is much more widespread, as this ***White-winged Grosbeak*** *in Tibet demonstrates. It has been suggested that, like mammalian herbivores at saltlicks, the birds are making up for some deficiency in their vegetarian diet. However, the quantity eaten is far in excess of what would be supplied by a carnivorous diet.*

[*Mycerobas carnipes carnipes*,
Yadong, Tibet.
Photo: Dong Lei]

ops from then on, the two individuals keeping closer company with each other than they do with any others in the flock. In the early weeks of the relationship the male repeatedly exhibits ritualized aggression towards the female, sleeking his plumage and raising his wings away from his flanks to show off their pattern, pointing his bill upwards and lowering his wings to reveal the colours of his rump or tail, or suddenly pursuing her in a vigorous headlong chase. Even so, the female quickly becomes the dominant partner in feeding situations, and, as the spring advances, the male's billing, an early indication of a willingness to feed her, turns into the real thing as he regurgitates seeds for the female to take, she for the moment adopting the typical food-soliciting posture, crouched and with wings fluttering, of a young bird. As mentioned previously (see General Habits), however, allopreening has not been observed for either fringilline or carduelline finches.

It is only at this stage that the process of selecting a nest-site and defending its immediate environs begins. The pair spends more time on the ground than usual, picking up and dropping items for use in nest construction, and visiting possible sites. The female usually leads the search, with the male on watch and in song at each venue, although the male of some *Leucosticte* finches may advertise a site while holding a piece of nest material. When she decides on one site, the male of many species perches nearby and sings, flying at conspecific male intruders and occasionally battling with them. The area that he defends, however, is relatively tiny, as little as 64 m² for the House Finch, 240 m² for the European Goldfinch and about 680 m² for the Lesser Goldfinch. A territorial male drives off other males, but not females, within these areas; nearer the nest, the territorial female will drive off intruders of either sex.

As a prelude to copulation, the male of some carduelline species may perform a "moth-flight" in front of his female, this consisting of a short, low-level fluttering flight usually under cover. Much more conspicuous is his higher-level song flight, usually undertaken in clear air and sometimes at a good height, often involving deep slow-motion wingbeats and always accompanied by calling and singing. For many people in the Old World, by far the most familiar is the song flight of the European Greenfinch, since this is so common a species even in towns. The explanation of such behaviour is not obvious. It occurs from the establishment of the territory until the start of incubation, but covers a larger area than the nest territory, and the song flight of the Common Redpoll, for instance, involves deeply undulating, rather high flights over an area several times the size of a Common Chaffinch territory. It may be triggered by aggressive interactions with other males, and seems to be performed mostly by males when breeding synchronously. Possibly it serves to attract other pairs to the area, with the resulting putative advantages in terms of communal foraging and security; possibly it is a self-advertisement of a male to the others in the colony, to establish some kind of status dominance, perhaps with the particular motive of extra-pair copulation.



When researchers at the University of Montana, USA, added common salt and calcium carbonate to soil already visited by a number of finch species including the ***Red Crossbill****, the birds' use of the treated patches increased significantly. The researchers suggest that the birds were originally attracted by builders' lime, which had leached from the walls of their laboratory into the soil. Hispaniolan Crossbills* (Loxia megaplaga) *have been observed eating soil in an area formerly mined for bauxite in the Sierra de Bahoruco National Park, in the Dominican Republic. Red Crossbills are among species regularly killed by traffic after being attracted to salt put down to melt ice on roads.*

[*Loxia curvirostra curvirostra*,
Huerta del Rey, Burgos, Spain.
Photo: Alejandro Torés]



Foraging on snow and open ground, including rocky scree and the shores of montane lakes, the ***Brown-capped Rosy-finch*** *takes emerging insects in the summer months. The proportion of insects in its diet can be as high as 84% in July, dropping to 5% by early September. For the rest of the year it feeds mostly on seeds. When deep snow covers its high-altitude breeding grounds, it descends to alpine meadows and valleys around the snow-line, but makes visits to higher slopes to forage in areas cleared by the wind. Birds are an average 3 g heavier in winter than in summer, because of stored fat.*

[*Leucosticte australis*, Mt Evans, Colorado, USA. Photo: Ian Merrill]

Certainly, male European Greenfinches, American Goldfinches and redpolls have been found to mate with more than one female; so also have male Common Linnets, Common Rosefinches and Evening Grosbeaks, the last two of which undertake no conspicuous display-flight. Given that these are among the best-studied of finches, it seems probable that other species will also be shown to have such occasional polygamous arrangements, while genetic work may well reveal extensive extra-pair paternity with no bond being established. In any case, the pair-bond of American Goldfinches may last for no longer than one brood, partners changing for the next; males of this species, therefore, do a great deal of mate-guarding. For at least one species, however, a remarkable circumstance prevails: the Eurasian Bullfinch, despite its English name, apparently derived from the stocky neck and powerful head, has a very quiet song and the smallest testes of any finch, and perhaps of any passerine. Moreover, unlike all other passerines studied to date, in which the sperm head is pointed and helical with a mid-piece extending along the flagellum, the Eurasian Bullfinch's sperm is rounded and the mid-piece very short. All the more remarkable is the fact that the sperm morphology of its close relative, the Grey-headed Bullfinch (*Pyrrhula erythaca*), is like that of other passerines. The explanation appears to be that there is no sperm competition among Eurasian Bullfinches, the species being absolutely monogamous, but why this should be so, or what ecological conditions dictate it, is entirely unclear.

The Eurasian Bullfinch is a species that does not nest in colonies, yet it is not obviously territorial, and simply ignores other birds near its nest. Because Eurasian Bullfinches can be seen in pairs, as well as in groups, in all months from December to August, the idea has grown that they "pair for life", but there seems to be no evidence of this from ringing. Nevertheless, the tendency to associate with another individual of the opposite sex is more obvious with this species than with other finches. Indeed, the predisposition of individuals to form single close relationships is seen among captive juvenile siblings, which caress, feed and solicit copulation from each other as early as six weeks of age, and continue to do so through to the following spring, when they acquire unrelated mates of the opposite sex. Mate acquisition in the wild follows a fairly simple process. Solitary individuals that encounter another such of the same sex by chance will fight briefly, but fiercely, before going their separate ways. Solitary individuals that encounter another such of the opposite sex respond differently: in a reversal of the usual roles, the female flies at the male, bill open and calling hoarsely, to which the male reacts with either a real or a ritual retreat, the latter consisting of turning his tail towards her, fluffing his belly feathers and flying briefly in a tense posture until her aggression subsides. This can quickly lead to "bill-caressing" and to the formation of a bond between the two.

When the time to breed comes, however, there are few outward indications. Eurasian Bullfinches perform no display-flights, and their quiet songs have no twittering elements. All displays

The northward expansion of the ***American Goldfinch*** *in the USA is probably linked to backyard feeding, as well as to climate change. But increased winter survival and range extension have not come without cost. As in Europe, feeders have been implicated in the spread of infection.* Mycoplasma gallisepticum, *a poultry pathogen not previously detected in wild birds, appeared first in the House Finch* (Carpodacus mexicanus) *in 1994, then in the American Goldfinch in 1995. Infected birds develop conjunctivitis, become debilitated and die. American Goldfinches have been found to carry* Mycoplasma *for up to 49 days without showing symptoms, and may play a part in spreading the infection among House Finches.*

[*Carduelis tristis tristis*, Rochester, Minnesota, USA. Photo: Stan Tekiela/DRK]



by this species involve the turning of the tail to one side, behaviour not known for other carduelines, and there are no sexual chases. The male does not advertise himself near the nest-site, and generally keeps away from it, except when taking food to his mate or young. Nest-building is stimulated by the performance of a "twig-display" in which the male, puffed up below, picks up a twig or root and proffers it to his mate, who herself then picks up another, and the two fly off; copulation often occurs with both birds holding nest material. As with the Hawfinch, which also has a very quiet song, the male identifies the nest-site, leading the female from option to option, and crouching in each one while giving a special call. The nests of these species are different from the nests of typical carduelines, being made of only two layers, one of twigs and one of roots. Moreover, their nest-sanitation regimes are much stricter, the adults disposing of faecal sacs throughout the nestling period, and they perform more elaborate displays, in the case of the Hawfinch probably because its bill is potentially so dangerous. The courting male Hawfinch has one appeasing posture in which he bows so deeply to the female that he hides his bill from her altogether.

The Hawfinch appears to be highly unusual among finches in that the male actually starts the building of the nest, constructing a flimsy base of twigs. Not enough is known of the cardueline grosbeaks, however, to determine whether such behaviour is typical of them, although the male Black-and-yellow Grosbeak is also reported as taking a secondary role in constructing the nest, while the female White-winged Grosbeak works alone. There are a few other reports of males helping to build, including those of the Spectacled Finch and some of the "desert" finches, but it is possible that what was observed was males simply holding nest material, as is the case with some other species such as, apparently, the Lemon-breasted Canary, Pine Siskin, Citril and Corsican Finches, European Goldfinch and the *Leucosticte* finches mentioned above, without actually participating further. Meanwhile, for all other finches that have been documented, including fringillines, it is the female that undertakes the business of nest-building, with the male in close attendance.

Species that build on flat branches or tangles, such as the Hawfinch, Eurasian Bullfinch and Pine Grosbeak, start with a shallow platform of haphazard twigs and loosely attach a thin pad made mostly of roots. Other species construct a nest generally made up of four concentric layers, the outermost a crust of cobweb and lichen, the next a mix of grass and moss, then a mostly grassy cup, and finally an inner lining made up of tiny soft roots and feathers. Species that build in high trees, such as the European Goldfinch and Eurasian Siskin, place their nests some way out on a branch and make small, neat but often rather deep cups of moss and lichen lined with hair, feathers or thistle down, sometimes bound to the twigs with cobweb. Those that build in forks in low trees and bushes, the great majority of the Fringillidae, use a rather bulky base of thin twigs, weave into it a solid cup of grass and moss, and line it with hairs and rootlets.

Rosefinches in the genus *Carpodacus*, rosy-finches and mountain-finches in *Leucosticte* and the Red-fronted Rosefinch in the monotypic genus *Pyrrhospiza* commonly place their nests very low down in vegetation. Some of these species also nest in



In studies of the relative declines in status of woodland birds in Britain, the ***Hawfinch*** *was found to be doing better in woodland sites with more "wet" features, such as ponds. It was suggested that this might be expected, "given they are known to have to drink regularly, probably to help in the digestion of their large-seed-rich diet". These shy birds are probably most easily seen when they come to drink. Crossbills* (Loxia) *are also reported to drink more often than other birds, including other finches. Eurasian Bullfinches* (Pyrrhula pyrrhula) *are sometimes seen hovering to obtain droplets of water from bushes or trees. Otherwise they prefer to drink at pools or springs under the cover of bushes, and they will fly some distance to find such sheltered drinking places.*

[*Coccothraustes coccothraustes coccothraustes*, Pusztaszer, Hungary. Photo: Markus Varesvuo]



Mountain streams and irrigated cultivation provide water for the ***Yemen Linnet****, which is endemic to the Asir Mountains of south-west Saudi Arabia and the highlands of southern and western Yemen. But the die-back of mature trees in some areas indicates that climate change may be resulting in reduced rainfall. Finches in arid environments can meet some of their needs by metabolizing water from their food. Desert populations of the House Finch* (Carpodacus mexicanus) *in California, USA, have been found to regulate their water use more economically than populations with better access to water.*

[*Carduelis yemenensis*, Kawkaban, Yemen. Photo: Hanne & Jens Eriksen]

crevices and even rodent burrows; other fringillids that nest on or in the ground, in crevices or in holes include the Red-fronted Serin, Cape Siskin, Drakensberg Siskin, Black-headed Canary, Twite, Common Linnet, Common Redpoll (amid piles of driftwood), Ankober Serin and Yemen Serin (*Serinus menachensis*), the last of which also uses old nests of Rock Martins (*Ptyonoprogne fuligula*); even the Brambling has, rarely, nested on the ground. Certain rosefinches and rosy-finches sometimes nest on buildings, and in North America the House Finch has profited from the use of such anthropogenic substrates as hanging baskets, carport roofs and streetlamps. Some other nest-sites may be commonly used by the species in question, but are relatively unusual for finches in general. For example, the African Citril, Yellow-fronted Canary and Lawrence's Goldfinch have been recorded as nesting among banana fruits and/or mistletoe (Loranthaceae) clusters, the Red Siskin (*Carduelis cucullata*) in *Tillandsia* bromeliads, the Streaky-headed Seedeater in clusters of seed pods and pine cones (once behind tree bark), the Citril Finch against tree trunks, and the Arctic Redpoll and Papyrus Canary over water, the last seemingly always in a papyrus head.

Eggs of finches are somewhat variable in colour, but are typically bluish-white or greenish-white, with sparse reddish-brown



The ***White-browed Rosefinch*** *is an altitudinal migrant. However, although most individuals descend to the lower mountain slopes in winter, some remain at high levels even when deep snow covers the ground. With "liquid water" unavailable, snow provides an alternative water source. Pine Siskins* (Carduelis pinus) *have also been recorded eating snow. On two occasions, single Pine Grosbeaks* (Pinicola enucleator) *were observed hovering below icicles on the edge of a cabin roof, and sipping droplets of water as they formed. This process was repeated 5–10 times over five minutes, the birds returning to their perches about 1·5 m away between drops.*

[*Carpodacus thura femininus*, Yajiang, Sichuan, China. Photo: Dong Lei]



*The song of the male **Hawfinch** is quiet and seldom heard, being used in courtship rather than advertisement or territorial defence. Pair formation takes place in early spring, before wintering flocks disband, and involves the gradual breaking down of the distance at which the birds will tolerate one another. The courtship is prolonged, and involves both genuine courtship feeding and a ritualized version (billing). The large, potentially dangerous bill may be one reason for the long and wary engagement period. One of the male Hawfinch's displays involves bowing so deeply that his bill is hidden from the female.*

[*Coccothraustes coccothraustes coccothraustes*, Lower Saxony, Germany. Photo: Duncan Usher/ardea.com]

to purplish-brown freckling and spotting around the blunt end. Several *Carpodacus* finches, the Long-tailed Rosefinch (*Uragus sibiricus*) and the Scarlet Finch (*Haematospiza sipahi*) have unusually deep blue eggs, sometimes with few markings, while some species that commonly nest in holes have white eggs, including the Cape Siskin, Ankober Serin, certain Asian mountain-finches or rosy-finches and the Black Rosy-finch. Clutch size varies with latitude, and with insularity. Many of the African *Serinus* canaries lay two to four eggs, the Papyrus Canary being an exception in laying only one or two, and the sparse data on Neotropical *Carduelis* siskins indicate a similar situation, with usually only two or three eggs, whereas the more northerly species typically lay four or five, and the Brambling, in strongest contrast, lays clutches of five to seven eggs. The Blue Chaffinch and Azores Bullfinch lay only two eggs, as might be expected of insular endemics. In temperate climates, at least, one egg, representing about 10% of the female's body weight, is laid each day.



After pair formation, the male cardueline finch accompanies the female everywhere she goes, guarding her from the attentions of other males. The male is dominant in winter, but becomes subordinate as the breeding season advances. However, in the European Greenfinch (Carduelis chloris), *this is often interrupted by outbursts of the "sleeked wings-raised" display by the male, which has a strong aggressive component. This display becomes very much less frequent just before copulation starts. Prior to and during copulation, male finches fluff out their body feathers, as demonstrated by this **Black-headed Greenfinch**.*

[*Carduelis ambigua ambigua*, Yunnan, China. Photo: John & Jemi Holmes]

Incubation of the eggs is done by the female finch alone. Usually, however, the male feeds her, with the result that she may spend as much as 98% of her time on the nest. For high-latitude species or, in the case of crossbills, before the end of winter, the risk of chilling of the eggs is so great that incubation starts with the first egg; otherwise, it usually begins with the last or penultimate egg, so that hatching is roughly synchronous. For the great majority of fringillid species, incubation occupies the same approximate period of 12–14 days, although the redpolls, nesting in the long days of the short arctic summer, manage to shorten this span by as many as three days and also have markedly curtailed nestling periods. Intriguingly, four small southern African finches, the White-throated and Protea Canaries and the two *Pseudochloroptila* siskins, have highly protracted incubation periods of 17–19 days. The nestling period is generally of about the same length as the incubation period, although that of some species is longer. The young of tree-nesting species such as the European Goldfinch, European Greenfinch, Eurasian Siskin and European Serin stay in the nest for 13–16 days, and for 17–18 in the case of the Citril Finch, whereas those of species that nest in the shrub layer, such as the Common Linnet, Twite, Common Redpoll and Common Rosefinch, leave the nest in 10–13 days. The risk of predation is higher for near-ground nesters, and there is evidently a premium on accelerated fledging.

Blind and naked except for some wispy down, nestling Common Chaffinches, soon after hatching, clump together with their heads inwards and, when an adult arrives, stretch up in unison, mouths open. Larger broods have difficulty in holding the formation, and the resulting asymmetry leads to uneven food distribution and a runt structure to the brood. By days 4–5 the nestlings can move more freely, their eyes begin to open and their wing and tail feathers emerge, and soon afterwards diurnal brooding dwindles sharply to nothing. The female provides 85% of the food, and feeding visits increase from 3–4 times per hour at hatch-







As the time for nesting and copulation approaches, pair members spend more time on the ground than usual, picking up and dropping items for use in nest construction. Males may incorporate these items into the courtship display. In the Purple Finch (Carpodacus purpureus), *for example, the male sometimes holds a piece of nest material in his bill as he hops round the female, singing loudly, with his tail cocked, crest raised, and wings fluttering vigorously. The* ***Pink-rumped Rosefinch****, which breeds in sparsely vegetated montane areas in central and southern China, is a scarce and little-known species, and its courtship has not been described. In the congeneric Common Rosefinch* (C. erythrinus), *the partners take turns circling one other with a head-up posture. As part of the display, the male bows towards the female then throws back his head and gives a rapid burst of song. Successful copulation among* Carpodacus *and other finch species occurs only at the invitation of the female, and does not automatically follow from the courtship display, even in an established pair. The female solicits in typical passerine fashion with tail tilted upward, drooping and quivering her wings, and giving begging calls.*

[*Carpodacus eos*, Bayi town, Nyingchi, SE Tibet.

Photos: Dong Lei (top, bottom), Pingzhao Luo (centre)]

ing to 6–9 times per hour near the time of departure from the nest. At the end of a feeding visit, the adult usually waits for a nestling to defecate; it swallows the faeces in the first few days and removes them for the next week, but prior to fledging it allows them to accumulate on the nest rim. During this last period, the nestlings begin to stretch and flutter their wings, grooming their flight-feathers to remove the basal sheaths.

In cardueline finches the pattern is much the same. Initially, it is the male, however, that provides food for the nestlings while the female broods them. Typically, the male regurgitates food to the female, which in turn regurgitates it to the young, placing it inside their open mouths. Later in the season, when the young are feathered, the two parents forage together, and feed the young directly and in turn. Moreover, because this food consists largely of seeds and must be gathered from considerable distances, the young are fed less frequently, usually at intervals of 20–60 minutes. Just as the adults hold this food in their expandable gullet, so, too, do the nestlings, thereby bridging the time-gap between visits. Thus, in most cases, the young fledge no less quickly than do fringillines fed on a diet of insects. Exceptions to these general rules are the chicks of the insular Blue Chaffinch, which take half as long again as those of Bramblings, young of some African *Serinus*, which take 19 days or more and, at the other end of the temperature spectrum, certain high-elevation *Leucosticte* finches and the crossbills, breeding as they often do in winter, which can take well over 20 days to fledge. Even so, newly fledged crossbills can themselves enter sexual maturity within a few months, before acquiring their adult plumage.

For Common Chaffinches, the fledgling period—the time between departure from the nest and leaving the care of the parents—divides into three stages. In the first, the young are led into dense cover by the parents, each fledgling in a different place, apparently as a strategy for minimizing losses to predators. There, each solitary young remains very quiet and still on a particular perch, except when expecting to be fed, when, perhaps as a means of ensuring relocation by the foraging parent, it fluffs out its head and breast, and lowers and continually pivots its body, giving a repeated "chirrup" to draw attention. The second stage, after about a week during which the flight capabilities of the chicks have greatly improved, involves the reunification of the family party, which then begins to move around the territory and into the neighbourhood, searching for caterpillars. Now the young are much noisier, but still incapable of foraging for themselves; for four or five days they pester their parents for food before they steadily develop their own foraging skills, pecking at small objects and fluttering after flying insects. This is the start of the third stage, lasting up to a fortnight, in which the young profit from the greater vigilance and competence of their parents to develop their own seed-hunting and seed-processing skills, and beg only if they are approached by a food-carrying adult.

Periods of post-fledging dependence are generally short. This is reflected in the fact that, while fringillines seem rarely to run to a second brood, carduelines, at least in temperate climates, commonly raise two or three broods. Fledged young generally continue to be fed for periods inversely proportionate to the period that they spend as nestlings: thus, fledglings of the European Serin, having been nestlings for as many as 15–18 days, are independent in just nine more, whereas those of the Common Rosefinch, nestlings for 10–13 days, are tended by the parents for a further 14 days. When a second brood is started, it is inevitably the female whose parental care for the first brood is terminated, leaving the male to provision the offspring while she lays a new clutch and, in some cases, constructs a new nest beforehand. In one study of the American Goldfinch, for which the breeding season is relatively short, the first egg of the new clutch was laid as close as three days and never more than ten days after the fledging of the first brood, a slightly longer period of 6–14 days elapsing in the case of nest failure.

Breeding success of cardueline finches is often low, but the production of several clutches per season is possible because of the long period over which suitable foods are available. Crows (Corvidae) are particularly regular and effective predators, figuring again and again in accounts of nest failure of finches around the world. As reflected in their respective nestling periods, however, finches that nest in the lower strata of vegetation tend to do worse than do higher-nesting species, and face a greater variety and, perhaps, a greater number of predators, including rats (*Rattus*), squirrels, stoats (*Mustela*), foxes (*Vulpes*) and cats



*The male **Cape Canary** may accompany the female as she gathers nest material, but, as in most finches, the female builds the nest alone. With some exceptions, such as the Hawfinch* (Coccothraustes coccothraustes)*, reports of male finches helping with nest-building can probably be attributed to male birds either accompanying their mates to guard them from other males, or offering nest material as part of courtship behaviour.*

[*Serinus canicollis canicollis*, Cape Town, South Africa. Photo: Rafael Armada]



*Beginning with a foundation of twigs, the female **European Greenfinch** builds a nest in the form of a well-made cup of grasses, twigs, moss, lichen and plant fibres, with a lining that may include feathers, animal hair (such as sheep's wool, here being collected from a barbed-wire fence), and plant down. The female also chooses the site for the nest, which the male then defends. Conifers and other evergreens are favoured, particularly early in the season before leaves are out on deciduous trees.*

[*Carduelis chloris*, Scotland. Photo: Phil McLean/FLPA]

(*Felis*), as well as the various corvids. On the other hand, the higher breeding success of Eurasian Bullfinches in hedgerows than in woodland has been attributed to the former's denser cover, through frequent clipping, and reduced accessibility to Eurasian Jays (*Garrulus glandarius*). Brood parasitism is a relatively unusual problem for finches, as one would expect from their high-seed diets. In fact, the Brambling, with its nestling diet of insects, is the only species of finch known to be parasitized by a cuckoo (Cuculidae), but Pine Siskins, American Goldfinches, Purple Finches and House Finches are hosts to Brown-headed Cowbirds (*Molothrus ater*), and the Hispaniolan Crossbill is host to Shiny Cowbirds (*Molothrus bonariensis*), although these icterids rarely reach the stage of fledging on the seed diets with which they are fed.

Within a few days of independence, young Common Chaffinches disperse up to several kilometres from the natal territory, form small groups from different broods and commence a moult. By the end of the year they will have begun to focus their foraging on a particular area, and this will become their home range, most individuals in non-migratory populations not moving farther from it than a kilometre, for the rest of their lives. Their parents, meanwhile, quickly turn into skulking creatures within or near their territories, and go into moult.

Movements

Migration from the breeding area is a response to reduced food availability. Since, in temperate climates, seeds persist in the environment across seasonal boundaries with greater predictability and constancy than invertebrates do, seed-eating species such as finches are far less constrained to long-distance movements than are insectivorous birds. On the other hand, seeds are typically somewhat patchy in time and space, so that all finches tend to undertake at least local, semi-nomadic movements. Species that are characterized simply as "sedentary" are often too little known for more to be said about them, but, given that all fringillid species with which ornithologists are familiar exhibit some sort of local displacement, it is predictable that these purely "sedentary" species will turn out to undertake some degree of short-distance wandering. An example is the European Greenfinch, which is classed as sedentary in Britain: the majority of ring recoveries come from within 20 km of the site of first capture, and in any direction, but the capacity to wander is shown by several records revealing that individuals have travelled more than 200 km.

For most members of this family, migration appears to be facultative more than obligate. The birds move in some years, but not in others, depending on food availability, and in any one year individuals from one and the same breeding area can vary



*In Ontario, Canada, the **American Goldfinch** delays nesting until July, and elsewhere in its range it is regarded as a summer, rather than spring, breeder. Among theories put forward for such late breeding is that the bird is waiting for thistle down to be available as material for its nest, although thistle seeds are also an important food for adults and nestlings. American Goldfinches that nest earlier in the season have been found to incorporate remaining down from the previous year's thistles. The nest is so tightly constructed from plant down, plant fibres and cobwebs that it is reported to be able to hold water, with the consequent risk of nestlings drowning after heavy rain.*

[*Carduelis tristis tristis*, New York, USA. Photo: Marie Read]



*The **Brimstone Canary** nests alone or in loosely associated groups. It breeds from March to January in East Africa, July to November in the Western Cape of South Africa, and May to January in the Eastern Cape. The exact timing may be determined by the rains. A study of Island Canaries* (Serinus canaria) *on Ilheu Chao in the Madeira archipelago found that they are opportunistic breeders, responding to favourable conditions rather than day length. Following unusually heavy autumn rain, they began breeding before the winter solstice, at least six weeks earlier than usual. The birds were already paired, mate-choice having taken place while the birds were in flocks during the non-breeding season.*

[*Serinus sulphuratus wilsoni*,
Barberton, South Africa.
Photo: John Carlyon]

greatly in the distances that they travel. Nevertheless, in the northern continents, most species of finch that breed over a wide span of latitude show a gradient in migratory behaviour, in that the proportions of individuals that leave for the winter increase from south to north, corresponding with the seasonal reduction in food supplies. Some species, such as the Common Chaffinch, are almost wholly migratory in the northern parts of the breeding range, totally sedentary in the southern parts, and partially migratory in regions in between. The same holds for the European Goldfinch and Common Linnet in Europe, and for the American Goldfinch and House Finch in North America. For this last species, the behaviour is recent, as the House Finch spread over most of the continent in the latter half of the twentieth century, and developed migratory behaviour appropriate to different breeding latitudes. Many finch species, in fact, are known to have both migratory and sedentary populations, including North America's Evening Grosbeak and, despite its scientific name, Asia's Yellow-billed Grosbeak (*Eophona migratoria*).

In the Northern Hemisphere, there seems to be only one fully migratory finch whose entire population moves a long distance in autumn to a distinct wintering range. This is the Common Rosefinch, the only true long-distance migrant in the family. It



*The rather untidy nest of the **Pine Grosbeak** is usually built close to or actually against the trunk of a tree. The typical clutch is four eggs, variably green to blue, sometimes freckled all over, sometimes with fewer, larger markings. Markings tend to be concentrated at the blunt end. For high-latitude species such as some crossbills* (Loxia), *which begin nesting during winter, the risk of chilling is so great that incubation may begin with the first egg. In most other finches it usually begins with the last or penultimate egg, so that hatching is roughly synchronous.*

[*Pinicola enucleator enucleator*,
Lapland, Finland.
Photo: Roger Powell/
naturepl.com]



In a long-term study of the ***American Goldfinch*** *in Ontario, Canada, older females (in at least their second season) were found to nest slightly earlier, and to produce larger clutches. The largest clutches were produced by older females mated with older males. Older females also had greater hatching and fledging success, and once again, success was greatest where an older female was mated with an older male. American Goldfinches often change mates between seasons—and sometimes between broods—but females tend to remain faithful to a nesting area, while males look elsewhere.*

[*Carduelis tristis tristis*, New York, USA. Photo: Marie Read]

breeds in boreal and temperate regions right across the Palearctic Region and south into mountain areas of Central Asia, following which all members of all of its populations migrate southwards, spending the winter months in the subtropics of southern Asia. Another species which occupies high boreal forests in the Palearctic and moves to lower latitudes for the winter is the Brambling, but in this case the distances travelled are almost entirely intracontinental, and a small percentage of the birds, at the lowest breeding latitudes, remain there all year. In Europe this species radiates south and west, occupying western and south-central Europe and crossing the Mediterranean only in small numbers, if at all. At least three conditions influence the movements of Bramblings. First, the species' own numbers have an effect when, after one or more good breeding seasons, the populations are generally at a high level and birds are driven farther afield by the sheer pressure of intraspecific competition for resources. Second, snowy weather prevents the birds from foraging on the ground. Third, the food on which the species largely depends in winter, namely beechmast, varies in abundance from year to year and from area to area, so that in lean years the birds may travel farther than usual, while in years of local high beechmast abundance they may concentrate in spectacular numbers at some localities. As a result of these various influences, the distances travelled by Bramblings vary from year to year, and individuals may end up in widely separated places in different winters, their "site-fidelity" being low.

Generally speaking, finch species that depend on the seeds of herbaceous plants tend to be rather more predictable in their patterns of movement, with somewhat higher levels of philopatry, than species that depend on the seeds of trees, which tend to vary in quantity and distribution from year to year. Eurasian Goldfinches and Common Linnets are examples of the former, with western European breeders travelling to western France and Spain and eastern European ones travelling to eastern Spain, but individuals of both species may move different distances in different years. Some finch species depend on trees that hold their seeds over winter, and are therefore under less pressure from snowfall than are ground-feeding species. On the other hand, widespread failure in tree seeding, which is frequent among many boreal and temperate trees, inevitably results in emigration. Tree-seed feeders are thus known for their irruptive behaviour, in which they appear in large numbers in particular localities in certain years, but are scarce or absent in other years, depending mainly on the distribution of seed crops. Well-known irruptive migrants in Europe include, besides the Brambling, the Common, Parrot and Two-barred Crossbills, Eurasian Siskin, Common and Arctic Redpolls and, in some regions, also the Eurasian Bullfinch, Pine Grosbeak and Hawfinch, while in North America irruptive finches include the Common and Two-barred Crossbills, Pine Siskin, Common and Arctic Redpolls, Evening Grosbeak and Purple Finch. Other seed-eaters from different bird families, including various tits (Paridae), nuthatches (Sittidae) and woodpeckers (Picidae), exhibit similar irruptive behaviour.

Irruptive finches show more variability in the distances and directions of their movements than do some other finches, because each year they seek out regions where their food is most available. Most such species stay within, or just south of, their breeding areas when suitable seeds are plentiful there, but travel to lower latitudes when local seed crops fail, occurring in the farthest parts of their winter range only in exceptional years as an "irruption". These patterns are evident from observations and also from ring recoveries. Directional variability is apparent within a given year, but also at the level of the population between one year and another. For example, most of the Common Redpolls ringed on migration in Finland in autumn 1965 were recovered in the ensuing winter far to the east and south-east, whereas those ringed in 1972 were recovered in the ensuing winter far to the south-west. This marked directional difference could be explained if the birds were tracking seed crops which took them in different directions in the two years.

As a result of these patterns, the numbers of irruptive finches in particular localities can fluctuate wildly from year to year, and particular individuals of irruptive species can end up in widely separated areas in different winters. Most individuals are reported from different points on the same migration axis, having travelled much farther in one year than in another, but others are reported from widely separated longitudes in different years, implying directional differences. At least four Common Redpolls have been reported in different winters at localities more than 8000 km apart: three were recorded in westernmost Europe in one winter and in Heilongjiang, eastern China, in another; and a fourth was found in Michigan, north USA, in one winter and in Okhotsk, on the eastern edge of the Eurasian landmass, in another. Similar east–west displacements, over hundreds or thousands of

kilometres, have been reported for other irruptive finches, including the Brambling, Eurasian Siskin and Eurasian Bullfinch. All of these birds are likely to have returned in the interim to the breeding range, but not necessarily the same locality, and to have taken different directions in the two years. More ring recoveries are available for the Evening Grosbeak than for any other irruptive species, resulting from this species' habit of visiting garden feeders in winter, allowing large numbers to be caught and ringed. The movements of this grosbeak are astonishing in that individuals seem to possess virtually no site-fidelity or predictability in their movements, the only discernible pattern being to winter in most years at lower latitudes than those at which it breeds. It is known to concentrate in areas of caterpillar outbreaks in the breeding range and of high tree-seed crops in the wintering range.

For many irruptive finches, ringing studies have demonstrated shifts of breeding areas between years, mostly over distances of up to a few hundred kilometres, but for Common Crossbills over distances of 2000–3000 km. Another indication of the almost complete lack of site-fidelity of some finch species comes from repeated trapping and ringing in particular localities. In one study, only seven out of 1238 adult Bramblings were retrapped in the same breeding area in a later year, and none of 1806 juveniles were refound there, despite an annual trapping programme lasting for many years. For this and other irruptive species, similar results were obtained from the trapping operations at various breeding and wintering localities. These findings stand in contrast to those for non-irruptive finches and other birds, many individuals of which occur in the same breeding and wintering areas in successive years. It is not as if irruptive species have poorly developed navigational systems: Common Redpolls of the subspecies *rostrata*, for example, undertake sea crossings from Greenland to Iceland and back, some of them reaching Scotland in what are clearly very precise movements.

Crossbills display an unusual pattern, at least in spruce areas, as they are so closely tied to cone crops. Typically, their one considerable movement each year occurs after breeding, when the seeds in the breeding area have been depleted and new crops are forming elsewhere. If the seeds hold out, the birds settle the area until the following summer, moulting and breeding together. They thus differ from other species in making only one major movement each year, in mid-summer, and by this means cope with both regional and annual variations in food supply. Their irruptions could be said to be large-scale versions of the same pattern, but the direction of movement tends to be more definite, and the distances travelled longer. Huge numbers may be involved: in late 1990, for example, as many as 1,500,000 crossbills were judged to have immigrated into Scotland. In some cases they disperse after one season, but sometimes they colonize the area for a time or even permanently, as in the case of the Red Crossbills that settled in the pine plantations of East Anglia, in England, after the invasion of 1909.

A possible explanation of these seemingly random choices of destination by many finch species each winter may lie in the mode of migration. Although Bramblings migrate partly at night, perhaps because they typically have such long distances to cover, most finches move by day, in relatively short steps that take them 100–200 km at a time. For example, Eurasian Siskins have been "timed" by ringing recoveries to have travelled various distances at 113 km, 160 km and 189 km per day. These movements take place from dawn until the middle of the day, with smaller ones in the evening; the birds rest and feed in the afternoons. This pattern of relatively relaxed, short-distance "hops" may allow the birds the chance to readjust their flightpath and speed according to local conditions—the weather, food supplies, the abundance of conspecifics, and so on—resulting in a multiplicity of wintering grounds for any one individual.

Being able to take food regularly in the course of their travels means that fat deposition in finches prior to migration is not particularly great. Fringillids typically put on an extra 15% in body weight in both spring and autumn. Fat is an unnecessary encumbrance to a bird that can eat on the way. The longest-distance migrants naturally accumulate the most fat, and tend to fly the farthest in the course of a day. For birds such as high-latitude Common Chaffinches, in autumn, fat deposition has to take place very rapidly after the completion of the moult. Even these birds, however, tend to stop for a day or two at a time in order to replenish their reserves, rather than attempting long-haul flights, which are really made only when large stretches of water need to be crossed. These pauses for feeding appear to explain why finches move in waves, and why on certain days when conditions seem perfect for migration no movement takes place. Compared with some other birds, finches can be classed mostly as "short-distance" migrants, in that their movements normally occur, as noted above, within continents. For the most part, they avoid long water cross-



*There are reports that the male **White-throated Canary** shares the duties of incubation. This would be unusual: in* Serinus *species, as in most of the Fringillidae, his job is to keep the incubating female provisioned. The White-throated Canary has a long incubation period of up to 19 days. The female's dependence on the male may be one reason why rates of extra-pair paternity of broods have been found to be lower in* Serinus *than in many other passerines.*

[*Serinus albogularis albogularis*,
Breede River, Bredasdorp,
Western Cape,
South Africa.
Photo: Peter Steyn/
ardea.com]



When the female ***Common Rosefinch*** *begins to incubate, the male resumes singing and moves away from the nest-site, sometimes several kilometres away. However, he regularly returns to visit and feed the incubating female, and later helps in feeding the young. He also feeds the female while she is brooding the newly hatched chicks. The young are fed mostly on seeds. Most food gathering is done outside the territory, and because the birds forage at some distance, there may be an hour or more between feeding visits, the parent birds cramming their distensible gullets with seeds. In some* Carpodacus *rosefinches, males may take two years to reach full breeding plumage. First-year male Common Rosefinches are often absent from the breeding grounds, although young males have been seen assisting in feeding the nestlings of established pairs. Some Common Rosefinch males have been found to mate with more than one female. Common Rosefinches are long-distance migrants which pack a single brood into a short season, and it has been suggested that because of these time constraints, female Common Rosefinches pair unselectively with the first available male. Extra-pair copulations may be their way of compensating for the hasty choice of a low-quality male. Males that are successful in extra-pair copulation do not tend to have other males' eggs in the broods they father, suggesting that they are higher-quality birds, and that their mates are satisfied with their choice.*

[*Carpodacus erythrinus erythrinus*, Pori, Finland. Photo: Hannu Hautala/ FLPA]



*The **Long-tailed Rosefinch** is unusual in that parents share incubation as well as care of the young. Broods in this species can vary from three to six birds, but four is most usual. As in other passerines, those with expansive north–south ranges tend to have smaller clutches at lower latitudes. In a sample of 20 House Finch* (Carpodacus mexicanus) *nests in Mexico City, 17 had two eggs and three had three eggs; farther north, clutches of four to six are more common. High-altitude populations of the Grey-crowned Rosy-finch* (Leucosticte tephrocotis) *are reported to have smaller clutches than coastal populations.*

[*Uragus sibiricus ussuriensis*, Ussuriland, Russia. Photo: Yuri Shibnev/ naturepl.com]

ings. Scandinavian Common Chaffinches mostly route themselves south-west through northern continental Europe, then turn west or even north-west to cross the North Sea to Britain from Holland; likewise, most Eurasian Goldfinches and Common Linnets intent on flying from Britain to Spain begin their journeys by heading east or south-east, reaching the continental mainland by the shortest sea route and avoiding a crossing of the Bay of Biscay.

Male Common Chaffinches, under compulsions to reoccupy breeding territories as soon as they become available, tend to stay closer and return sooner to the nesting grounds than females, and this earlier reappearance, or just their same-sex winter aggregations, caused Linnaeus to think of them as bachelors, hence his name *coelebs*, from which the English word "celibate" is derived. Male *Leucosticte* rosy-finches exhibit the same habit in North America, gathering impatiently in areas adjacent to their snow-clad mountain tops until the mid-summer thaw allows them access to their territories. There is some evidence of differential movement by Common Chaffinches, the slightly larger males



*The female **Common Chaffinch** provides most of the food for the nestlings, the male contributing no more than one-third, and often less. The number of feeding visits she makes increases from four per hour immediately after hatching to up to nine per hour as fledging approaches. Common Chaffinch chicks are fed almost entirely on invertebrates, mainly defoliating caterpillars. A study of Common Chaffinches breeding on farmland in Britain has found that proximity to oak trees* (Quercus), *which are particularly high in invertebrate biomass and diversity, is an important factor in the success of nests. To a lesser extent, willows* (Salix) *are important for the same reason.*

[*Fringilla coelebs coelebs*, Lesvos, Greece. Photo: Mathias Schäf]



Some cardueline finches, such as the European Greenfinch (Carduelis chloris), *include a proportion of invertebrates in the food they bring their nestlings, particularly in the early days. The* ***European Serin****, however, has been known to feed its young entirely on seeds. A study of European Serins breeding in olive groves in Spain found that the young birds were fed almost entirely on the seeds of two plants, wall-rocket* (Diplotaxis virgata) *and stork's-bill* (Erodium). *Wall-rocket was among the least abundant of potential food plants in the groves, so the parents must have been seeking it out. The seeds of these two plants are particularly high in protein.*

[*Serinus serinus*, La Rioja, Spain. Photo: José Luis Gómez de Francisco]

displacing females at food resources, driving them farther on in their migrations; larger size is, however, a thermoregulatory advantage in colder climates, and it is this difference that is thought to explain the longer distances travelled in winter by female Evening Grosbeaks in North America. British Common Chaffinches, unlike their more boreal counterparts, and irrespective of sex, are notably sedentary, 90% of individuals keeping to within 5 km of their natal site and the remaining 10%, almost all first-years, not straying beyond 50 km. The same pattern is found with several other British finches, most strikingly the Eurasian Bullfinch, for which 85% of all ringing recoveries are at less than 5 km from the site of first capture, and only two exceeding 200 km. This is in marked contrast to the irruptive behaviour of Eurasian Bullfinches which breed in the boreal forests of northern Eurasia, and which move to lower latitudes in years when their winter foods, especially rowan (*Sorbus aucuparia*) fruits, are in short supply. This species thus provides another example of regional variation in migratory behaviour associated with the availability of winter foods.

Relatively little is known of the movements of fringillids in Africa and the Neotropics. None of the species concerned seems to be truly migratory, but local movements, dictated by food availability, are likely to take place. Furthermore, altitudinal shifts could be expected in some cases. In Middle America, for example, Black-headed Siskins (*Carduelis notata*) from higher-lying areas of the range make a post-breeding descent to adjacent lower levels and coastal areas, and some Black Siskins in the Andes move to lower elevations in the non-breeding season. Yellow-rumped Siskins (*Carduelis uropygialis*) breeding in the Andes of central Chile and adjacent Argentina appear to be partial or altitudinal migrants, wandering widely and erratically during April–October in search of feeding areas. Their travels at this time take some of these birds northwards as far as central Peru and western Bolivia, and individuals appear down to 500 m, more rarely to sea-level, and sometimes at altitudes as high as 4000 m.

Relationship with Man

Typically, seed-eating birds such as finches are rather abundant. Many have profited from the global growth in agriculture, which has produced huge areas of cultivated lands and orchards, created long lines of hedgerows and woodland edge, and broadly generated the conditions for the spread of weeds. As a consequence, finches in particular have become among the most familiar birds in the anthropogenic landscape. Only 39 species, 27% of the total, have been described as occupying habitats which do not include, at least partially or seasonally, human settlements, cultivations, parks, gardens, grazed land, clearings, ditches or roadsides, and these are typically species that are either threatened, restricted in range and little known, or confined to very high remote mountain tops or deep montane vegetation, notably the *Mycerobas* grosbeaks and most *Pyrrhula*.

Seed-eating birds are also relatively easy to keep in captivity, and this, combined with the sheer abundance of finches, and their handsome appearance, tuneful singing and ease of domestication, explains the extraordinary degree of interest that people have taken in finches over the centuries. Perhaps the longest-serving prisoner of human attention has been the European Goldfinch, whose use as a cagebird in human societies throughout its range doubtless dates further back than any records show, but over time it also acquired an important mythological status that may, in turn, have generated a further interest in catching and keeping it. The ornithologist H. Friedmann reviewed its use by artists in the Middle Ages, the Renaissance and beyond, tracing no fewer than 486 classical paintings—by Leonardo da Vinci, Raphael, Zurbarán, Tiepolo and 250 other artists—of Mary and the infant Jesus with a European Goldfinch in his hand, a symbol of the soul, resurrection, sacrifice, death, healing and redemption. The widespread use of the species as a pet may have been driven in part by this religious association, one popular myth being that the red on its face was the stain of holy blood to be worn in honour by all the descendants of a bird that tried to pull the thorns from the brow of the martyred Christ.

The popularity of the European Goldfinch especially as a children's pet is reflected in several great paintings, such as Bronzino's "Giovanni de' Medici as a child" (1545) and Goya's "Don Manuel Osorio Manrique de Zúñiga" (1790), but the poignancy of captivity could hardly find finer illustration than in the 1654 study by Rembrandt's pupil Fabritius of a goldfinch held by a little chain to a tiny double wall perch. Other species, however, were also much favoured down the centuries for pets and



On hatching, finches are blind and naked apart from a few tufts of down. Their eyes open after about four days, when their feathers begin to emerge. Daytime brooding ceases soon after. The young ***European Greenfinch*** *nestling leaves the nest after 14–18 days. This period is typical of species that nest in trees. Those that nest in the shrub layer, or otherwise close to the ground, tend to leave the nest after 12–13 days, reducing their exposure to predators. However, a number of African tree-nesting* Serinus *species have longer nestling periods, notably the Yellow-fronted Canary* (S. mozambicus) *at 16–24 days.*

[*Carduelis chloris aurantiiventris*, Mendixur, near Gasteiz, Spain.
Photo: Joseba del Villar]

portraits, such as Rubens's "Child with bird" (1629), showing a chubby infant holding a fluttering European Greenfinch, Greuze's "Girl with dead canary" (1765), a touching image of adolescent grief, and Rossetti's "Veronica Veronese" (1872), a study of a young woman contemplating music with her hand on a violin and a yellow canary singing in a cage behind her.

Indeed, it is the domestic canary, descended from the Island Canary (*Serinus canaria*) and often given the "subspecific" name *domestica*, that has had the strongest and most important relationship with man, eclipsing the European Goldfinch in the years since wild Island Canaries were first brought to Europe from the Canary Islands in the early fifteenth century. Only 40 years after the islands' discovery and conquest, Charles VII of France gave his teenage lover, the serving maid Agnès Sorel, this new, rare, wonderful, year-round songster, which T. Birkhead described as "the ultimate status symbol, for both giver and receiver". From



As the nestlings grow and no longer need constant brooding, the male and female ***Eurasian Bullfinch*** *forage together, taking turns to feed the young. Rather than carrying food in the gullet like most finches, breeding bullfinches develop two food pouches, one on each side of the tongue, in which they carry a mixture of seeds and invertebrates. The mouth colour of the Eurasian Bullfinch nestlings becomes a more vivid red with increasing food deprivation, stimulating parents to feed the most needy young birds first.*

[*Pyrrhula pyrrhula iberiae*, Burgos, Spain.
Photo: José Luis Gómez de Francisco]



*At the end of a feeding visit, the adult **Common Chaffinch** usually waits for a nestling to defecate. In the first few days, the parent swallows the faecal sacs, but at later stages it carries them away. Studies of the European Goldfinch* (Carduelis carduelis) *suggest that the digestive efficiency of newly hatched birds is relatively low, and their faeces are energy-rich; parent birds stop eating the faecal sacs when the nestlings' digestive efficiency is equal to their own. A challenge to this theory proposes that swallowing the sacs enables the parents to spend more time at the nest while the young need brooding.*

[*Fringilla coelebs coelebs*, Gillenfeld, Vulkaneifel, Germany. Photo: Winfried Schäfer/ photolibrary.com]

this royal beginning, the popularity of the canary as a pet and as a gift steadily spread downwards and outwards through society, creating a profitable enterprise for the Spanish colonists of the islands, who, wittingly or unwittingly, maintained their monopoly by setting up enterprises, often involving monasteries that exported only the singing males.

The birds became so prized, however, that demand rapidly outstripped supply, and by the late sixteenth century fanciers in the Tyrol region of Austria contrived to obtain some females through Italian connections. Eventually, they worked out how to breed the species in volume in captivity, in what may well be the first instance of successful large-scale aviculture since the domestication of the pigeon, chicken, goose and duck, and within 50 years German-speaking lands had virtually wrested control of the trade from Spain, to the point at which the birds temporarily lost their name of "Canary birds" and became known as "German birds". A point in favour of these captive-bred versions was that, because they were selected and bred specifically for the quality of their songs, they were soon found to sing even more richly than the birds from which they were descended.

Not surprisingly, this led to still greater demand for the species. By the early eighteenth century London households were estimated to be home to some 200,000 canaries, at a time when the human population of the city was only 630,000. Scuffles would break out among prospective buyers when German dealers arrived in Paris each spring and autumn. In 1705, a young Frenchman called Hervieux, who had spent his adolescence training the Princesse de Condé's canaries, published his *Nouveau Traité des Serins de Canarie*, instructing the reader on how to increase the quality and duration of a canary's song, and engendering the profession of *siffleur d'oiseaux*, the peripatetic canary teacher. At around that time, however, a small flute known as the "flageolet", pitched exactly at the canary's vocal range, came into fashion. This was similar to the instrument still known today under the English name of "recorder", the original meaning of which is "memoriser" precisely because it was used to train canaries and Eurasian Bullfinches to sing in a particular way. Then, around 1730, the serinette, a tiny barrel-organ with bellows and pipes, was invented to take the strenuous puffing and elaborate fingerwork out of the training schedule, and this quickly became an object of desire among the wealthier classes, from King George III downwards. Several paintings by Chardin entitled "La serinette" (1751) show a well-dressed woman in an opulent interior working the handle of the machine to inspire song by a tiny caged finch across the room; doubtless, the singing capabilities of one's canary were a sign of social status, and its training needed serious endeavour.

In German-speaking Europe, the canary-breeding centre shifted by turns from the Tyrol to Nuremberg and Augsburg and

*To begin with, the nest of the **Lemon-breasted Canary** is extremely well camouflaged. But as the young birds approach fledging, the parents, like other finches, stop carrying faeces away and allow them to accumulate conspicuously around the rim. As well as faeces, parasites are likely to have accumulated in the nest. Finches beginning a second brood usually build a new nest. Again, the female does all the work, while the male is kept busy caring for the earlier brood.*

[*Serinus citrinipectus*, Bonamanzi, KwaZulu-Natal, South Africa. Photo: Guy Upfold]



then, in the late eighteenth century, to the Harz Mountains, and here it really took root among the miners and artisans of the region, who devoted their spare hours to developing the finest singing canaries the world had ever known. Selective breeding backed up by intensive training led to the development of the Harz Roller, named for its extraordinary trillings, and, with ever-increasing sophistication in techniques of mass production, "Roller Canaries" became the most sought-after of avian pets in the nineteenth century, from America to Russia. In England, Darwin got one in 1850 for one of his daughters, and so also did the writer Charles Dickens one year later. By the 1880s the Harz Mountains were producing 150,000 male canaries every year, a remarkable cottage industry that also generated significant subsidiary businesses in cage-making and pottery for food-holders and water-holders, and this continued right up to the Second World War. In the period 1900–1940, more than 10,000,000 canaries were exported from Germany to the USA, where a proportion of them became pets of mobsters, who took the German word *Fink* and used it to describe an informer, someone who "sang" to the police; one was acquired by the celebrated humorist Dorothy Parker, who called him "Onan", because he was always, as the English Bible has it, spilling his seed.

Miners in the Harz Mountains were finch-keepers long before the advent of the canary in their midst, and they had learnt the value of taking locally caught and trained Common Chaffinches below ground. Presumably, at first this was done simply for their companionship but, when the birds died from breathing gas before it built up enough to poison their owners or to explode, it was quickly realized that the birds had another, far greater value. Then, when the miners began to produce canaries in large numbers, these became the finch of choice for the grisly business of a primitive early-warning system. They were trained to sing under ground, in the poorest light conditions, and taken in groups so that they would sing to and against each other; when one stopped for longer than a brief moment, it was likely to be either dead or in distress, a sure sign of gas and danger. This use of canaries quickly spread to mining communities across the planet. How many canary lives were lost and human lives saved it is impossible to compute, but millions and tens of thousands, respectively, seem likely to be appropriate ballpark figures. In Britain, despite the advent of sophisticated detection equipment, canaries continued to be used right up to 1986, and the English-speaking world has been given the phrase "canary in a coalmine" for anyone or anything that gives an early warning of disaster.

Canaries were not, however, bred just for their song. Birkhead's history of canary-breeding reveals that part-yellow birds were known in 1580 and all-yellow ones in 1657, so that "it had taken around a century—one hundred canary generations and three generations of canary breeders—to complete the [transition from green to yellow]". This, too, has given the English language the phrase "canary-yellow", but by the late nineteenth century interest had moved on to the attempted breeding of a red canary. A. Newton wrote in his *Dictionary of Birds* (1896):

> "It has been found that by a particular treatment, in which the mixing of large quantities of cayenne-pepper with the food plays an important part, the ordinary 'canary yellow' may be intensified so as to verge upon a more or less brilliant flame colour. Birds which have successfully undergone this forcing process, and are hence called 'hot canaries', command a very high price, for a large proportion die under the discipline, though it is said that they soon become exceedingly fond of this exciting condiment."

The colour was maintained only until the next moult, when a further period of "colour-feeding" was needed to colour the next generation of feathers. The search for a genetically red canary, however, persisted into the twentieth century, spearheaded by the German bird-fancier H. Duncker. Although his work ultimately failed, it produced important spin-offs in the area of genetics, and Duncker's *Genetik der Kanarienvögel*, published in 1928, gave canary-fanciers a step-by-step guide on how to breed their birds to the best desired effect. His ideas even reached R. F. Stroud, the "Birdman of Alcatraz". Stroud, a highly intelligent psychopath, spent the years 1912–1942, the first 30



*The long days of the Arctic summer allow **Common Redpoll** parents to feed their chicks almost around the clock, and the young birds can leave the nest after as little as nine days. In the treeless north of the range, they nest in the shrub layer or on the ground, so keeping the nestling period short minimizes the threat from predators. Chicks may leave the nest before they can fly; they do not become fully independent until 26 days old. Further south, Common Redpolls tend to nest in trees, and the pace is less frenetic, with a nestling period of up to 14 days.*
The Common Redpoll expanded its European range in the nineteenth and twentieth centuries, probably because changing forestry practices created new habitat, which this bird was well placed to exploit. It was also introduced to New Zealand.

[*Carduelis flammea*, Christchurch, New Zealand. Photo: Don Hadden]



After leaving the nest at 14–18 days, the young ***Pine Grosbeak*** *is fed by the parents for a further 21 days. This is a long period of dependency for a bird with a relatively long nestling stage, but Pine Grosbeaks are single-brooded, and the parents are under less pressure to get the first brood out of the way. Breeding success in this and other cardueline species is relatively low, mainly because of predation, particularly by crows (Corvidae). In some finch species, family groups stay together and join wintering flocks. In others, such as some* Leucosticte *species, the young leave to form all-juvenile flocks.*

[*Pinicola enucleator*, Alaska, USA. Photo: Steve Kaufman/ photolibrary.com]

of his 54 years of incarceration, not on Alcatraz, where, ironically, he was not allowed to keep birds, but in Leavenworth, Kansas, and it was there that he developed such knowledge of canaries that he published a classic work, *Diseases of Canaries*, in 1933, updated ten years later as *Stroud's Digest on the Diseases of Birds*.

Canaries were, of course, bred also for size and shape. In each industrial centre in Britain, traditions grew up for the breeding of canary types. Huguenot weavers who, having been persecuted in France, set up business in Norwich, in eastern England, bred plump-looking canaries twice the size of the original, and these duly took the name of the city, just as other breeds did in other parts of Britain, especially London, Lancashire, Yorkshire, Border and Fife. In Italy, incomprehensibly, fanciers went to the extreme of creating the pathetically grotesque Gibber, a naked-thighed, arch-necked, bug-eyed hunchback. Everywhere across the urbanized world, from very roughly 1850 to 1950, people created an entire industry in the breeding, keeping and training of canaries, involving food specialists, cage-making, dedicated magazines and journals, gramophone records, clubs, societies and exhibitions.

Even so, the craze for canaries seemed not to suppress the spread of catching and keeping wild finches as pets. Indeed, perhaps it fuelled it, poorer folk making do with untrained songsters. The European Goldfinch has for long been a common cagebird, and the rise and fall of commercial bird-catching in Britain is often held responsible for the general decline of the species there in the nineteenth century and for its recovery in the first half of the twentieth century. In 1860, as many as 132,000 goldfinches were reportedly being caught each year on the south coast near Worthing, in Sussex, and the newly formed Society for the Protection of Birds, not yet Royal, made the saving of the goldfinch one of its first tasks. The story is the same with the Common Linnet, which declined in the nineteenth century and recovered in the twentieth. Some of the wild-caught captives were used for further genetic experimentation. Hybrids between the domesticated canary and finches such as the European Goldfinch and European Greenfinch were bred for novelty interest in both song and form, the hybrids being known as "mules". Usually a male finch was paired with a female canary, because the female canary was more likely than a female finch to rear the resulting young. Nevertheless, different species of finch were also hybridized, particularly prized ones being the European Goldfinch × Eurasian Bullfinch and the Common Linnet × Eurasian Bullfinch. The resulting hybrids were infertile. Hybrid-breeding from finches is still practised by a small number of devotees, but is much less common than it was in the past.

Some of these wild finches had traits of their own worth cultivating. European Goldfinches, Eurasian Siskins and Lesser Redpolls tuck food under one foot and then work it with the bill, and early bird-fanciers took advantage of this habit to train them by suspending a morsel on a long thread, so that the birds, in order to feed, would have to pull the thread up by trapping it in loops under the foot. Special cages were made for European Goldfinches in which they could gain access to food and drink only by pulling it up on separate strings, the water in a thimble, so that a sixteenth-century name for them in several European languages was "water-drawer".

The male Eurasian Bullfinch was prized not just for its stunning colours but also, like the canary, for its song-learning ability, even though its own song is quiet and unimpressive. Young canaries could be trained to sing a wide range of songs; K. Reich, a close associate of Duncker, miraculously taught his birds to sing like his captive Common Nightingales (*Luscinia megarhynchos*), a feat which he achieved by manipulating the latter's light regimes in order to reprogramme their song period. Just as young canaries can learn a wide variety of songs, so young bullfinches can be taught almost any simple tune. The bullfinches were so easy to catch with decoys that the Germans, who pioneered the techniques of teaching them songs, gave them the name *Gimpel*, meaning "simpleton"; this and other finches were the prime targets of the great majority of central European bird-catchers, whose most famous representative was Papageno, in Mozart's opera *Die Zauberflöte*, "The Magic Flute". Their musical education was undertaken in groups of 20–30 individuals, whose sex was not then known, by special trainers, who whistled different tunes to them, allowing them to acquire song after song, folk tunes being selected from the countries to which they were to be exported. Because of the young age at which this took place, however, the birds would often become imprinted on human males, and fall



The nominate race of the restricted-range ***White-cheeked Bullfinch****, though patchily distributed and at best locally common, is regarded as stable. The race* steerei *is found in the Mindanao and the Eastern Visayas Endemic Bird Area, where again its distribution appears patchy, although this may be because of incomplete observer coverage. The White-cheeked Bullfinch is found in montane moist oak* (Quercus) *and mossy forests on hillsides and valleys, but its diet, its breeding, and other aspects of its ecology are little known.*

[*Pyrrhula leucogenis leucogenis*,
Mt Polis, Luzon,
Philippines.
Photo: Edward
Vercruysse]

silent if their owners were women. Even so, the European trade in trained bullfinches was, in the eighteenth and nineteenth centuries, highly lucrative.

Somewhat in contrast, the Common Chaffinch was prized for the sheer power and speed of its song, and not for what it could learn by way of variation. As a consequence, for at least five-and-a-half centuries the species has been used in singing competitions in Germany and, especially, Flanders, where the tradition persists under strict rules and conventions. Wild birds, often migrants from Scandinavia, are caught in the autumn and trained for up to three years with older Common Chaffinches, which sing songs of the right type, rapidly delivered but with the appropriate end flourish; those that fail to learn, which would be older individuals with inflexible vocabularies, are released. Cared for with devotion by their owners, who are known as fincheneers, these contest birds may compete for over a decade, and one did so for no fewer than 29 years, an extraordinary age for a passerine. The highest number of songs produced over a specified time period, from five minutes to an hour—there is such a contest in Zola's novel *Germinal*—decides the winner. The chaffinches are kept covered so that they can only hear, but not see, their rivals, in the belief that this makes them sing better; in earlier years they were often blinded, a practice which in Belgium was outlawed only as recently as in 1921.

The scientific study of song acquisition by birds has been pioneered almost entirely through work on finches, building on the insights and achievements of bird-fanciers down the centuries, people who discovered, for example, that captive finches not only learned their songs from what they heard when young, but also then transmitted them to their offspring. Thus, one species could adopt the song of its foster-species in captivity and pass it on down through many generations. Students of song, such as J. Nicolai, working with Eurasian Bullfinches, and P. Marler and W. H. Thorpe, working with Common Chaffinches, greatly advanced our understanding of the extent to which song by oscine passerine birds may be learnt, rather than inherited.

Finches enrich the lives of modern man by the vitality of their colours and songs, and by their presence in gardens and willingness to come to birdfeeders. "Glory be to God for… finches' wings", wrote the poet Gerard Manley Hopkins, to which most people, believers or not, are likely to respond *Amen*. In Europe, Common Chaffinches, European Greenfinches and European Goldfinches come regularly to strings and bags of seeds and nuts, although Common Chaffinches have some difficulty in hanging from them. The use of feeders by European Greenfinches in Britain is credited with evening out the fluctuations in this species' abundance, which were thought to reflect fluctuations in



Although its global range is less than 1000 km², there are three races of the ***Principe Seedeater****. On the island of Príncipe, in the Gulf of Guinea, the nominate race is very scarce, at least in accessible areas. The São Tomé race,* thomensis, *appears still to be common, having adapted both to the conversion of much of the island's primary forest to cultivated land and plantation, and to its subsequent reversion to secondary forest. The race* fradei, *found only on the tiny, 30-ha island of Bone de Jókei, and almost exclusively in the oil palms which dominate the island, nevertheless occurs at high densities and probably numbers over a thousand birds.*

[*Serinus rufobrunneus fradei*,
Bone de Jókei Island,
off Príncipe,
Gulf of Guinea.
Photo: Martim Melo]



*With a total range of 440 km², the **Blue Chaffinch** is dependent on Canary pine* (Pinus canariensis) *for food and breeding sites. Canary pine forests have been heavily exploited, and in 2007 a fire on Gran Canaria destroyed one of the most important remaining sites, reducing suitable habitat on the island to isolated patches totalling 3·6 km². The population of the Gran Canarian race* polatzeki *is down to around 250 birds. On Tenerife, however, the range and population of the nominate race are thought to be stable. Estimates for the overall population of the species range from 2000 to 5000 birds, and it is listed as Near-threatened.*

[*Fringilla teydea teydea*, Las Lajas, Tenerife, Canary Islands. Photo: Rafael Armada]

the abundance of the weeds on which it was, before the advent of stringed peanuts, largely dependent. In the USA, the American Goldfinch and House Finch are among the stars of the birdtable, although on both sides of the Atlantic smaller finches will also use feeders, especially in hard weather (see Food and Feeding).

Native to the south-western USA and northern Mexico, the House Finch is one of the most remarkable examples of colonization of new lands through human agency, since the huge population in the eastern USA is the progeny of a small number of individuals released on Long Island, New York, in 1940, when dealers were either unable to sell them or in fear of prosecution for trying to do so. Most people are happy to have this addition to their environment, but shifting around finches in cages has its drawbacks for birdwatchers, who cannot be sure whether what they see is a genuine vagrant or an escape. Records of the Long-tailed Rosefinch in Finland and England are considered to have concerned individuals which had escaped from captivity, as are records of Pallas's Rosefinch (*Carpodacus roseus*), but not without much speculation. Trade in true finches is a reflection of the considerable and persistent popularity of these species among bird-fanciers, although it has had a serious impact on only two members of the family, one of them, the Red Siskin, precisely because its genes were sought after for cross-breeding to produce that elusive red canary. Nevertheless, escaped and released birds continue to challenge the integrity of national avifaunal lists.

Occasionally, they also challenge the integrity of farmers' livelihoods. In 1862, the nostalgic British colonizers of New Zealand brought over and released Common Chaffinches, European Greenfinches, European Goldfinches and Lesser Redpolls, and all of them multiplied so much that they became some of the country's commonest birds. Within 50 years, the first two were causing such damage to crops that a bounty was introduced to control them, and the greenfinch and redpoll also became pests around fruit trees. Their impact, however, diminished as farmers switched largely to livestock in the first half of the twentieth century. Within the native ranges of finches, on the other hand, there are very few instances of species acquiring pest status, but there was an extraordinary recent period in Europe when the Eurasian Bullfinch became a plague in orchards. This species has had a bad reputation among fruit-farmers since at least the sixteenth century, but it was only in the mid-twentieth century that its populations grew and began to invade fruit-growing areas in significant numbers. A single individual can remove the buds of fruit trees at the rate of 30 or more per minute, with a predilection for plum (*Prunus*) and pear (*Pyrus*) followed by gooseberries (*Ribes uva-crispa*) and currants (*Ribes*), with apple (*Malus*) and cherries (*Prunus*) least affected. Even within the same type of fruit, however, the bullfinches discriminated between certain

*Census figures show that **Cassin's Finch** has undergone a small decrease in North America over the last 40 years. Since 2002, the species has been listed as Near-threatened. But the National Audubon Society considers that the Christmas Bird Counts show the population to be stable, and has not included Cassin's Finch on its "WatchList" of birds in immediate need of conservation help. Cassin's Finch has a range of some 1,500,000 km² throughout the conifer belts of North America's western interior mountains. It changes its breeding grounds from year to year, depending on the pine-seed supply.*

[*Carpodacus cassinii*, Lake County, Oregon, USA. Photo: Brian E. Small]





*The **Arabian Grosbeak** is scarce and generally rather difficult to locate, except perhaps in Yemen. Until 2007, it was treated as one of three races comprising the species known as the "Golden-winged Grosbeak", but these are now considered more appropriately split into three species. The Socotra Grosbeak* (Rhynchostruthus socotranus)*, restricted to its eponymous island, has a population that is small but stable. The Somali Grosbeak* (R. louisae)*, a restricted-range species found in northern Somalia, is considered scarce, with few recent records, although this could be due to the lack of observer coverage in this politically unstable region. Arabian and Somali Grosbeaks may both be declining, and are listed as Near-threatened.*

[*Rhynchostruthus percivali*, Yemen. Photo: Peter Ryan]

varieties: among pears, the variety "Conference" and "Williams" were favoured over "Comice du Doyenne"; among apples, dessert varieties were generally selected in preference to cooking varieties; and among gooseberries, "Leveller" was chosen over most other varieties. The extent of bud loss in different pear varieties is now known to be linked to the concentration in the buds of various distasteful toxins known as polyphenols. The pear variety "Comice", which is normally avoided by bullfinches, has more polyphenol in its buds than "Conference", which is favoured. Whole orchards of favoured varieties were frequently denuded of fruit buds, leading to complete crop failure, while in mixed orchards favoured varieties were stripped, while others were left untouched. A solution to this problem, devised in the 1960s, was to cull bullfinches in autumn, thereby greatly decelerating their depletion of preferred winter seed stocks and allowing the survivors to feed on these for much longer, without the need to switch to commercial fruit buds until much later in the season, when the damage was minimal. Ironically, within the same decade the species went into steep decline, at least in Britain, to the extent that, in 2001, it was added to the UK Biodiversity Action Plan as part of a strategy to rescue its dwindling populations.



The amount of bud damage caused by Eurasian Bullfinches varied from year to year, according to the amount of winter seed available for them. A key food species was the European ash (*Fraxinus excelsior*), which over a period of at least twelve years in south-east England fruited every second year, resulting in a biennial pattern also in orchard damage. In the 1970s, this biennial pattern was broken, both in the ash crop and in the bud damage. The seeds of ash were found to contain a toxin called fraxinin. The concentration varied among individual trees, and this explained why bullfinches fed selectively, accepting seeds from certain trees, but avoiding the majority, whose seeds were left untouched on the trees. The toxins found in pear buds and ash seeds provide examples of the chemical defence mechanisms through which plants protect themselves against finches and other seed and bud predators.

Interestingly, the period when Eurasian Bullfinches became serious pests in English fruit orchards, from the late 1950s to the late 1960s, coincided with the time when Eurasian Sparrowhawks (*Accipiter nisus*) were virtually absent from those areas, having been eliminated by the newly introduced organochlorine pesticides, which included DDT and dieldrin. It is not that sparrowhawks eat large numbers of bullfinches, although they do take some, but, rather, that their presence seems to influence the behaviour of these finches, encouraging them to stay near the safety of cover. The absence of these predators encouraged bullfinches to feed on open land more than they had previously, and in the early 1960s they were regularly seen more than 100 m from woods and hedgerows, exploiting the

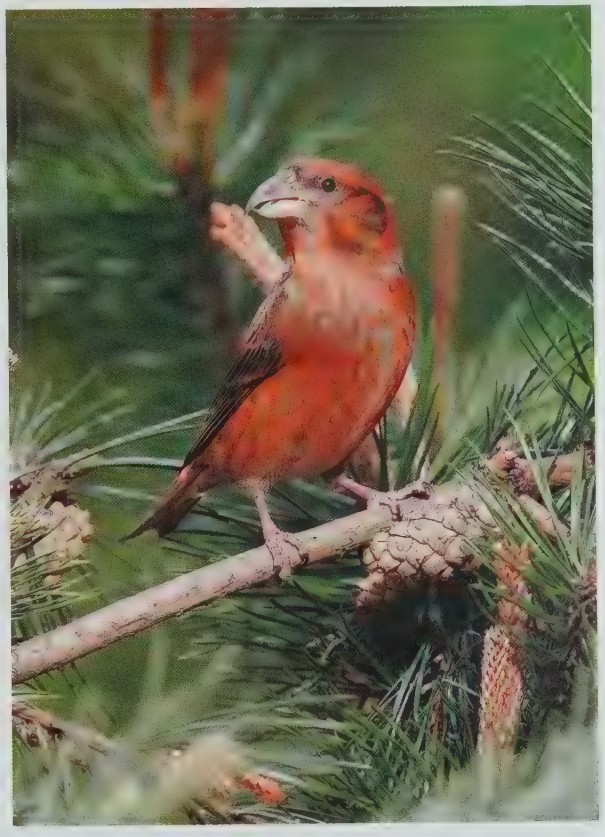
*A restricted-range species found in the Da Lat Plateau Endemic Bird Area, the **Vietnamese Greenfinch** is still locally common. It may even be benefiting from the increase in Khasi pine* (Pinus kesiya)*, which is stimulated to germinate by fires that destroy other trees. But much of the Da Lat Plateau has already been deforested, and what survives is allocated to "production forest", which could be subject to rapid clearance in the future. The Vietnamese Greenfinch is therefore listed as Near-threatened.*

[*Carduelis monguilloti*, Di Linh, Vietnam. Photo: Theodoulos Poullis]

additional foodplants thereby made available. It may have been this temporary increase in accessible food supplies which promoted the big increase in bullfinch numbers, and resulted in large-scale damage in fruit orchards. At this time, fruit-growers with 50 ha of orchards could regularly kill more than 1000 bullfinches per year, and could continue to do so year after year. Eurasian Sparrowhawks eventually recovered as organochlorine pesticides were phased out, but Eurasian Bullfinches continued to decline well beyond this date, probably because of further reduction in their food supplies caused by changes in agricultural procedure (see Food and Feeding).

Status and Conservation

The great majority of true finches, almost 90% of the family total, enjoy a secure conservation status at the global level, being placed in the IUCN category of Least Concern. As already noted, this is likely to be attributable, at least in part, to the fact that finches have actually profited from the human conversion of many habitats to agriculture, silviculture and gardens. Through the tabulation of man-made habitats and finch use of them, every European finch in mainland Europe can be seen to have adapted in some degree to rural and/or urban landscapes, with concomitant rises in populations. This is not to say that populations of finches are free from pressure in the modern world, but, by comparison with many other families of birds, fringillids appear to have done relatively well in what P. Krutzen has dubbed "the Anthropocene". Thus it is that only one species of the Fringillidae, the Bonin Grosbeak, is known to have become extinct in historical times. As a denizen of a tiny oceanic island, Chichi-jima, in the Bonin group, south-east of Japan, it was always likely to be susceptible to anthropogenic change. Having evolved in the absence of rats and cats to the point where it was reported as spending most of its time on the ground, a relatively unusual circumstance for a finch, it is presumed to have died out when these animals became established on the island. It did, however, have a startlingly heavy conical bill, evidence of a feeding specialization, and it may well be that the deforestation of Chichi-jima compounded the speed at which the Bonin Grosbeak disappeared.



When Parrot Crossbills (Loxia pytyopsittacus) *were found breeding in Scotland, among the known population of Red Crossbills* (L. curvirostra), *it complicated the uncertain taxonomic status of the* ***Scottish Crossbill****. There are virtually no genetic differences, and no plumage differences separating the three forms. However, sonagrams show that they have distinctive calls, associated with different bill sizes, specialized on different conifer cones. Using playback of its calls, the Scottish Crossbill population was estimated at 13,600 mature birds. As a result, its IUCN status was revised in 2010 from Data-deficient to Least Concern.*

[*Loxia scotica*. Photo: Paul Hobson/ naturepl.com]

It is not entirely coincidental that the only Critically Endangered finch is also a small-island species and that it also possesses an enormous bill. The Sao Tome Grosbeak has always been a rare and mysterious bird, the first one having been collected in 1888 and two more in 1890, both latter skins having been destroyed by fire in 1978, so that the only physical evidence of this species now is the type specimen. After 1890, none was seen again until 1991, and there have been only a few sub-



First described in 1979, and sometimes treated as a race of the Yemen Serin (Serinus menachensis), *the* ***Ankober Serin*** *is herein placed in* Carduelis *because of its bill morphology. It is known from a few widely separated locations in the highlands of central and northern Ethiopia, but it is thought likely that it occurs in all ecologically similar habitat throughout the highland massif of Amhara and parts of Tigray, and along the eastern mountain escarpments from Ankober to Simien. Its range is likely to be decreasing because of habitat alteration, but if it proves to be tolerant of such changes, its listing as Vulnerable might be reconsidered.*

[*Carduelis ankoberensis*, near Debre Sina, Amhara, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



*There are records of the **Yellow-faced Siskin** from Carabobo, north Venezuela, at least 3500 km from the only other known populations in north-east Brazil. It has been suggested that these Venezuelan sightings refer to escaped cagebirds, highlighting the main historical problem for this extremely rare species, which suffers from high-volume, illegal trade on both national and international markets. One of only two recent sightings from its former stronghold in Pernambuco, Brazil, may involve birds released after confiscation from smugglers. Because of the sharp decline in its range and numbers, the Yellow-faced Siskin is listed as Vulnerable.*

[*Carduelis yarrellii*, Quebrangulo, Alagoas, Brazil. Photo: Anita Studer]

sequent sightings. This grosbeak's future is entirely bound up with the fate of its rainforest habitat in the south of São Tomé, in the Gulf of Guinea. The fact that it is so rare would seem to reflect its ecological niche, since the forest is, for the most part, intact. Relatively large seeds are its food, and their low availability appears to restrain the global population, for which there is no evidence of a number higher than 50 individuals, whence its current IUCN status.



Another species which was almost on the brink is the Azores Bullfinch, ironically persecuted as a fruit-tree pest before 1920, but now pinned down in the last of its native laurel forest in the east of São Miguel, in the eastern Atlantic Ocean. In 2005, the species was thought to number no more than 331 individuals, restricted to an area of just 43 km² in the Pico da Vara/Ribeira do Guilherme Special Protection Area, but such was the rate of spread of exotic vegetation within its tiny range that it was thought that the key food supplies of the species might soon be seriously affected. It was listed as Critically Endangered. Since then, a considerable amount of work has been done with the aim of controlling the invasive plants and restoring the native laurel forest. In 2008, a full census was carried out, and the species was found to be present in a larger area, amounting to a little more than 100 km², with an estimated population of 607–990 individuals. Moreover, the species' population size has since been recalculated, on the basis of monthly data on the probability of resighting of ringed individuals, and is now put at approximately 1608 mature individuals, or about 800 pairs. The threat status of the Azores Bullfinch has, in 2010, been downgraded to that of Endangered, but its situation still needs to be monitored carefully.

One of the other four Endangered finches is, like the above two, an insular species. Only a few thousand Hispaniolan Crossbills now survive in the already much-reduced and steadily diminishing pine-forest habitat of its native island. With the immense and varied problems in Haiti, it falls to the Dominican Republic to ensure that this habitat is permanently secured for conservation. Small ranges such as those that islands impose on their inhabitants are necessarily associated with endangerment: data from the BirdLife website, prior to the change in conservation status of the Azores Bullfinch, indicate an average range size of Critically Endangered finches of 66·5 km², of Endangered ones of 5475 km² and of Vulnerable species of 8696 km². A notable feature of the geography of threatened finches, however, is the notably high proportion of them confined to the Horn of Africa, a region celebrated, or, among conservationists, notorious, for the number of species that it holds which have seemingly inexplicable small ranges. Two Endangered finches, the Yellow-

***Salvadori's Seedeater** is poorly known. After its discovery in 1880, it was seen only on about 30 occasions between 1900 and 1970; in recent times there have been roughly single records per year. It is listed as Vulnerable because it is thought to have a small population that is declining. It is uncommon at the known sites, although there remains the hope that it might be more widespread and numerous over a large area that has not yet been well surveyed. The main problems all appear to be associated with the increasing local human population, and possible threats include the expansion of subsistence agriculture in formerly uncultivated wooded areas, intensive grazing, the cutting of trees and bushes for firewood, and even gold-mining and hotel development.*

[*Serinus xantholaemus*, Sof Omar, Ethiopia. Photo: Nick Davies]



*Two Endangered finches, the **Yellow-throated Seedeater** and the Warsangli Linnet* (Carduelis johannis)*, and two Vulnerable ones, the Ankober Serin* (C. ankoberensis) *and Salvadori's Seedeater,* (Serinus xantholaemus)*, are found in the Horn of Africa, a region known for a high number of species with inexplicably small ranges. The Yellow-throated Seedeater has a patchy distribution within a total range of 4600 km², and a shrinking population that may already be as low as 250 birds. The main threat is habitat alteration: this species has never been recorded from cultivated or highly degraded land, and seems highly susceptible to habitat disturbance.*

[*Serinus flavigula*, Melka Jebdu, Dire Dawa, Ethiopia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

throated Seedeater (*Serinus flavigula*) and Warsangli Linnet (*Carduelis johannis*), and two Vulnerable species, namely Salvadori's Seedeater (*Serinus xantholaemus*) and the Ankober Serin, are restricted to this region, the linnet in northern Somalia and the other three in Ethiopia. All four have a common enemy: increasing human populations within their small ranges leading to loss of habitat to the relentless advance of agriculture and livestock grazing.

Two Vulnerable and three Near-threatened finches are largely or exclusively confined to woodland and forest, one in each of South America, Europe, the Middle East, Africa and Asia. The Saffron Siskin (*Carduelis siemiradzkii*) is one of a large number of bird species confined to the Tumbesian region of Ecuador and Peru, an area ravaged by deforestation and overgrazing: the few thousand individuals of this species remaining are scattered among a handful of protected areas. The Syrian Serin is confronted everywhere in its fragmented range by overgrazing and wood-cutting, and again depends on a handful of reserves. The Blue Chaffinch is confined to pine woods in the Canary Islands, the nominate race on Tenerife and subspecies *polatzeki* on Gran Canaria; while Tenerife holds several thousand individuals in a stable population, however, Gran Canaria has witnessed the loss of most appropriate habitat such that only some 250 birds remain in a total area of a mere 3·6 km², making *polatzeki* one of the most threatened of all finch taxa. The Kipengere Seedeater, sometimes treated as a subspecies of the Thick-billed Seedeater (*Serinus burtoni*), is found in several Tanzanian forest reserves, but it must be declining outside them in the face of logging, lopping and expanding agriculture and plantations. The Vietnamese Greenfinch is, like the race *meridionalis* of the Red Crossbill, tied to the pine forests of montane South Annam, in Vietnam, where, once again, agricultural expansion is the prime cause of concern.

Although, in Europe, finches, both wild-caught and captive-bred, were for centuries traded in volume, no long-term effects were felt. Some species definitely became much rarer at the peak of commercial activity in the nineteenth century, at least in Britain, and it is difficult to imagine that the Island Canary did not suffer initially from the plunderings that it must have experienced in the first centuries after the Spanish colonized the Canaries, and before captive-breeding established a self-sustaining *ex situ* gene pool. Even so, the finches of Europe, with their generally extensive populations, survived well enough. When Europeans moved on to South America, however, they encountered several finches at least as attractive as anything that Europe had to offer, but with far smaller ranges. One of these, the Red Siskin of north-



*Common in the early twentieth century, the **Red Siskin** has become extremely rare, and its range very fragmented, because of the depredations of the bird trade. It is now listed as Endangered. There are recent records from just four Venezuelan states, whereas it previously occurred in 15. It has disappeared from Trinidad, where a reintroduction programme has been halted by disease. A record from Colombia in 2000 was the first since 1986. The huge cagebird population has been compromised by hybridizing with domestic canaries to produce a red variant. In 2000, a new population was discovered in Guyana; estimates range from a few hundred to a few thousand birds. The Guyana population is being studied to devise effective conservation measures.*

[*Carduelis cucullata*, Venezuela. Photo: Roland Seitre]

ern Venezuela (ironically, colonised by many Spaniards from the Canary Islands), became the target of enormous and continuing commercial interest from the start of the twentieth century, as the quest for a red canary led bird-fanciers, particularly in Germany, to experiment with hybridizations. Unfortunately, even after the quest was abandoned in Europe, Red Siskins persisted in trade as objects of desire in their own right, and at least into the 1990s trapping pressure was the single greatest threat to the survival of the species, whose status today remains that of Endangered. Another very beautiful species, the Yellow-faced Siskin (*Carduelis yarrellii*), a Vulnerable finch known from a handful of localities in north-east Brazil, has experienced the same intense interest from trappers. Intriguingly, there are records of this species from Venezuela which have been judged to involve escapes, although this is hard to reconcile with the fact that part of the evidence for its presence in that country takes the form of 28 specimens collected in Carabobo in 1914.

Of the remaining finches, one presents a worrying case that is perhaps a hint at how things are really going with the wider-ranging species. Cassin's Finch of western North America may have a huge range, of 1,500,000 km², and a huge population, totalling 1,900,000 individuals, but in the years 1966–2002 its numbers declined at a rate of 2·3% per year, enough to set distant alarm bells ringing and to trigger its Near-threatened status. Of course, only in circumstances where reasonable baseline data exist well back in time is it possible to recognize the signs that a seemingly healthy species such as this may actually be in trouble. Unfortunately, such data are lacking for almost all members of the Fringillidae, and it is impossible, therefore, to gauge whether they may be in chronic decline or not. Few are so lacking in data, however, as Sillem's Mountain-finch (*Leucosticte sillemi*), known only from two specimens taken in 1929 in southern Xinjiang, in west China, and consequently treated as Data-deficient, a category that has otherwise been applied among the finches only to the Scottish Crossbill, chiefly in response to its unclear taxonomic status.

Taxonomic status makes a significant difference to *Rhynchostruthus* grosbeaks. Although this genus is often treated as monotypic, its sole species being known as the "Golden-winged Grosbeak", it is sometimes, as in the present treatment, split into three species, namely the Socotra Grosbeak, the Arabian Grosbeak and the Somali Grosbeak. The last two qualify as Near-threatened, in both cases because of their low overall numbers, estimated at 6000 and 2500–10,000 mature individuals, respectively, and because of possible recent declines. In this case, ironically in view of the above comments, it is the insular, Socotran, population of this large-billed genus, numbering some 6500 individuals, that presents least cause for concern, since it shows no evidence of a decline.

Some species, despite their Least Concern status, are clearly of greater conservation interest than are others. Into this category fall two finches each in its own genus, Przevalski's Rosefinch, which is, indeed, now judged to be in its own family (see Systematics), and Roborovski's Rosefinch. Both are regarded as being uncommon to rare, the nest of neither having been discovered, the former being found in high mountain thickets in southern and central China, the latter in desolate mountain steppes in west-central China. Two other rosefinches, Blanford's (*Carpodacus rubescens*) and Pink-rumped Rosefinches (*Carpodacus eos*), are also rare or scarce, the former found from Nepal to south China, the latter in south China, both typically at high elevations. It may be thought that the apparent rarity of these species is just an assumption generated by the lack of human contact with them, but there has been sufficient fieldwork within their ranges for observers to be fairly confident that all four are genuinely scarce creatures. This seems to be the case also with two small Asian finches living at relatively high elevations, the Tibetan Siskin of south China and the Mountain Serin of the Sundas and the south Philippines. Two formerly Near-threatened small finches from Africa, the Papyrus Canary and Protea Canary, are, as their names suggest, confined by habitat preference to relatively small areas, but, although it is clearly important that they are studied and monitored, they are no longer thought to be in decline at rates that trip alarms.

The finch taxon with much the smallest range is, however, the subspecies *fradei* of the Principe Seedeater. Despite its English name, the Principe Seedeater occurs on both São Tomé and Príncipe, in the Gulf of Guinea. It has also colonized a 30-ha islet 3 km off Príncipe called Boné de Jóquei, where *fradei* has evolved its own identity in morphology, voice and behaviour, being dependent on the resources supplied by the oil palms (*Elaeis*



*A combination of habitat conversion and invasive plants saw the **Azores Bullfinch** reduced from a locally abundant species, regarded as a pest of fruit orchards, to a state so perilous that in 2005 it was listed as Critically Endangered. It was thought to be confined to 43 km² of native forest, with an estimated population of no more than 331 birds, until in 2008 a simultaneous count by 48 observers found it present in 102 km² of forest. The population is now estimated at some 1600 mature birds, and in 2010 the species was downgraded to Endangered. With strong support from the regional government and people of the Azores, BirdLife International and its Portuguese partner are restoring native habitat to encourage further recovery.*

[*Pyrrhula murina*, São Miguel, Azores. Photo: Vaughan Ashby]



Currently the only Critically Endangered finch, with a population of perhaps less than 50 individuals, the ***Sao Tome Grosbeak*** *is confined to a small area of primary forest on its namesake island. The forest is officially protected, but the law is not enforced. An unobtrusive canopy species, it was known from only three nineteenth-century specimens and thought extinct until its rediscovery in the 1990s. A local NGO, Associação dos Biólogos Santomenses, is carrying out research and conservation work. The only finch known to have become extinct in historical times was another large-billed island species, the Bonin Grosbeak* (Chaunoproctus ferreorostris).

[*Neospiza concolor*, São Tomé, Gulf of Guinea. Photo: Martim Melo]

guineensis) which dominate the island and which produce unique gigantic nuts. Fortunately, despite the constraints of geography, *fradei* lives at high densities, so that probably well over a thousand individuals are present on the islet at any one time. Is there a taxonomically defined bird population anywhere on earth with a smaller geographical range?

One reason for keeping an eye on these smaller, less known populations is that, like any species, they can experience seemingly inexplicable declines. The Lesser Redpolls that colonized English towns and cities several decades ago, apparently in response to the mimicking of their natural habitats by gardens and parks, have all but deserted them now, and, as noted earlier, Eurasian Bullfinches, plague birds in British orchards in the 1960s, went into steep and mysterious decline in the 1970s. Evening Grosbeaks have recently been determined to be in serious spatial and numerical decline across North America, such that 50% of sites reporting the species in 1988 failed to do so again by 2006, and mean flock size declined by 27% at the sites where records continued to be made; yet a clinching explanation for this change is unforthcoming, although habitat simplification and the chemical control of spruce budworm (*Choristoneura fumiferana*) are good candidates. There are also predictable and inevitable declines, as demonstrated by the situation in Europe. The European Union agricultural "set-aside" scheme, which sought to reduce "food-mountains" by paying farmers to take land out of agricultural production, has been good for birds. Some 80% of Common Linnets in East Anglia, England, were seen in winter in set-aside fields, and the termination of the scheme in 2008 will almost certainly result in a lowering of the capacity of all EU regions to support finch populations. With their heavy dependence on farmland, many species of finch worldwide are likely to remain at the mercy of agricultural policy and practice, and with the perceived need continually to intensify farming methods, further declines in their abundance levels seem inevitable.

Finally, among the crossbills, the conservation outlook for the newly described "South Hills Crossbill" (see Systematics), appears dire. This form is restricted to the South Hills of Idaho, USA, where its lodgepole pine (*Pinus contorta*) habitat covers at most 100 km², of which 95% lies within the Sawtooth National Forest. Climatologists have forecast that, by the end of the present century, the whole region of southern Idaho could have lost all of its lodgepole pines, effectively leaving this crossbill homeless. During a five-year period in the first decade of the twenty-first century, its numbers declined by more than 60%, and survival rates of adults fell by about 50%. At the end of summer in 2008, the total population of South Hills Crossbills, including young, was estimated at only 4000 individuals.

According to models calculating the potential distribution of species in 100 years' time under the effect of recent global warming, other finch species, especially mountain ones such as the Citril Finch, will lose large parts of their present habitat. This development is highly likely to have a strong impact on a number of species which are currently restricted to higher altitudes.

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inches 3
cm 8
PLATE 32
1
ssp coelebs
ssp palmae
ssp maderensis
ssp spodiogenys
2
3
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ssp huillensis
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ssp flavivertex
ssp canicollis
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ssp griseitergum

Subfamily FRINGILLINAE

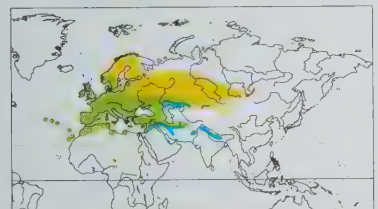
Genus *FRINGILLA* Linnaeus, 1758

1. Common Chaffinch

Fringilla coelebs

French: Pinson des arbres **German**: Buchfink **Spanish**: Pinzón Vulgar
Other common names: European Chaffinch; Canary Chaffinch ("*canariensis* group"); African Chaffinch ("*spodiogenys* group")

Taxonomy. *Fringilla coelebs* Linnaeus, 1758, Sweden.
Forms a superspecies with *F. teydea*. Has hybridized with *F. montifringilla*. Geographical variation complex. Races currently considered to form three groups, "*coelebs* group" (European and Asian races), "*spodiogenys* group" (also including *africana*, *moreletti* and *maderensis*), and "*canariensis* group" (also including *ombriosa* and *palmae*), each of which may merit full species status on grounds of morphological and genetic differences; in genetic studies, large differences between "*coelebs* group" and "*canariensis* group", but less clearly so between "*spodiogenys* group" and "*coelebs* group", with nominate and *africana* evidently closely related; further study required. Considerable variation also within races, especially nominate, and wide degree of intermediates. Nominate race varies clinally; races *sarda*, *syriaca*, *solomkoi* and *alexandrovi* possibly represent extreme limit of variation of nominate, but further research required; proposed races *hortensis* (from Anhalt, in C Germany), *balearica* (from Mallorca), *tyrrhenica* (from Corsica), *schiebeli* (from Crete), *caucasica* (from S Caucasus region) and *wolfgangi* (from Tomsk, in W Siberia) all considered to fall within range of variation of nominate. Additional races described are *scotica* (described from Carmunnock, in SW Scotland) and *hibernicus* (from Glengariff, in SW Ireland), both synomymized with *gengleri*, and *tintillon* (from Tenerife), treated as a synonym of *canariensis*. Race *transcaspia* sometimes misspelt "*transcaspica*". Fourteen subspecies currently recognized.
Subspecies and Distribution.
F. c. gengleri O. Kleinschmidt, 1909 – British Is.
F. c. coelebs Linnaeus, 1758 – breeds Europe (except British Is) E to SC Siberia (R Angara and S L Baikal), S to Balearic Is, Corsica, Sicily, S Greece, Crete, N &W Turkey, N Lebanon, Caucasus, N & NW Kazakhstan and NW China (NW Xinjiang); non-breeding also S to N Africa, Ukraine, and SW Asia E to NW & SE Afghanistan, N & W Pakistan (Gilgit and Baluchistan) and N Nepal.
F. c. sarda Rapine, 1925 – Sardinia.
F. c. solomkoi Menzbier & Sushkin, 1913 – Balkans E to Crimea and W Caucasus; winters also Turkey and Iran.
F. c. syriaca Harrison, 1945 – Cyprus, Levant, SE Turkey and N Iraq.
F. c. alexandrovi Zarudny, 1916 – W & N Iran; winters E Turkey, N Iraq and N & C Iran.
F. c. transcaspia Zarudny, 1916 – S Caucasus, NE Iran and S Turkmenistan; winters N Iran and Iraq.
F. c. moreletti Pucheran, 1859 – Azores.
F. c. maderensis Sharpe, 1888 – Madeira.
F. c. africana Levaillant, 1850 – Morocco E to extreme NW Tunisia, and NE Libya (Cyrenaica).
F. c. spodiogenys Bonaparte, 1841 – N & E Tunisia and NW Libya (Tripoli).
F. c. palmae Tristram, 1889 – NW Canary Is (La Palma).
F. c. ombriosa E. J. O. Hartert, 1913 – SW Canary Is (El Hierro).
F. c. canariensis Vieillot, 1817 – C Canary Is (La Gomera, Tenerife, Gran Canaria).
Introduced (nominate race or *gengleri*) in S South Africa (Cape Town area) and New Zealand.



Descriptive notes. 14–18 cm; 17–29 g. Medium-sized finch with conical bill, peaked hindcrown and broad white wingbars. Male nominate race has black forehead, slaty grey-blue crown to upper mantle, with lores and face vinous-pink with orange tinge; mantle and back reddish-brown or chestnut, lower back to uppertail-coverts olive-green, centre of tail bluish-slate, narrowly edged green, rest of tail black, outer two feathers broadly tipped white; inner lesser upperwing-coverts and scapulars bluish-green, median coverts and tips of outer lesser coverts white, greater coverts black, tipped white; alula, primary coverts and flight-feathers black, finely edged pale yellow or greenish-yellow (forming pronounced panel on secondaries in winter), and bases of all except outermost three remiges white or yellowish-white (small white patch on closed wing); tertials black, broadly edged and tipped pale buff (paler buff when worn); underparts like face, vinous-pink, paler on lower breast and flanks, white on belly to undertail-coverts; in fresh plumage (autumn), forehead dark grey, crown to upper mantle washed browner, mantle browner, uppertail-coverts grey-brown, tips of greater coverts yellowish, and pink on face and underparts duller; iris dark brown; bill pale bluish-grey with dark tip, in winter becoming yellowish or buffish at base; legs pale pinkish-brown to dark grey. Female has head and most of upperparts dull earth-brown, tinged greyish, paler on centre of nape, diffuse dark brown sides of crown and nape, sides of head and nape washed greyish (prominent in fresh plumage in autumn); mantle olive-brown, lower back and rump yellowish-green, uppertail-coverts duller yellowish-brown; flight-feathers and tail as for male, but centre of tail browner and entire outer tail feathers white; dull buffish-brown below, often tinged greyer on breast and upper belly (sometimes pink tinge on breast), lower belly whitish, becoming whiter on undertail-coverts; bill brownish, darkest at tip, palest at base of lower mandible. Juvenile is similar to winter female, but more conspicuous buffish-white patch on nape, upperparts more uniformly brown except for duller green rump, underparts washed yellowish; juvenile male has warmer tinge on mantle, and buffish-brown cheek and ear-coverts. Races differ mainly in pattern and plumage of male: *gengleri* is like nominate, but mantle slightly deeper brown, lores darker and face browner (between rufous-cinnamon and ochre-brown), underparts dark rufous-cinnamon, paler on belly; *sarda* has broad bill base, mantle dull brown or tinged green, rump duller olive-green, face and underparts cinnamon, tinged tawny or vinous on belly; *solomkoi* is slightly larger than nominate, bill slightly larger and heavier, mantle tinged dull brown or umber-brown (tinged green in fresh plumage), rump dull olive-green, underparts paler vinous-pink; *syriaca* has mantle tawny or orange-brown, rump yellowish-green, side of head deep vinous with cinnamon tinge, underparts pale pinkish-mauve or vinous-pink, centre of belly to undertail-coverts white, female paler brown, underparts drab brown with ash-grey tinge; *alexandrovi* is very like nominate, but mantle slightly darker (and less chestnut than *solomkoi*), and face and underparts between vinaceous and rufous-brown (less pinkish-brown); *transcaspia* is like previous but slightly larger, mantle duller and underparts paler; *maderensis* has deep blue crown and nape (forehead black), slightly paler or greyer blue on lower mantle (forming saddle) and back, bright olive-green on upper mantle and rump, flight-feather edges buff or yellowish, face to breast light pink or peach-buff, belly and flanks pale greyish-white, female like *canariensis* but sides of crown and nape darker, mantle greener, back darker, only outer tail feather white; *moreletti* is similar to previous, but bill larger and slightly longer, blue on crown to upper mantle paler, rump blue, face to breast deeper peach-buff or tinged brownish, female similar to nominate; *africana* has crown and nape bluish-grey, face to side of neck slightly paler, broken white eyering and white postocular spot, mantle to rump bright olive-green, scapulars and uppertail-coverts blue to blue-grey (occasionally lower back to rump all blue-grey), outer rectrices extensively white, underparts pink or washed peach-buff, side of breast and flanks tinged light grey, centre of belly to undertail-coverts white, female similar to nominate but paler above, tinged green on mantle and scapulars, brighter green on rump (duller when worn), bluish-grey uppertail-coverts, outer two rectrices white, wings paler and duller, white tips on median coverts, pale yellowish tips on greater coverts and edges of secondaries, whitish-buff below, often greyer on breast and flanks (underparts tinged yellowish-buff in NE Libya); *spodiogenys* male is very similar to last, but paler crown and nape, bright olive-green upper mantle merging into bluish-grey scapulars and back, blue rump, more white in outer tail feathers, broad white edges on secondaries and tertials, pale pinkish-white throat and breast, otherwise washed greyish below, female like last; *canariensis* has crown to back deep slate-blue, rump bright green (duller when worn), uppertail-coverts and centre of tail bluish-tinged slate-grey, outer two tail feathers with variable amount of white tips with blackish terminal edge, tip of next inner rectrix white, wing mostly black except for white median coverts and narrow white tips of greaters, pale green edges of remiges, face and underparts pinkish or peach-buff, whitish on belly and undertail-coverts, bill black or dark bluish-horn, female has upperparts dark olive-brown, generally lacks dark streaks on sides of crown and nape, rump bright green rump (darker brown with green tinge in worn plumage), face and underparts light olive-brown, tinged buff-brown on chin to breast; *palmae* is similar to previous but slightly larger, with larger bill, upperparts deep slate-blue, rump dark bluish-grey, more prominent yellowish-green edges of flight-feathers and tertials, central tail feathers grey, mostly white below, with pinkish to peach wash on chin to upper breast, greyish wash on flanks; *ombriosa* is similar to preceding race, but with dull green lower mantle to rump, small white patch at base of primaries, narrow yellowish edges of secondaries, paler peachy-buff colour below usually not reaching flanks, bill black. Voice. Song, by male only, mainly Mar to mid-Jul throughout most of range, a descending musical rattle of several notes followed by accelerated final flourish, "chip chip chip, tell tell tell, cherry-erry-erry tissi cheweeeoo", usually repeated from prominent perch in tree or bush; subsong, mostly from ground or from dense cover, occasionally given also by female, softer or more subdued than full song and mostly series of chirps, warbles and rattling notes. Song of N African races slightly faster and more rhythmic. Song of Atlantic island races more varied: *canariensis* a more rapid series of accelerating "chiu-chiu-chiu-chiu" notes followed by jumbled flourish of "chichichiaaar" or "chiyaa-chiyaa"; *ombriosus* similar but less rapid and more drawn out, with longer series of "chie-chie-chie-chie-chia-chia-chie-chia-chiiar", final flourish less emphatic; *palmae* very similar to *canariensis*, differs in characteristic and musical "chio-chu-gui" ending; *moreletti* also similar to *canariensis*, but song occasionally given in sections and not always concluding with flourish. Slight variations in song throughout range, e.g. birds in N Europe give short, sharp "chip" or "chink" similar to call of Great Spotted Woodpecker (*Dendrocopos major*) immediately following end of song. Calls include sharp, distinctive "pink" or "chink", singly or as double-note (latter seemingly unknown in C & S Europe), nominate race also has variations of "twit" or "fit", also a loud "wheet", "whit" or "tsip" most often given in spring; high-pitched wheezing "eeese" and a soft "chup" or "tsup" flight call; male also gives loud and drawn-out "hooeed", regionally variable, often given on overcast or wet days (hence known as "rain-call"). N African races (*africana* and *spodiogenys*) have soft "chef" or "chep" and abrupt, higher-pitched "chip chip chip chip"; in Canary Is more distinct variations in calls within small ranges, *canariensis* "chiu-chiu" on Tenerife but clear "chivi-chivi" on Gomera, call on El Hierro (*ombriosa*) like that on Tenerife, but call on La Palma (*palmae*) "chiri-chiri" and similar to that on Gomera; call on Azores (*moreletti*) a distinct "gai" and on Madeira (*maderensis*) similar or softer and slightly more musical. In flight frequently gives soft "tsup", "tap" or "chup" note; female usually silent, but sometimes gives soft "chip" or "chirrip" or, in spring, may respond to male song with soft "zi" or wheezing "si-si-si".
Habitat. Lowland and lower montane deciduous, mixed and conifer woods with slight preference for beech (*Fagus*), hornbeam (*Carpinus*), mature oak (*Quercus*), spruce (*Picea*) and pine (*Pinus*), forest edges and glades; also copses, heaths, edges of tundra and agricultural areas, hedgerows, orchards, parks and gardens. In Canary Is found in laurel (Lauraceae) forest and areas of dense vegetation; in Moroccan High Atlas occurs also in *Juniperus thurifera*. In non-breeding season more widespread in similar habitat and open agricultural areas, particularly weedy fallow and stubble fields, olive (*Olea*) groves, palms, wadis and desert oases. Sea-level to 2500 m.
Food and Feeding. Diet the most varied in the family, mostly small invertebrates and their larvae, also seeds and buds. Animal items include springtails (Collembola), mayflies (Ephemeroptera), small dragonflies (Odonata), stoneflies (Plecoptera), grasshoppers (Orthoptera), earwigs (Dermaptera), cockroaches (Blattodea), bugs (Hemiptera), lacewings (Neuroptera), moths (Lepidoptera), flies (Diptera), caddis flies (Trichoptera), ants and wasps (Hymenoptera), beetles (Coleoptera), harvestmen (Opiliones), millipedes (Diplopoda), centipedes (Chilopoda); also snails (Pulmonata) and small earthworms (Lumbricidae). Seeds, buds (mostly of trees in spring) and flowers include those of yew (*Taxus*), cypress (*Chamaecyparis*), juniper (*Juniperus*), larch (*Larix*), spruce, pine, fir (*Abies*), Douglas-fir (*Pseudotsuga*), willow (*Salix*), poplar (*Populus*), birch (*Betula*), alder (*Alnus*), elder (*Sambucus*), hornbeam, beech, chestnut (*Castanea*), oak, elm (*Ulmus*), mulberry (*Morus*), tulip-tree (*Liliodendron*), sycamore (*Acer*), lime (*Tilia*), ash (*Fraxinus*), olive, mistletoe (of genus *Viscum*), nettle (*Urtica*), knotgrass (*Polygonum*), dock (*Rumex*), goosefoot (*Chenopodium*), beet (*Beta*), orache (*Atriplex*), glasswort (*Salicornia*), amarant (*Amaranthus*), chickweed (*Stellaria*), mouse-ear (*Cerastium*), corn spurrey (*Spergula*), buttercup (*Ranunculus*), meadowsweet (*Filipendula*), rose (*Rosa*), bramble (*Rubus*), strawberry (*Fragaria*), currant (*Ribes*), cinquefoil (*Potentilla*), apple (*Malus*), pear (*Pyrus*), cherry (*Prunus*), rowan (*Sorbus*), hawthorn (*Crataegus*), cotoneaster (*Cotoneaster*), clover (*Trifolium*), wood-sorrel (*Oxalis*), cranesbill (*Geranium*), spurge (*Euphorbia*), sea-buckthorn (*Hippophae*), willowherb (*Epilobium*), evening prim-

On following pages: 2. Blue Chaffinch (*Fringilla teydea*); 3. Brambling (*Fringilla montifringilla*); 4. Red-fronted Serin (*Serinus pusillus*); 5. European Serin (*Serinus serinus*); 6. Syrian Serin (*Serinus syriacus*); 7. Island Canary (*Serinus canaria*); 8. Yellow-crowned Canary (*Serinus flavivertex*); 9. Cape Canary (*Serinus canicollis*).

rose (*Oenothera*), dwarf alpenrose (*Rhodothamnus*), bilberry (*Vaccinium*), crowberry (*Empetrum*), grape (*Vitis*), primrose (*Primula*), bedstraw (*Galium*), thrift (*Armeria*), comfrey (*Symphytum*), forget-me-not (*Mysotis*), plantain (*Plantago*), sunflower (*Helianthus*), nightshade (*Solanum*), figwort (*Scrophularia*), snowberry (*Symphoricarpos*), teasel (*Dipsacus*), sedges (*Carex*), rushes (*Juncus*) and various grasses and cereals. Nestlings fed with insect larvae, mainly aphids (Aphidoidea) and caterpillars. In non-breeding season, nominate race often forages in flocks consisting solely of males or solely of females and immatures (this behaviour less frequently recorded for other races, except *moreletti*) and in association with *F. montifringilla*, *Carduelis chloris* and sparrows (*Passer*); in Canary Is occasionally associates also with *F. teydea*. Actively forages on ground throughout year, also at all levels in bushes and trees in spring and summer; perches briefly on near-vertical tree trunks (particularly during outbreaks of bark beetles), and occasionally pursues and catches flying insects, also hovers briefly to take invertebrates from leaves or beside suspended fat or peanuts at garden feeders. Wades in shallow water; puts head beneath surface to collect caddis fly larvae, and removes outer case as if it were a seed husk. On ground has distinctive shuffling or jerky, forward-hopping or walking motion, simultaneously nodding head.

Breeding. Season mid-Mar to mid-Jul; one brood, exceptionally two. Monogamous, exceptionally bigamous; pair-bond frequently maintained into subsequent years (sedentary race *gengleri*). Solitary nester, territorial; size of breeding territory (used for courtship and nesting) variable, average in S England 0·7 ha, at start of breeding season territory larger, size decreasing as areas forfeited to later-arriving settlers. Site-fidelity variable, strong in males in England and in pairs S Finland; evidence from Russian study that c. 90% of year-old individuals return to breed within 1 km of natal site. Territorial male, with sleeked plumage (highlighting wingbars), displays to female by singing and by making low, short, undulating moth-like flight with wings extended and beaten rapidly while head and tail held low, and on landing crouches, turns sideways to female, becomes motionless, lifting or flicking wings, and then tilts body on side closest to female and raises wing for several seconds, revealing flanks and belly (may also alternately switch wings depending on location of female, each time raising wing closest to her), before relaxing and moving off in moth-like flight to repeat display, or female flies in rapid zigzag chase with male in pursuit; mating usually takes place towards start of nest-building, may be initiated by either sex, but successful only if female solicits with wings lowered and shivered, tail partly raised and breast feathers fluffed while giving loud "seep" calls; in early courtship male initially dominant, but female gradually assumes dominance during egg-laying and incubation. Nest, built entirely by female, a deep cup of plant fibres, grass, fine roots, lichens, moss, bark strips, animal hair and feathers, placed up to 35 m above ground on branch, against trunk or in fork of tree or bush. Clutch 4–5 eggs, pale bluish-green to light reddish, variably marked with purple-brown blotches, spots or fine streaks; incubation by female, period 10–16 days; chicks fed and cared for mostly by female, male contributes little or up to one-third of food for young, nestling period 11–18 days; young fed by both parents for up to 21 days after fledging. Breeding success: of 10,967 eggs in Britain, 59% hatched and 41% of these produced fledged young; in 1950–60 proportion of successful clutches increased from 38% of those begun in early Apr to c. 50% in late May (owing largely to reduced predation as vegetation cover increased), 2·6–4·5 young fledged from successful nests depending on month and clutch size (clutches of 5–6 most successful), losses of eggs and young due to predation by crows (Corvidae), red squirrels (*Sciurus vulgaris*) and grey squirrels (*Sciurus carolinensis*), cats, also stoats and weasels (*Mustela*), nest failures caused also by human predation or disturbance, bad weather and desertion following loss of parent; in W Russian study, 63% of 3859 eggs hatched and 52% fledged young, averaging 3·1/successful nest; of 20 nests in German study, average of 3·7 young/successful nest. Breeds in first year. Longevity at least 14 years.

Movements. Resident, partially migratory and migratory. Breeders in N & NE of range move S and SW between mid-Sept and end Nov, to wintering areas within breeding range in C & S Europe, around E Mediterranean, also NW Africa, and farther S in C Asia, onward or further movements within range usually triggered by onset of severe weather; return N from late Feb to early May, adult males making earliest movements, ahead of adult females and first-year individuals. Evidence from ringing shows that juveniles and adult females move farther than males; wintering population in Sweden, Britain, Belgium and Netherlands mostly males, in Ireland predominantly females. Some evidence of winter site-fidelity among migrants wintering in Britain in subsequent years. Most movement diurnal, in small to medium-sized flocks, often visibly along lines of hills, river valleys, and coasts (particularly at headlands) and through high mountain passes; in some areas, particularly Baltic, North Sea and E Mediterranean coasts, passage often continuous for several days when weather conditions favourable; sometimes huge numbers involved, e.g. daily peaks of hundreds of thousands of individuals at Falsterbo (S Sweden), and 60,000 in a single day in Schwäbische Alb (S Germany). W breeders move farthest W and those from more E populations winter progressively farther E. Those from Scandinavia head W or S through Denmark and Netherlands (seldom directly across North Sea) to non-breeding grounds mainly in C & S British Is, Netherlands to W France and W Spain, peak arrival SE England second half Oct, subsequent movements N & W to N Wales and Ireland; return route reverse of autumn one, but more frequently crossing North Sea on broad front in less than a day. Breeders from Finland, E Baltic region, Poland and NW Russia move between S and SW to winter areas mainly in SW France and W Spain, with smaller numbers Britain, S Germany and Switzerland, where local breeders make relatively short flight to S France, N Italy, E Spain and Balearic Is; Polish breeding birds migrate before main passage from farther N; those from Czech Republic head SW to S France, smaller number reaching Spain and Italy, and birds from Slovakia winter mainly N Italy, joining others from W Russia, Hungary, Switzerland, Germany, France and smaller numbers from Finland and Poland; in W Alps passage into Switzerland of first-year females reaches peak 3–4 days ahead of adult females, first-year males up to a week later, and adult males peaking up to 12 days later. Numerous in winter in NW Africa, where most arrive via Strait of Gibraltar, mostly of C European origin but small numbers also from W Russia. In Russia, N breeders form large post-breeding flocks from early Aug and move S & SW from early Sept to mid-Oct, wintering within S area of breeding range and in C & S Europe; in NC Siberia breeding areas along R Yenisey deserted by mid-Sept, return passage through Caucasus late Feb or early Mar, and farther N from late Mar or early Apr, continues to early May, males arriving back on breeding territory on average one week ahead of females; regular on passage in W & C Mongolia, W China and throughout Kazakhstan, with main direction in autumn SW through Ural Valley to N Caspian region and Tien Shan foothills, also some birds wintering in E China (Hebei, Liaoning); in N Iran common visitor early Oct to early Apr in areas S of Caspian Sea; winter visitor also in NW & SE Afghanistan, N & W Pakistan (regular Baluchistan, scarce in N), Kashmir, occasional or sporadic NW India and Nepal. Breeding birds in Britain (race *gengleri*) largely sedentary, with 90% of ringing recoveries up to 5 km from natal area (remainder moving less than 50 km), and French breeders largely sedentary, but small numbers move short distance W or SW (occasionally reaching Spain); proportion of population migratory increases farther E & N, e.g. 60% of breeders in Belgium sedentary, and small numbers wintering S Scandinavia (mostly Sweden and S Norway); irregular in winter W Russia, but small numbers in St Petersburg region; annual in varying numbers in Iceland, mostly in spring and autumn, involving individuals drifted off passage to/from Scandinavia. Wintering birds (females often predominating) arrive late Sept to mid-Nov and outnumber local breeding populations in Greece, Turkey and Cyprus, and a common passage migrant and winter visitor in Lebanon, Syria, Israel, N Jordan and Iraq; small numbers of nominate race winter N Egypt and coastal Libya (mostly Tripolitania) between late Oct and early Apr. N African breeders largely sedentary or move short distances S of breeding range to N edge of Sahara; Atlantic Is races also largely resident or move to lower levels. Vagrant to Saudi Arabia (recently more regular in E provinces), Kuwait, United Arab Emirates, and E to NW Thailand, E China (some regular overwintering), Korea and Japan; also E North America.

Status and Conservation. Not globally threatened. Common to locally abundant; scarce or uncommon in China; race *spodiogenys* uncommon or locally common in N Africa. Estimated European breeding population (including Russia W of Urals) 230,000,000 pairs, most of which in Britain, Fennoscandia, Germany, Croatia, Belarus and Russia. Breeding densities variable: in Britain highest densities 631 birds/km² in Scots pine (*Pinus sylvestris*) woods, average 58 pairs/km² in woodland and 21 pairs/km² on farmland; in Fennoscandia more numerous in deciduous woods (49–145 pairs/km²) than in conifers (12–102 pairs), and in Bialowieza Forest, in E Poland, up to 157 pairs/km² in deciduous forest and up to 100 pairs/km² in coniferous forest; in Switzerland, more numerous (up to 190 pairs/km²) in subalpine spruce than in mixed oak–hornbeam forest (max 110 pairs). Numbers in much of range largely stable; slight increase in Spain, Britain, Denmark, Croatia and Ukraine during 20th century as a result of changes in forest structure and management.

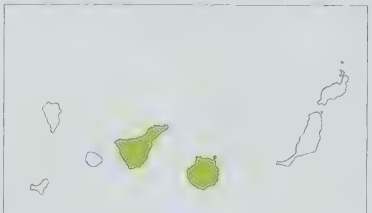
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2. Blue Chaffinch

Fringilla teydea

French: Pinson bleu **German**: Teydefink **Spanish**: Pinzón Azul
Other common names: Teydean Chaffinch, Mount Teyde Blue Chaffinch, Teydefinch, Canary Islands Finch

Taxonomy. *Fringilla teydea* Webb *et al.*, 1836, Tenerife, Canary Islands.
Forms a superspecies with *F. coelebs*. Two subspecies recognized.
Subspecies and Distribution.
F. t. teydea Webb *et al.*, 1836 – Tenerife, in C Canary Is.
F. t. polatzeki E. J. O. Hartert, 1905 – Gran Canaria, in C Canary Is.



Descriptive notes. 16–17 cm; 29–30 g. Medium-sized to large finch typically with crown peaked. Male nominate race has area around base of bill darker to blackish, otherwise entire head, face and upperparts deep slaty greyish-blue, cheek and ear-coverts often deeper blue, white partial broken eyering; tail black, central feathers edged deep grey-blue, outer feathers tipped white (on inner web); upperwing-coverts black, broad whitish or bluish-white tips on medians and greyish-white tips on greater coverts (forming two dull or indistinct wingbars), flight-feathers finely edged bluish-white (broadly on tertials), small greyish-white square at bases of inner primaries on closed wing; underparts slightly paler or more bluish than upperparts, becoming white on lower belly to undertail-coverts; iris dark brown to blackish; bill metallic steel-blue or bluish-black; legs slate-grey, tinged pink. Female has head and upperparts drab olive-brown or earth-brown, upperparts with greenish wash; wing and tail brownish-black, pale buff or whitish tips on median coverts and greyer tips on greater coverts (forming wingbars), small buffish-white square at base of inner primaries on closed wing, outer tail feathers pale brown; paler below than above, becoming pale grey on lower breast, flanks and belly, and whitish on undertail-coverts; bill greyish-horn to grey-brown, often paler on lower mandible; legs deep pinkish-brown. Juvenile is like female or slightly darker, with duller wingbars. Race *polatzeki* is smaller than nominate, bill slightly smaller, male has forehead blacker (more pronounced dark band), upperparts duller and greyer, tips of median and greater coverts greyish-white, female paler and less grey on chin to breast, with belly extensively off-white. Voice. Song mostly from Apr and declining through breeding season, from prominent tall perch, a short series of level or slightly descending notes followed by accelerating terminal flourish, "chip-chip-chip-chip-chip-chip-chip-chip-chiu-chuiooo", similar to that of *F. coelebs* but slower; also gives high-pitched trilling "sschi-errrr" or "ssdderrer"; song of race *polatzeki* higher-pitched, notes more disyllabic and musical. Calls include sharp disyllabic "tchap-tchiee", more rarely "chip-chip" and "wit-chooee" or "djio"; *polatzeki* gives weaker and monosyllabic "ui" or "uit", reminiscent in tone of Willow Warbler (*Phylloscopus trochilus*) or Common Chiffchaff (*Phylloscopus collybita*) calls; in flight, occasionally a sharp "sipp".

Habitat. Forests of Canary pine (*Pinus canariensis*) between 300 m and 2300 m, mainly above 1200 m; usually most numerous in areas of well-developed undergrowth, mainly including tagasaste (*Chamaecytisus proliferus*). Also in tree-heath (*Erica arborea*) and holly (*Ilex*) in areas adjacent to pine forests, where it occurs in mixed stands with introduced Monterey pine (*Pinus radiata*), and laurels (Lauraceae) within pine forest. Sometimes in gardens and cultivations in non-breeding season.

Food and Feeding. Largely seeds of Canary pine, also of the white-flowered broom *Spartocytisus supranubius*, forget-me-not (*Myosotis*), bean-trefoil (*Adenocarpus viscosus*), bramble (*Rubus*) and chickweed (*Stellaria*); some insects, including weevils and other beetles (Coleoptera), crickets and grasshoppers (Orthoptera), ant-lions (Myrmeleontidae), and butterflies and moths (Lepidotera). Nestlings fed mostly with caterpillars and pine seeds. Forages often on the ground; pine seeds picked from ground or extracted from open cones (on ground and on branch). Also searches branches and trunks of pine trees for insects, starting at top of tree and working methodically downwards; pursues and catches butterflies and moths in flight. In heat of day spends long periods perched on branch of pine. Forages alone and in small groups of up to ten individuals; occasionally in mixed flocks with *F. coelebs*.

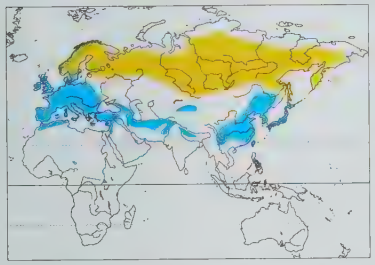
Breeding. Season Apr–Aug; normally one brood, but second brood recently recorded on Gran Canaria. Monogamous; pair-bond not well studied, but apparently endures throughout non-breeding season and possibly from year to year. Solitary, territorial; territory demarcated by male, singing from prominent perches; in optimum habitat territories may overlap. Nest built entirely by female, mostly from pine twigs, tree-heath or broom, plant fibres and down, pine needles, grass, moss, lichens, animal hair, feathers and cobwebs, placed up to 12 m above ground against trunk of Canary pine, sometimes in laurel or heather. Clutch 2 eggs, pale blue or greenish-blue with brownish-purple blotches and reddish-brown or purple specks and streaks; incubation by female only, period 13–14 days; chicks fed and cared for mostly by female, nestling period 17–18 days. Breeds in first year.
Movements. Resident. May fly some distance in search of water, especially in summer months; occasionally recorded above tree-line. Post-breeding flocks (mostly of immatures) wander randomly throughout suitable habitat, but break up towards start of breeding season. In severe winter weather, sometimes leaves high-level forests and descends to lower levels. Vagrant on Lanzarote, in E Canary Is.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Madeira and the Canary Islands EBA. Estimated global population 1800–4500 individuals, of which great majority on Tenerife (nominate race); c. 250 on Gran Canaria (race *polatzeki*). Legally protected since 1980. Has declined since end of 20th century; on Gran Canaria has been in decline since early 20th century as a result of habitat destruction, and currently occupies patches of woodland totalling 3·6 km². Nevertheless, species' population currently considered more or less stable. Illegally captured and kept as a cagebird. Formerly trapped also for trade, and this practice, although likewise illegal, possibly still continues (individuals exported mainly to Italy, Germany and Belgium); this may have effect on population. Suffers also from habitat loss and fragmentation; pine woods heavily exploited for commercial gain, resulting in isolation of population, especially on Gran Canaria; e.g. in summer of 2007 important areas destroyed, including one of the major sites on Gran Canaria. Important sites on Gran Canaria protected since 1982, and in 1987 El Teide forest, on Tenerife, and six important areas on Gran Canaria designated as National Parks or Natural Areas. Although protected, these heavily utilized by people for recreation and leisure on Gran Canaria. A conservation programme started in 1991, and captive-breeding programme in 1992.
Bibliography. Anon. (2009i), Bannerman (1912, 1963), Butchart & Stattersfield (2004), Carrascal *et al.* (1992), Clarke (2006), Clement *et al.* (1993), Collar & Stuart (1985), Cramp & Perrins (1994), Étchécopar & Hüe (1967), García-del-Rey & Cresswell (2005), González (1996), Lynch & Baker (1990), Meade-Waldo (1889a, 1889b, 1893), Pestano *et al.* (2000), Polatzek (1908, 1909), Slater & Catchpole (1990), Snow & Perrins (1998), Thanner (1903, 1905, 1910, 1912, 1914), Tristram (1889), Tucker & Heath (1994), Vaurie (1959).

3. Brambling

Fringilla montifringilla

French: Pinson du Nord **German**: Bergfink **Spanish**: Pinzón Real

Taxonomy. *Fringilla montifringilla* Linnaeus, 1758, Sweden.
Has hybridized with *F. coelebs*. Monotypic.
Distribution. Breeds in N & NE Europe E in broad band to E Russia (Chukotka), S to NE Kazakhstan, C & SE Altai, Tuva, S L Baikal, Russian Far East (S to Amurland, Sakhalin I and Kamchatka); migrates to W, C & S Europe, N Africa, Middle East, and SW, C & E Asia.



Descriptive notes. 13·5–16 cm; 17–30 g. Medium-sized finch with peaked crown, broad wingbars and white rump. Male breeding has head to side of neck, mantle and upper back glossy black, scapulars and lesser upperwing-coverts pale orange, centre of lower back and rump white, becoming greyer with buffish-brown tips on uppertail-coverts; upperwing black, white median coverts, broad white tips on greater coverts, white at base of inner primaries (small white patch on closed wing), and pale buffish edges on secondaries and broader edges on tertials; tail black; chin pale orange, usually deeper orange on breast, upper belly and flanks, some dark spots on rear flanks; belly and vent white, with variable amounts of pale orange on undertail-coverts, underwing-coverts bright lemon-yellow; iris dark brown; bill entirely black, sometimes blue-grey with black on tip and along cutting edges; legs dark brown. Male non-breeding has head and upperparts mottled with brownish edges and grey-brown tips, nape and hindneck pale grey, side of neck bluish-grey, sometimes pale buffish-brown eyering or partial eyering; scapulars broadly tipped pale orange, white on median and greater coverts often tinged orange, flight-feathers dark brown, edged pale yellow, tertials and inner secondaries edged warm brown; bill variably pale yellow to dark orange with blackish tip. Female is similar to non-breeding male, but plainer brown head and face, centre of crown tipped paler and sides of crown and nape blackish, enclosing paler grey nape and side of neck; cheek and ear-coverts grey-brown; mantle has broad pale brown fringes, less orange on scapulars, lesser coverts blackish, wing and tail as for male but more clearly browner; bill as non-breeding male, but sometimes all blackish-grey. Non-breeding female is similar to non-breeding male, but head paler, dark tips on orange scapulars, pale orange tips on median and greater coverts, with edges of tertials and inner secondaries warmer brown, underparts duller, spots on rear flanks more diffuse, bill horn-coloured with paler or yellowish base, legs brown. Juvenile is similar to female but browner, with extensive pale buff-brown tips from forehead to nape, mantle and back, tips of median and greater coverts pale yellow to pale buffish-orange, rump and belly tinged dull yellow; first-year male like adult in fresh plumage, except for paler, reddish or rust-brown lesser coverts and grey-brown (not black) outer greater coverts and primary coverts. Voice. Song a sweet and melodious series of jumbled twitters, chirps and short trills and fluty notes, including "zip chii tschrr" or " tschrr tschrie tschra tschirrr tschrii", followed by longer, drawn-out evenly pitched wheezing "zweeee", "zheee"or "dzweeeeh", occasionally interspersed with softer or quiet twitters, also a descending rattle; reminiscent of similar song of Redwing (*Turdus iliacus*); often given by several males in chorus in non-breeding area prior to return migration. Calls include loud, sharp or rasping, nasal "zweee", "tsweeek" or "tsweee-ik", usually by male frequently in breeding season, also a musical "dweee" similar to that of *Carduelis chloris*; also sharp "chink", similar to "pink" call of *F. coelebs*; alarm a sharper version of "zweee" note; in flight also a soft "chuc" or "chup".
Habitat. Breeds in birch (*Betula*) and conifer woodland, also in mixed deciduous and conifer woods; along N edge of tundra occurs in dwarf birch and willow (*Salix*) scrub, farther S in riverine alder (*Alnus*). In non-breeding season mainly in areas of deciduous trees, including woods, forests and small copses and shelter-belts, especially those containing beech (*Fagus*) or hornbeam (*Carpinus*), along edges of open agricultural fields, also in weedy and stubble fields, also orchards, and in areas of snowfall visits birdtables in gardens; to 3050 m in Himalayas.
Food and Feeding. Mostly seeds and fruits; also small invertebrates and their larvae, size of adult animal prey mostly up to 6 mm and larvae to c. 20 mm long. Seeds and fruit include those of beech, hornbeam, birch, spruce (*Picea*), pine (*Pinus*), larch (*Larix*), yew (*Taxus*), juniper (*Juniperus*), poplar (*Populus*), alder, oak (*Quercus*), sycamore (*Acer*), elder (*Sambucus*), lime (*Tilia*), olive (*Olea*), apple (*Malus*), ash (*Fraxinus*), rowan (*Sorbus*), blackthorn (*Prunus*) and hawthorn (*Crataegus*), together with those of lady's-mantle (*Alchemilla*), tormentil (*Potentilla*), privet (*Ligustrum*), guelder-rose (*Viburnum*), dogwood (*Cornus*), crowberry (*Empetrum*), bilberry (*Vaccinium*), knotgrass (*Polygonum*), sorrel and docks (*Rumex*), goosefoot (*Chenopodium*), orache (*Atriplex*), chickweed (*Stellaria*), spurrey (*Spergula*), buttercup (*Ranunculus*), globeflower (*Trollius*), rocket (*Sisymbrium*), rape (*Brassica*), charlock (*Sinapis*), radish (*Raphanus*), shepherd's-purse (*Capsella*), bird's-foot-trefoil (*Lotus*), wood-sorrel (*Oxalis*), flax (*Linum*), violet (*Viola*), rock-rose (*Helianthemum*), evening-primrose (*Oenothera*), dead-nettle (*Lamium*), hemp-nettle (*Galeopsis*), cow-wheat (*Melampyrum*), plantain (*Plantago*), cudweed (*Gnaphalium*), wormwood (*Artemisia*), sunflower (*Helianthus*), wood-rush (*Luzula*), also seeds of sedges (*Carex*), grasses (Gramineae) and cereals, mainly wheat (*Triticum*) and maize (*Zea*). Invertebrates taken mainly in summer, include springtails (Collembola), stoneflies (Plecoptera), earwigs (Dermaptera), bugs (Hemiptera), aphids (Aphidoidea), moths (Lepidoptera), caddis flies (Trichoptera), dragonflies (Odonata), flies (Diptera), bees, ants and wasps (Hymenoptera), beetles (Coleoptera), spiders (Araneae), harvestmen (Opiliones), mites (Acari), centipedes (Chilopoda), woodlice (Isopoda) and pulmonate snails (Gastropoda). Nestling diet mostly moth larvae. In summer forages mainly in low shrubs, bushes and trees; picks insects from bark of trunk, branches and among foliage, and occasionally pursues and catches insects in flight. In winter and early spring usually forages on ground, also digs into leaf litter in search of beechmast. Forages singly, in pairs and in small groups. In non-breeding season also in larger flocks, sometimes containing thousands of individuals, and in extreme cases flocks estimated to hold several millions gather in S & C Europe; sometimes in mixed-species flocks with *F. coelebs*, *Carduelis chloris*, *Carduelis carduelis* and *Carduelis cannabina*, as well as sparrows (*Passer*) and buntings (Emberizidae).
Breeding. Season May to early Aug; single-brooded, occasionally two broods in C Siberia and NW Russia. Monogamous; pair-bond lasts for duration of season. Solitary; also sometimes within or around breeding colonies of Fieldfare (*Turdus pilaris*), where several males defend nesting area (up to eight full territories recorded at such sites); territories frequently overlap partially or entirely with those of *F. coelebs*. Little evidence of site-fidelity, either partner breeding up to 600 km from site used in previous year. Displaying male gives wheezing song from prominent perch with bill wide open and head back, crown feathers raised, wings drooped (especially wing closest to female) and displaying bright scapulars, wingbars and ruffled white rump, tail also partly spread; sometimes makes low, silent flights with slow flicking wingbeats. Nest built by female alone, a large, loose cup of grass, heather, birch or juniper bark strips, moss, lichens, plant down, animal hair or fur, feathers and cobwebs, sometimes pieces of string or paper added, placed 1–15 m above ground in fork or against trunk of tree, conifer or deciduous, exceptionally low down in scrub or on ground. Clutch 5–7 eggs, clear light blue to dark olive-brown, sparsely or densely spotted or blotched pinkish or rust-brown; replacement usually laid in new nest if first clutch lost, occasionally old nest reused after predation; incubation by female, fed on nest by male, period 11–12 days; chicks fed by both parents, nestling period 13–14 days. Nests often parasitized by Common Cuckoo (*Cuculus canorus*) in some areas. Breeding success apparently dependent on insect abundance at nestling stage: in Scandinavia, nests in vicinity of Fieldfares more successful owing to reduced avian predation; of 109 eggs in N Russian study (on Yamal Peninsula), 59% hatched and 57% fledged young, most predation by Carrion Crow (*Corvus corone*), Hooded Crow (*Corvus cornix*), Spotted Nutcracker (*Nucifraga caryocatactes*) of "slender-billed" race *macrorhynchos*, and Siberian Jay (*Perisoreus infaustus*). Breeds in first year. Recorded longevity 14 years 9 months.
Movements. Migratory; small numbers resident in Scandinavia. Most movement diurnal, but sea crossings (e.g. across North Sea) usually overnight; rate of daily movement not well known, but one ringed in Norway recovered nine days later 1130 km NW in SE Iceland (average c. 125 km/day). Some evidence from ringing that adults winter farther N than immatures; proportion of males in wintering area decreases from N to S (except in years of poor food supply in N areas) and females depart from breeding areas ahead of males. Breeding birds from Scandinavia and W Russia move S & SW at end Sept or early Oct to wintering grounds in Europe S to Mediterranean and E to W & C Turkey, Crete, Cyprus, Israel, also Caucasus and N & SW Iran. Passage in NC Europe mostly from middle or late Sept to early Nov; in C Siberia large numbers of first-years move S along main rivers from end Jul to beginning Sept; arrives in wintering areas on broad front from end Sept, peak numbers later or in second wave mid-Oct to early Nov (later or onward movements usually triggered by food shortage during winter months); in W Europe reaches Pyrenees and Mediterranean coast by mid-Oct; small numbers cross Strait of Gibraltar to extreme N Morocco and Algerian coast (occasionally farther S), usually most numerous in years of severe weather in Europe. In SE Europe and E Mediterranean arrives between mid-Oct and end Dec (mainly mid-Nov to Dec); in Crimea and N Caucasus numbers vary greatly from year to year, from occasionally numerous to rare, passage early Oct to late Nov. Scandinavian breeders winter mostly in British Is, Belgium and France; in Britain arrives on broad front across North Sea, numbers annually variable, between 50,000 and 2,000,000; individuals ringed in Norway also recovered in Germany, Spain and Portugal; small numbers of Finnish breeders together with others from W Russia winter in Spain, SE France, Italy and Switzerland. Evidence from ringing indicates strong fidelity to wintering area, with birds retrapped up to six years later within vicinity of winter ringing area; others winter more distantly in successive years, e.g. individual ringed in winter in Switzerland subsequently recovered in Ireland, British-ringed birds subsequently wintering in Italy and Croatia, and wintering birds in C Europe subsequently recovered in winter in Caucasus. In years of periodic or cyclic abundance following successful breeding seasons, large numbers (up to several millions) move in random directions over wide areas within C & S Europe, with huge concentrations especially in S Germany and Switzerland; estimated flocks of more than 10,000,000 individuals at abundant supply of beechmast in Switzerland. In Asia, small numbers often present throughout winter in SC Russia; throughout Kazakhstan on passage late Sept to Nov, mainly along Ural Valley and Caspian–Aral Sea region; common in winter in Uzbekistan and Kyrgyzstan, and return passage late Feb to early May; in N Iran common winter visitor in irregular number Nov to end Mar; locally common in winter Afghanistan E to Nepal. Farther E, passage into Japan, mainly through Hokkaido and N Honshu, late Sept to Nov, with peak mid-Oct; passage into N & E China and Korea at same time, mostly of birds wintering in E China (S to Fujian and Yunnan), scarce or irregular Hong Kong. Throughout range, return passage N from late Feb to early May, and passage to early Jun in N Kola Peninsula and NC Siberia; arrival in N parts of breeding range often delayed by prolonged cold weather, and in years with late springs those from most N areas may breed farther S than normal. Scarce or uncommon on passage or in winter S Morocco, C Algeria, Cyprus, E Turkey, Lebanon, Jordan, Oman and Taiwan. Vagrant in Spitsbergen, Bear I, E Atlantic islands (Azores, Madeira, Canaries), N Africa away from coastal NW (S to Algerian Sahara, Mauretania, and at sea 60 km W of Senegal), Bahrain, United Arab Emirates, Ladakh, Bhutan, SE Asia (Thailand, Vietnam), Philip-

pines (Calayan), Pribilof Is, Alaska, W Canada, and W Aleutian Is (annual in spring and autumn; in spring counts on Attu I over past 20 years, maximum day count 150 individuals). Records in mainland USA in Oregon, Nevada, California, Montana, North Dakota, Pennsylvania, New York, Massachusetts and New Jersey, at least some of which undoubtedly involve escaped captives.
Status and Conservation. Not globally threatened. Common to locally abundant, and widespread. Breeding population in Europe estimated (on basis of suitable habitat) at c. 15,000,000 pairs, with most in Russia, Finland, Norway and Sweden. No data on numbers in E of range, but in non-breeding season uncommon in China; numbers on passage and wintering in Japan declined during last century. Breeding densities variable, highest 107 territories/km² of subalpine birch forest, 100 territories/km² of spruce forest and in mixed deciduous riverine forest, and up to 65 territories/km² in spruce–birch forest. In subalpine Fennoscandia breeding numbers vary annually, and largely determined by abundance of caterpillars of autumnal moth (*Epirrita autumnata*) and winter moth (*Operophtera brumata*); in S Urals and S Siberia (S limits of breeding range), years with high breeding numbers generally followed by years of complete absence. Outside normal range, occasional breeding in Iceland, Faeroe Is, Scotland, Denmark, Netherlands, Czech Republic, Germany, Austria and N Italy, also N Belarus; has bred also in W Aleutian Is.
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Subfamily CARDUELINAE

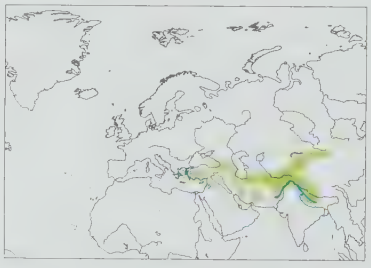
Genus *SERINUS* Koch, 1816

4. Red-fronted Serin

Serinus pusillus

French: Serin à front d'or **German**: Rotstirngirlitz **Spanish**: Serín Frentirrojo
Other common names: Fire-fronted Serin, Gold-fronted Finch/Serin

Taxonomy. *Passer pusillus* Pallas, 1811, near Caucasus and Caspian Sea.
Relationships uncertain; recent molecular-genetic studies suggest that this species is probably closest to *S. serinus* and *S. canicollis*. Monotypic.
Distribution. NW, CS, E & NE Turkey E to S Caucasus, N Iraq, W, N & SE Iran, and S Turkmenistan E to SE Kazakhstan (Tarbagatai Range, Dzhungarian Alatau and Tien Shan) and NW & SW China (NW & W Xinjiang, SW Xizang) and S to NW, C & E Afghanistan and N Indian Subcontinent (NW & N Pakistan E to C Nepal). Non-breeding also S to Lebanon, N Israel, SW Syria, C & SE Afghanistan and NW India (Punjab).



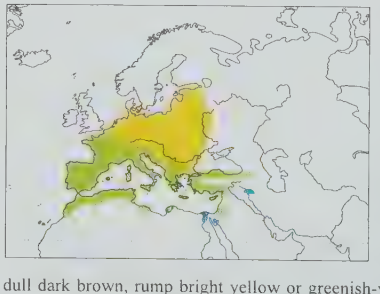
Descriptive notes. 10·5–13 cm; 9·5–13·5 g. Small finch with short, stubby bill, tail forked at tip. Male has bright red to deep orange circular or oval patch on forehead; rest of head to nape and chin to upper breast sooty black, upperparts blackish with broad yellowish or golden-buff feather edges, rump bright yellow or yellowish-tan, becoming darker on uppertail-coverts, tail dark brown, narrowly edged orange to golden; upperwing-coverts dark brown, edged warmer brown to buffish-brown, medians tipped pale orange, greaters tipped slightly paler buffish-yellow on inners (forming two wingbars); flight-feathers and tertials dark brown, finely edged yellowish-orange to golden (paler buff on secondaries); lower breast and belly yellowish, whiter on undertail-coverts, centre of breast to flanks streaked sooty black, becoming more broken streaks on belly; underwing-coverts pale yellowish-white; iris dark brown or black; bill and legs dark brown or black. Female is like male but duller, with often only a thin red strip or patch on forehead and black of head to back duller or brownish-black, hindcrown and nape may have paler grey edges, and black less extensive (looks more yellowish) on mantle, back and breast. Both sexes non-breeding are paler, with forehead patch duller and more reddish-orange, and ashy or buffish feather edges and tips on head and throat. Juvenile has forehead to nape, face and side of neck rust-brown, darker crown and ear-coverts, blackish-brown upperparts more heavily streaked than on adult, with broad pale buffish or yellowish-brown edges (but rump as on adult), scapulars and tips of greater coverts may be gingery brown, rest of wing similar to that of adult, except for white or yellowish-buff tips on median and greater coverts and primaries finely edged golden-yellow, tail has bright yellow edges on all outer feathers, chin and throat pale buff-brown, underparts brown or washed light orange, except for yellowish belly and flanks; first-winter has dark brown head and face, sometimes some red tips on forehead, and throat black on male and brown on female, tertials edged whitish-buff. Voice. Song, often from tops of trees, bushes or similar prominent perch, also in flight, a rapid series of melodious rippling trills interspersed with softer twittering and hoarse notes and frequently repeated phrases, "tsi-tsu-teeh-tsi tit-tit-tit-tit-tit"; similar to that of *S. serinus*, but in general quality reminiscent also of *Carduelis carduelis* song. Calls include rapid, ringing and rippling "trillit-drillt", usually given repeatedly in flight and also from tops of trees, also a soft "dueet" or "tuueet" and more drawn-out twittering "bri-ihihihihi"; foraging flocks on ground emit soft, continuous twittering.
Habitat. Breeds in montane and submontane forests of birch (*Betula*), pine (*Pinus*), juniper (*Juniperus*), spruce (*Picea*), willows (*Salix*) and larch (*Larix*), usually at or towards edge of forest, rarely in dense areas; also dwarf junipers and scattered barberry (*Berberis*) scrub on open hillsides and above tree-line, rhododendrons (*Rhododendron*), on scree slopes, alpine and subalpine meadows, ravines and upper edges of steep valleys; at 600–3000 m in Caucasus, 1500–3300 m in C & E Turkey, 2300–3300 m in Afghanistan and 2000–4700 m in Himalayas. In non-breeding season in similar habitat at lower levels, down to 1370–3300 m, also in orchards and gardens at edges of human settlements, including large towns and villages, scattered trees on hillsides with low scrub, river valleys, rocky wadis and edges of cultivation.
Food and Feeding. Mainly seeds, shoots, flowerheads and fruits, together with small numbers of insects. Takes seeds of variety of trees, including alder (*Alnus*), birch, spruce, juniper, willow, larch, mulberry (*Morus*), *Prunus eburnia*, also those of various alpine plants, including wild rose (*Rosa*) and docks (*Rumex*), chickweed (*Stellaria*), barberry, kale (*Crambe*), shepherd's-purse (*Capsella*), rocket (*Sisymbrium*), lady's-mantle (*Alchemilla*), rest-harrow (*Ononis*), St John's wort (*Hypericum*), thistles (*Carduus*, *Cirsium*), fleabane (*Inula*), wormwood (*Artemisia*), dandelion (*Taraxacum*), salsify (*Tragopogon*), viper's-grass (*Scorzonera*), also several species of Asteraceae, including *Saussurea* and *Cousinia*, and a variety of grasses (Gramineae); also shoots of conifers. Insects include aphids (Aphidoidea). Forages mostly on ground at woodland edges, on also open screes, meadows and open windblown boulderfields, actively, moving with short hops; perches on plants and grasses to reach seedheads. Also in branches, where hangs upside-down to reach birch catkins, and on tops of trees, but prefers dead branches, stones or boulders. Usually in pairs and in small groups of up to 30 individuals; post-breeding flocks may be mostly of males; in C Asia flocks sometimes of 200–300 individuals, exceptionally up to several thousands by early winter (from early Sept), often in company with other finches.
Breeding. Season Apr–Aug; two broods, in Kazakhstan usually only one. Monogamous; pair-forming usually occurs in dispersing winter flocks. Solitary and semi-colonial, with nests 4–5 m apart. Some evidence of fidelity to breeding site, as ringed birds retrapped in same area five years later. Territorial. Several males may competitively display simultaneously to female; in presence of female displaying male sings with crown and forehead feathers prominently raised, wings drooped and partly spread and tail slightly raised, and may swivel body to left and right; also courtship-feeds female prior to copulation. Nest built by female, occasionally helped by male, a neat, compact cup of dry grasses, strips of bark, plant fibres and down, moss, lichen, feathers and cobwebs, placed low down in bush or higher on branch or in fork, or against trunk 1·5–9 m from ground in conifer (mainly spruce), or on rock crevice, on cliff ledge or in hole in scree. Clutch 3–5 eggs, bluish-white, sparsely flecked, blotched or scrawled with pink or reddish-brown or purple; incubation by female alone, period 11–16 days; chicks fed and cared for by both parents, nestling period 14–16 days; young independent at 3–4 weeks, but still fed by parents at up to 5 weeks. Breeding success not well known, but often high rate of failure owing to infertile eggs, poor weather and predation; of 25 nests in Kazakhstan study, 60% produced no young, predation of nearly 50% mainly by Common Magpie (*Pica pica*) and squirrels (Sciuridae). Breeds in first year.
Movements. Resident and migratory. Post-breeding dispersal away from breeding areas, mostly by juveniles, in late Jul–Aug. Also an altitudinal migrant, moving to lower valleys and adjacent foothills in non-breeding season from mid-Sept to early Mar or mid-Apr: those breeding in Caucasus and C Asia E to Kazakhstan, NW China and N Pakistan descend to lower levels in foothills and adjacent plains, frequent in towns and villages (including Almaty, in Kazakhstan), numbers moving largely dependent on severity of weather at higher altitudes, and lowest areas of non-breeding range usually deserted by mid-Mar, movements beyond 70 km exceptional but sometimes reaches Chu and Ili river valleys, and Oct record in SW Mongolia; in W Pamirs moves down from highest levels, immatures usually moving slightly farther than adults. Those in C Turkey move S or SW beyond breeding range to winter in S Turkey (reaching coastal lowlands and Chios I) and irregularly E & S to Lebanon (passage late Oct to late Nov, winters early Dec to early Feb, return passage mid Feb to late Mar), N Iraq and S Iran; in N & C Israel rare on passage between end Oct and end Dec, and rare or locally uncommon winter visitor above 800 m (but occasional winter influxes at certain sites), return passage early Feb to mid-Mar, occasionally present in wintering areas to mid-Apr. In Iran small numbers occur in lowlands around Caspian in winter. Vagrant in Cyprus, Greece, Jordan and Egypt; individual in Austria thought very probably an escape, and occurrences elsewhere in Europe (e.g. British Is) considered also to originate from captivity.
Status and Conservation. Not globally threatened. Common or locally common, uncommon in W & NW China; locally common in NW Himalayas in winter. No estimate of total population available; between 10,000 and 100,000 pairs in Turkey. Population densities in W & C Caucasus ranging from 116 birds/km² in edges of cultivation, 67 birds/km² in pine forest, 37 birds/km² in upper forest zone and 39 birds/km² of river valley down to 2–5 birds/km² in subalpine meadows. In SE Kazakhstan has declined since late 1960s as a result of trapping for cagebird trade.
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5. European Serin

Serinus serinus

French: Serin cini **German**: Girlitz **Spanish**: Serín Verdecillo
Other common names: Eurasian/Common Serin, Serin Finch

Taxonomy. *Fringilla Serinus* Linnaeus, 1766, Switzerland.
Recent molecular-genetic studies suggest that this species is probably closest to *S. pusillus* and *S. canicollis*; has sometimes been thought to form a superspecies with *S. syriacus*, *S. canaria* and *S. canicollis*, but relationships uncertain. Monotypic.
Distribution. Breeds in Europe (except British Is and almost entire Fennoscandia) E to E Baltic, W Russia and Belarus, S to Mediterranean islands, N, W & CS Turkey, C Georgia, Canary Is (Tenerife, Gran Canaria), N Africa (N & C Morocco E to N Tunisia and NW & NE Libya), Lebanon and Israel; winters SW & S Europe and N Africa E to N Egypt, also Iraq.



Descriptive notes. 11–12 cm; 8·5–14 g. Small and compact streaky finch with short stubby bill, short rounded wings, slightly forked tail and bright yellow rump. Male has forehead and forecrown bright lemon-yellow, this colour extending along supercilium and down behind ear-coverts to side of neck; cheek and ear-coverts greyish-olive, small yellow subocular crescent (sometimes similar patch on lower cheek), dark green moustachial stripe, with variably developed yellow submoustachial area; crown and nape green or yellowish-green, finely streaked darker, upperparts streaked dull yellowish-green and dull dark brown, rump bright yellow or greenish-yellow, uppertail-coverts and tail dark brown, latter with fine yellow edges (edges yellowish-green in winter); upperwing-coverts yellowish

with darker or browner centres, yellowish-buff tips on medians and greaters (forming two wingbars); flight-feathers dark greyish-brown, finely edged pale greenish-yellow, tertials similar but edged buffish; chin to lower breast bright yellow, paler or whitish on lower breast, belly and undertail-coverts, side of lower breast to flanks streaked blackish; iris dark brown; bill brown or dark horn, usually paler horn on lower mandible; legs brown. Female is similar to male but duller, more greenish-yellow, with heavier streaking above and below, supercilium narrower and rump often much paler. Juvenile is like female but browner, upperparts broadly streaked brownish and edged greenish-buff, rump light olive or pale brown with darker streaks, wings and tail dark brown, light buffish-brown tips on median and greater coverts, also warm buff-brown edges on tertials and outer tail feathers, chin pale yellow or whitish, underparts pale yellowish-buff and generally only lightly streaked brown or buffish-brown. Voice. Song, usually from prominent perch (e.g. top of tree, tall post, TV aerial, or roadside powerlines), also in song flight, a rapid jumbled mixture of melodious, high-pitched, jangling notes and short buzzy trills, often including several of call notes, similar to song of *Carduelis spinus* but higher-pitched; male sings throughout year, but much less frequently during autumn and winter months. Calls include metallic and rapid or high-pitched trilling "tirrillilit" or "trillilit" as contact between pair-members, also shorter "titteree" and drier "dza-dzweee" or "tirrup", "chuip" or "chit-it" more like sparrow (*Passer*) call, also a sharp, descending metallic "ch-ik-ik-ik-ik-ik-ik si-see"; in alarm or excitement gives high-pitched "tsooee" or "tsswee", similar to notes of *S. canaria*.

Habitat. Lowland to lower montane mosaic of wooded hills with conifers and open country, maquis slopes with pine (*Pinus*) woods, including Monterey pine (*Pinus radiata*), small stands of cedars (*Cedrus*), junipers (especially *Juniperus oxycedrus* and *Juniperus thurifera*), cypress (*Chamaecyparis* and *Cupressus sempervirens*), European silver fir (*Abies alba*) and thuja (*Thuja*); widespread in olive (*Olea*) and citrus groves, open agricultural areas, tall hedges and windbreaks, orchards, vineyards, plantations, suburban parks, avenues and gardens (including those in centres of large towns and cities), also ravines and gorges with trees and shrubs; in semi-desert areas occurs in palms and around villages. In Pyrenees breeds at low densities in black pine (*Pinus uncinata*) forests, co-existing with *Carduelis citrinella*. From sea-level to mountains; to 2000 m in Pyrenees, 2120 m in Alps, 1300 m in Carpathian Mts, 2000 m in Turkey, 2150 m in N Algeria, and to subalpine zone at 2500 m in High Atlas of Morocco.

Food and Feeding. Mainly seeds, buds, shoots, flowers and small invertebrates. Seeds, buds and flowers include those of alder (*Alnus*), birch (*Betula*), spruce (*Picea*), thuja, pine, larch (*Larix*), elm (*Ulmus*), mulberry (*Morus*), also nettle (*Urtica*), hemp (*Cannabis*), docks (*Rumex*), knotgrass (*Polygonum*), shepherd's-purse (*Capsella*), hedge mustard (*Sisymbrium*), pennycress (*Thlaspi*), alison (*Alyssum*), wall-rocket (*Diplotaxis*), hairy rocket (*Erucastrum*), charlock (*Sinapis*), buckwheat (*Fagopyrum*), common mugwort (*Artemisia vulgaris*), orache (*Atriplex*), amaranth (*Amaranthus*), chickweed (*Stellaria*), poppy (*Papaver*), lettuce (*Lactuca*), rose (*Rosa*) and other Asteraceae, also willowherb (*Epilobium*), evening-primrose (*Oenothera*), pimpernel (*Anagallis*), forget-me-not (*Myosotis*), lavender (*Lavendula*), plantain (*Plantago*), dandelion (*Taraxacum*), grasses (*Poa*) and millet (*Setaria*). Insects include aphids (Aphidoidea) and moth larvae (Lepidoptera); other invertebrates spiders (Araneae). Nestlings fed mostly with seeds. Forages actively and energetically on ground, at seeding heads of plants (mostly Asteraceae) and in bushes and small trees; on ground walks with slight shuffling gait or makes short hops, and uses feet to hold plant while extracting seeds; in flowering shrubs plucks petals and bracts before extracting seeds from flowerhead, and in trees pecks at buds and catkins, frequently destroying latter. Forages alone and in pairs; in non-breeding season in small flocks, also in larger gatherings of over 100 (exceptionally to c. 500) individuals, and often with other finches; autumn passage flocks in NW Spain and wintering flocks in Israel often number several thousands at communal feeding or drinking sites.

Breeding. Season Feb to early Aug; usually single-brooded, but two broods frequent in parts of C Europe. Monogamous. Solitary or in loose semi-colonial groups. Territory (used for courtship, nesting and feeding) c. 1 ha, boundary not well defended and display-flights frequently stray into adjoining territory. Displaying male, with upright stance, wings drooped and quivered, tail raised and head up, sings loudly next to female while turning head from side to side, throat feathers ruffled and body slightly trembling; after several bursts of song from perch, flies up to perform twisting or rolling song flight with slow wingbeats, covering wide arc of territory, before descending in slow parachute-drop to perch next to female, where resumes singing; repeated display singing and song flight lead to aerial pursuit of female and copulation. Nest built entirely by female, male may assist with collection of material, a small and compact platform of small twigs, plant stems and down, bark strips, roots, grasses, moss, animal hair and feathers, placed up to 13 m (most at 3–6 m) above ground among outermost branches, in crown or on branch against trunk in bush or tree, usually conifer or fruit tree. Clutch 3–4 eggs, white or slightly glossy bluish or greenish, lightly spotted and streaked rust-red and purple-brown; incubation by female alone, period 12–13 days; chicks fed by both parents, in early days male brings food and regurgitates it to female, nestling period 15–18 days; young become independent 9 days after leaving nest. Breeding success: in study in cemetery habitat in Germany, 90% of 587 eggs hatched and 92% of 450 nestlings fledged, resulting in average of 5·5 young per pair per season; of 290 eggs in Spanish study, 67% hatched, 33% resulted in flying young, losses due mainly to predation by Common Magpie (*Pica pica*), crows (of genus *Corvus*) and cats, also to poor weather and starvation of young, also habitat loss to farming; main causes of failure in Swiss study area included predation by corvids and cats, and nests blown down by wind. Breeds in first year. In long-term study in NE Spain, mean lifespan 1·98 years and annual mortality 40%.

Movements. Resident and migratory. Post-breeding dispersal by juveniles from mid-Jul; breeding birds from C Europe move SW to SE between early Aug and Oct to winter within C & S Europe, mainly Spain, Balkans and around Mediterranean, also N Africa in coastal Libya, N Egypt (Sinai, Nile Delta and Nile Valley S to Aswan) and E to Israel, Jordan and N Iraq; in C Europe locally in winter N to N France and small numbers in C & NE Germany. Ringed individuals from S Poland, Czech Republic, Slovakia, Slovenia and Austria subsequently found wintering in Italy and Sicily, birds from Belgium, Germany, France and Switzerland recovered wintering in Spain, birds from E Germany also retrapped in Italy; Italian breeders make mostly short-distance movements to Sicily, SE France and Balearic Is, and recoveries in Malta (where most numerous mid-Oct to early Apr) include one of individual ringed Hungary. Longest movements apparently by W Russian population, with recoveries in Croatia, Italy and 1600 km SW in SE France. Spanish breeders either largely sedentary or move short distances to S around Strait of Gibraltar, but also common diurnal migrant across Strait of Gibraltar (15,000 counted in single autumn) mid-Sept to end Nov; in Morocco migrants present late Feb to early Apr, and local breeders from higher areas of Atlas Mts move to lower levels in winter. In Cyprus largely an altitudinal migrant, and first arrivals from farther N from late Oct. Passage into Syria, Lebanon, Israel and N Jordan from early Oct to end Nov; passage through N & C Israel on broad front, most along W coast. Return movements N from late Feb to early May, present in Lebanon, W Syria, Israel and N Egypt to mid-Mar and passage through Crete, Cyprus and Lebanon mainly mid-Mar to early Apr; farther N, passage through Europe from end Mar to mid-May, although first arrivals in breeding area of NC Italy by late Feb; first arrivals in N of range mid-Apr. Regular overshooting passage migrant W to Canary Is (where also resident populations on Gran Canaria and Tenerife) and N to British Is, where also has overwintered. Vagrant in Iceland, Norway, Azores, Madeira and SW Iran.

Status and Conservation. Not globally threatened. Common or locally common. Breeding population in Europe in 1990s estimated at between 10,000,000 and 13,000,000 pairs, with most in Spain (4,000,000–6,000,000) and Germany (up to 4,000,000). Breeding density in Switzerland generally high, 100–200 pairs/km², and in 26-year study at cemetery 110–170 pairs/km², compared with 5–15 pairs/km² in built-up area; in NE Spain, 56 pairs/km² in optimal habitats (mosaic of cultivation and scrub; Mediterranean pine woods); in Morocco, 125 pairs/km² in forests and 18 pairs/km² in maquis and semi-arid scrub. Range in Europe expanded N during 20th century, possibly still moving N into S Scandinavia and E into W Russia (in St Petersburg region), Belarus and Ukraine, but rate of expansion erratic and often followed by decline. Breeding population in Belgium c. 2500 pairs in 1970s, but declined to 650–1200 pairs by 1991; similarly, Netherlands population in late 1970s c. 550 pairs, but fewer than 150 pairs by mid-1980s, and declined also in Denmark after peak in late 1970s and probably no longer an annual breeder; small numbers (c. 25 pairs) in S Sweden. In Finland, increase in occurrence in 1970s and confirmed breeding in 1967 and 1976, but possibly fewer than 5 pairs and not annually; bred in Britain in 1967, but on only few occasions thereafter. In S, slight expansion of range in E Mediterranean, with a few thousands of pairs in Israel by late 1980s; first bred Jordan in 1983 and Syria 2003; breeds in coastal Tripolitania area of Libya following introduction of acacias (*Acacia*) in 1930s; possibly local breeding resident in Nile Delta.

Bibliography. Andrews (1995), Belda *et al.* (1995), Björklund & Senar (2001), Cardoso & Mota (2004, 2007), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Estrada *et al.* (2004), Étchécopar & Hüe (1967), Ferguson-Lees (1968), Flint *et al.* (1984), Fry & Keith (2004), Glutz von Blotzheim & Bauer (1997), Goodman & Meininger (1989), Hagemeijer & Blair (1997), Hoi-Leitner, Hoi *et al.* (1999), Hoi-Leitner, Romero-Pujante & Pavlova (2001), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Kinzelbach (2004), Maumary *et al.* (2007), Mayr (1926), McCarthy (2006), Mota (1999), Mota & Cardoso (2001, 2003), Mota & Depraz (2004), Murdoch (2005), Porter *et al.* (1996), Rohner (1980), Roselaar (1995), Senar & Copete (1990), Senar, Domènech & Conroy (1998), Shirihai (1996), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1959).

6. Syrian Serin

Serinus syriacus

French: Serin syriaque **German**: Zederngirlitz **Spanish**: Serín Sirio
Other common names: Tristram's Serin

Taxonomy. *Serinus syriacus* Bonaparte, 1850, Beharre, Lebanon.
Has sometimes been thought to form a superspecies with *S. serinus*, *S. canaria* and *S. canicollis*, but relationships uncertain. Monotypic.

Distribution. Breeds Lebanon, S Syria, N Israel and adjacent areas of Jordan; winters also S to NE Egypt (Sinai), S Jordan and N Iraq.



Descriptive notes. 12–14 cm; 10–14 g. Small finch with short bill and deeply forked tail. Male has forehead to forecrown deep golden-yellow (sometimes orange), becoming paler yellow on lores, around eye and on chin; crown to lower cheek, ear-coverts, centre of nape and most of upperparts grey-buff, faintly streaked darker, side of neck yellow; rump and upper-tail-coverts unstreaked bright yellow (tips of longest coverts may be streaked dark brown); tail blackish-brown, feathers edged yellowish at base, becoming buff on outer rectrices; upperwing-coverts yellow or greenish-yellow, greaters with blackish centres, alula and flight-feathers blackish or blackish-brown, finely (or broadly on secondaries and tertials) edged yellow, whitish to pale buff tips on secondaries; underparts pale yellow, or slightly deeper yellow on belly to undertail-coverts, may be suffused greyish and slightly streaked on flanks; iris dark brown to black; bill blackish to greyish-horn; legs pale pinkish-brown to brownish-grey. Differs from slightly smaller *S. serinus* mainly in slimmer shape, paler and much less streaked plumage, broad yellow bands on wings, and more extensive golden-yellow on face. Female is similar to male, but duller yellow, more heavily streaked on crown and upperparts, rump also duller and may show some slight streaks; wings paler yellow on coverts and edges of flight-feathers; dull yellow below, washed greyish on belly, sometimes some brown streaks on flanks. Juvenile is mostly pale buffish-brown, with mantle and back tinged sandy-brown and lightly streaked darker, median and greater coverts broadly tipped warm buff (bases of greaters also warm brown), yellowish edges on blackish-brown flight-feathers, chin and throat to upper breast pale buff or light buffish-brown, becoming greyer on lower breast, rest of underparts dull white. Voice. Song, usually from top of tree, bush or post, similar to that of *S. canaria* but slower or more hesitant, and with characteristic "twee", "tweet", "siu" and rolling dry "drrrr" trills and chirps; frequently includes call notes and repeated phrases. Calls include dry "tearrrrh", "tirrrh" or "tsirrr" similar to some notes of *S. serinus*, and thin nasal "shkeep" and softer "tree-der-der" or "tree-der-doo" reminiscent of calls of *Carduelis flammea*.

Habitat. Breeds in submontane and montane open woodland and bushy slopes usually dominated by sparse cedar (*Cedrus*), pine (*Pinus*), fir (*Abies*) and juniper (*Juniperus*) woods, also small Palestine oak (*Quercus calliprinos*) and Phoenician juniper (*Juniperus phoenicea*) woods and mixed deciduous–conifers, fruiting trees and orchards, at 900–1800 m. During post-breeding dispersal occurs above tree-line in Lebanon. In non-breeding season at lower levels in acacias (*Acacia*) and thorn-scrub in desert and semi-desert areas, also in vegetated wadis, *Artemisia* steppe with dwarf shrubs and scattered trees, and edges of cultivation and orchards. Requires daily access to drinking water.

Food and Feeding. Mainly seeds and some insects. Seeds include those of canary grass (*Phalaris canariensis*) and fruiting perennials such as *Erodium*, *Erophila*, *Cardaria*, *Lactuca*, *Melica*, *Nepeta*, *Noaca*, *Piptatherum*, *Polygonum*, *Raphanus*, *Reseda*, *Sisymbrium*, *Tanacetum*, *Thlaspi*, *Triticum*, *Holosteum*, *Schismus arabicus*, *Crepis aspera*, *Matricaria aurea*, *Senecio vernalis* and *Hirschfeldia incana*; in non-breeding season mostly seeds of *Artemisia*; at all seasons usually close to water. Feeds on the ground and in bushes and trees. Forages alone and in pairs; flocks of up to 300 gather to drink, and in non-breeding season often in large nomadic flocks of up to c. 600 and may associate with *Carduelis carduelis*.

Breeding. Season mid-Mar to mid-Aug, but start of breeding dependent on snow melt and in some years not until end Apr; one brood in Jordan, two or occasionally three in Israel. Monogamous; pair-bond lasts for at least duration of breeding season. Colonial or semi-colonial breeder, with less than 10 m between nests. Nest a shallow cup similar to that of *Carduelis carduelis*, placed up to 2 m above ground in bush or low tree. Clutch 4–5 eggs, pale blue, sparsely speckled reddish to purple-brown; incubation period 12–14 days; fledging period 14–16 days.

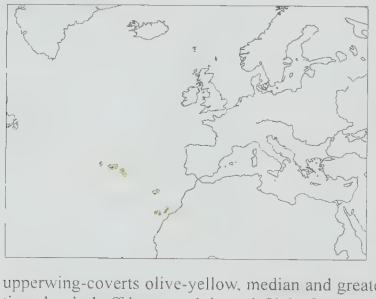
Movements. Resident and partially migratory. Mainly resident in Lebanon, and breeding visitor in extreme S Syria (along border with Lebanon). In N Israel, ascends to 1750 m in mid-summer for second brood, but in autumn leaves entire breeding range, moving short distances to lower levels, initially to form pre-migration concentrations. Post-breeding dispersal throughout range from late Sept to mid-Nov in large flocks, which move briefly to higher areas (including above tree-line) within breeding range and from NE to S at lower levels (below snowline), and S to S Israel (where common around coastal area of Eilat) and more widely in SW Jordan (occasionally also in summer). Passage into Lebanon and through S Israel early Oct to Nov; return to breeding areas from mid-Feb to early Apr, back in breeding area in N Israel (Mt Hermon, Golan Heights) second half of Mar. Small numbers winter in Tigris valley, in N Iraq. Erratic and generally rather scarce or even rare winter visitor to Sinai, in NE Egypt, but more than 100 in some years; vagrant farther S & E in Egypt.
Status and Conservation. VULNERABLE. Restricted-range species: present in Levantine Mountains Secondary Area. Global population estimated at 4000 mature individuals, of which 1000–1250 in Jordan and 100–360 in Israel; very common in Lebanon and local in Syria. Densities of 60 pairs/km² in open oak–juniper woods and 8 pairs/km² in juniper-dominated woodlands, usually in densest parts of woodland. Has small population within geographically restricted range; numbers previously considered stable, but have declined at key sites since 1996, mainly as a result of prolonged drought which exacerbated effects of other impacts, including overgrazing by livestock and wood-cutting by local humans. Jordanian breeding population declined by c. 20% and area of occupancy by 25% between 1996 and 1999. Main breeding areas in Jordan and Israel and three locations in Lebanon are protected.
Bibliography. Andrews (1995), Andrews *et al.* (1999), Anon. (2009i), Baumgart (1995), Butchart & Stattersfield (2004), Clement *et al.* (1993), Cramp & Perrins (1994), Étchécopar & Hüe (1967), Evans (1994), Fry & Keith (2004), Goodman & Meininger (1989), Göwert (1978a, 1978b), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Khoury (1998, 1999, 2000, 2001, 2003), Murdoch & Betton (2008), Porter *et al.* (1996), Ramadan-Jaradi & Ramadan-Jaradi (1999), Ramadan-Jaradi *et al.* (2008), Shirihai (1996), Snow & Perrins (1998), Stattersfield & Capper (2000).

7. Island Canary

Serinus canaria

French: Serin des Canaries **German**: Kanarengirlitz **Spanish**: Serín Canario
Other common names: Atlantic/Common Canary

Taxonomy. *Fringilla Canaria* Linnaeus, 1758, Canary Islands.
Has sometimes been thought to form a superspecies with *S. serinus*, *S. syriacus* and *S. canicollis*, but relationships uncertain. Monotypic.
Distribution. Azores, Madeira and Canary Is.
Introduced in Bermuda, Puerto Rico and Hawaii.



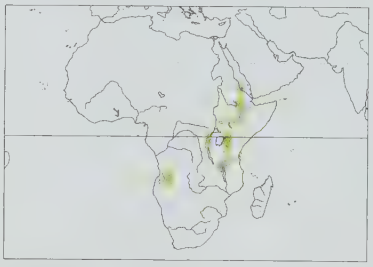
Descriptive notes. 12·5–13·5 cm; 15–20 g. Small yellowish-green finch with forked tail. Male has forehead and supercilium golden-yellow, forecrown to nape greenish-yellow with slight darker streaking; foreface yellow, loral spot and most of ear-coverts much duller ashy-brown to pale brownish-grey, with dusky olive line beneath yellow crescent under eye, running down at gape and then back around lower ear-coverts; upperparts light grey, feathers with blackish centres and greenish-yellow edges, rump greenish-yellow or dull olive, uppertail-coverts dark brown with greyer tips; tail dark brown, edged pale green; lesser upperwing-coverts olive-yellow, median and greater coverts blackish, edged greenish-yellow and tipped pale buff-brown; alula and flight-feathers black or blackish-brown, finely edged yellow, tertials the same or more broadly edged buff or brownish-buff on innermost; dull golden-yellow below, washed olive on chin to breast and sometimes tinged greyish on side of breast and flanks, breast and upper belly yellow, lower flanks streaked blackish, lower belly and undertail-coverts pale buff or whitish; iris dark brown or blackish; bill pale fleshy- or greyish-horn, often darker and greyer on upper mandible, especially culmen; legs brown. Female is like male, but duller or greyer on face and upperparts; side of head greyer, yellow restricted to area around bill and eye, also upperparts tinged brownish and more heavily streaked than on male, rump and tail slightly duller and tinged greenish, median coverts tipped broadly with yellow, greaters tipped pale buff-brown (paler or whiter when worn), flight-feathers finely edged greenish-yellow, tertials as on male and tipped buff; breast greyer than on male and belly to undertail whiter, with diffuse dark streaks on streaks. Juvenile is mostly pale brown, streaked on head, upperparts and underparts, lacking yellow on head (except chin and throat) and body, forehead greenish-yellow, face pale buffish-brown, tips of median and greater coverts warm buffish-brown. VOICE. Song, often from within treetop or from open songpost, a rapid series of rich, varied, sweet, melodious (rising and falling) fluty whistles, piping and trills, interspersed with twitters and churrs, repeated in alternating series; also given following display-flight; sometimes gives softer subsong or quieter phrases of main song. Calls include high-pitched "sooee", "swee" or "sooeeet", often with light twittering "tiioodididi"or "twee-tee-ee" trill, usually given in flight; during territorial dispute a sharp or dry "zee-zee-zee" or a more prolonged "dididididididi..."; anxiety or alarm note a sharp and rising "psiahh".
Habitat. Wide variety of lowland and submontane forests of pine (*Pinus*), laurel (Lauraceae), and edges of cultivation, including orange groves, banana plantations, orchards and vineyards, wooded valleys (barrancos) with almonds (*Prunus*), tamarisk (*Tamarix*) thickets, myrtle (*Myrica*) hedges, tree-heaths (*Erica*) and especially areas of broom (*Cytisus*), also parks and gardens; on Desertas (Madeira) breeds in open semi-arid areas with little or no vegetation cover. From sea-level to c. 750 m on Madeira, to c. 1100 m on Azores and to c. 1700 m in Canary Is.
Food and Feeding. Predominantly seeds, mostly of herbs and grasses, also some buds and fruit, and small number of insects. Seeds, buds, shoots and fruits include those of conifers, birch (*Betula*), fig (*Ficus*), mulberry (*Morus*), amaranth (*Amaranthus*), chickweed (*Stellaria*), charlock (*Sinapis*), cotton (*Gossypium*), flax (*Linum*), mercury (*Mercurialis*), dandelion (*Taraxacum*), sow-thistle (*Sonchus*), lettuce (*Lactuca*), mugwort (*Artemisia*), oxtongue (*Picris*), ragwort (*Senecio*), agave (*Agave americana*) and grasses (Gramineae), mainly canary grass (*Phalaris*); also takes nectar of agave. Insects taken include aphids (Aphidoidea). Forages actively and energetically on ground and in shrubs and bushes; walks or hops on ground, uses feet to hold down plant stems while extracting seeds. Usually in pairs during breeding season; summer flocks may consist solely of adult males; in non-breeding season in flocks of several hundreds and in company with *Carduelis carduelis*, *Acanthis cannabina* and Common Rock-sparrows (*Petronia petronia*) and Spanish Sparrows (*Passer hispaniolensis*).
Breeding. Season Jan–Jul; two or three broods (only two in Azores). Monogamous. Territorial male performs stiff-winged butterfly-like display-flight, ending with planing descent on half-closed quivering wings to land on top of tree or songpost, where it then sings; in display, holds head almost horizontal, gaping, and approaches female slowly, she responds, and male grasps her bill; courtship feeding of female by male from shortly after pair formation and prior to full display (or even commencing during nest-building) may be initiated by female with begging calls, ruffled plumage and wing-shivering. Nest built by female, accompanied by male, a deep compact cup of twigs, plant fibres and down, grass, moss and lichens, small leaves, animal hair (mainly sheep wool) and feathers, placed up to 4 m above ground in fork at end of thin branch or in crown of small tree, usually native pine, sometimes fruit tree, cypress (*Chamaecyparis*), broom, heather or banana (including within bunches of growing fruit). Clutch 3–4 eggs, pale blue to bluish-green, spotted or blotched with red, violet or rust-brown; incubation by female, period 13–14 days; chicks fed and cared for by both parents, nestling period 15–17 days; young fed by parents for up to further 21 days and fully independent at c. 5 weeks.
Movements. Resident, with short-distance dispersal. Between late Aug–Oct and Feb–Mar flocks wander over wide areas, becoming more numerous in parts of breeding range, e.g. NE Madeira; breeding birds from Madeira move to neighbouring Desertas in winter, and has also been recorded in Selvagen Is (N of Canaries). Moves between islands in Azores.
Status and Conservation. Not globally threatened. Restricted-range species: present in Madeira and the Canary Islands EBA and Azores Secondary Area. Common to locally common; scarce and local in E Canary Is (Fuerteventura and Lanzarote). Total population estimated at between 80,000 and 90,000 pairs. Azores breeding population between 33,800 and 63,900 individuals. Few data on breeding densities; in Canary Is, 5 pairs/km² in Canary pine (*Pinus canariensis*) woodland and 24 pairs/km² in introduced Monterey pine (*Pinus radiata*) on Tenerife. In 1980, 12–15 individuals released onto Fuerteventura in effort to boost population there. Widely kept in captivity in most areas of the world; this species (and varieties bred from it) probably the best-known of all cagebirds.
Bibliography. Arnaiz-Villena, Lowy *et al.* (2007), Bannerman (1963), Bannerman & Bannerman (1965), Birkhead *et al.* (2004), Clarke (2006), Clement *et al.* (1993), Cramp & Perrins (1994), Dietzen *et al.* (2006), Étchécopar & Hüe (1967), Hagemeijer & Blair (1997), Leitner *et al.* (2001), Pasteau *et al.* (2009), Snow & Perrins (1998), Voigt & Leitner (1998), Voigt *et al.* (2003), Ward, S. *et al.* (2003).

8. Yellow-crowned Canary

Serinus flavivertex

French: Serin à calotte jaune **German**: Gelbstirngirlitz **Spanish**: Serín Coronigualdo
Other common names: Kenya Canary

Taxonomy. *Crithagra flavivertex* Blanford, 1869, Adigrat, Tigray Province, Ethiopia.
May form a superspecies with *S. canicollis*; previously considered conspecific, but differs significantly in plumage and habitat, and in preferred altitudinal range, and treatment as two separate species supported by recent studies of mitochondrial DNA. Three subspecies recognized.
Subspecies and Distribution.
S. f. flavivertex (Blanford, 1869) – Eritrea, Ethiopia, SE Sudan, C & SW Kenya and N Tanzania.
S. f. sassii Neumann, 1922 – E DRCongo, SW Uganda, W Rwanda, W Burundi, SW & S Tanzania, NE Zambia and N Malawi.
S. f. huillensis Sousa, 1889 – WC Angola (S Cuanza Sul S to Huíla).



Descriptive notes. 11·5–13 cm; 12·5–17 g. Small, long-tailed finch with double wingbar. Male nominate race has forehead and crown (including side of crown) bright golden-yellow, becoming dingy green on hindcrown and nape, narrow dusky eyestripe, face yellow with lores to ear-coverts olive-green; upperparts bright olive-green, streaked blackish-brown, rump and uppertail-coverts bright greenish-yellow; tail blackish, narrowly fringed greenish-yellow; upperwing black, broad bright yellow tips on median and greater coverts (forming two wingbars), yellow fringes on tertials, middle primaries also edged bright yellow (forming panel on closed wing); below, mostly bright yellow, sometimes tinged greenish on side of breast, whitish lower belly to undertail-coverts; iris brown; upper mandible slate-coloured, lower mandible pale brown; legs fleshy-brown to blackish. Female is like male, but duller and tinged greener, forehead and supercilium dull yellow, crown and upperparts dull olive-green, tinged brownish, except for yellowish-green rump and uppertail-coverts, edges of tail greenish-yellow; tips of median and greater coverts narrower and fringes of tertials and middle primaries edged duller yellow; chin to upper belly pale green or washed yellowish, finely streaked dark on side of breast and flanks. Juvenile is mostly buffish-brown with darker streaks above, rump and uppertail-coverts dark-streaked light buff, tail dark brown, edged yellowish, median and greater coverts with dark brown bases and broadly pale or warm buff-brown tips, edges of flight-feathers and tertials yellowish (or broadly pale buff on tertials), face yellowish-buff, underparts pale yellowish-buff, streaked dark brown, streaks becoming thinner or fading on belly, bill dark horn, paler base of lower mandible. Race *sassii* is slightly smaller than nominate, male with nape to side of neck greenish, tail entirely yellow except for blackish central shafts and dark outer edges of outer feathers, female similar to nominate but with more blackish-brown on central rectrices (only edges yellowish); *huillensis* male has head and underparts golden-yellow, upperparts more yellow than other races and unstreaked, median and greater coverts broadly edged pale yellow and tipped slightly paler, flight feathers black, secondaries and lower tertials edged bright yellow, female similar to nominate, dull olive-green with pale yellow rump and some streaks on crown, juvenile like nominate with bright yellow edges on flight-feathers and base of tail and underparts heavily streaked. VOICE. Song a loud series of mixed rich musical trills, harsher trills and warbles, reminiscent in structure and quality of *Carduelis carduelis* song, usually given for up to 15 seconds without pause or repeatedly for up to 15 minutes at height of breeding season; also sings in chorus with other males and in slow display-flight. Calls include rising or querulous "sweet", "peet" or combined "sweet-peet", and a liquid trilling, often given repeatedly.
Habitat. Lower montane forest edges and clearings, including juniper (*Juniperus*) forest and *Podocarpus* trees within forest, also moorlands, grasslands and savanna with scattered bushes, thorn-scrub with acacia (*Acacia*) and eucalypt (*Eucalyptus*) trees, pastures and edges of cultivation and gardens; in S of range occurs also in grasslands with thin or scattered woods, bracken and scrub with heath; frequently in plantations of non-native trees. At 1400–4300 m in E Africa.
Food and Feeding. Diet not well-studied, mostly green seeds, including those of trees, shrubs, small plants and grasses (including cereals, especially *Sorghum*); occasionally small insects, in-

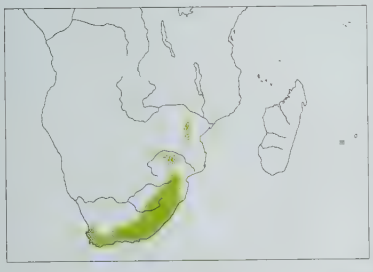
cluding grasshoppers (Orthoptera). Forages mostly on ground, also low down in vegetation. Singly and in pairs or small flocks; following breeding season often in flocks of up to c. 50, occasionally to 500 individuals, also in mixed-species foraging flocks.
Breeding. Breeds in all months, mostly Apr–Jun and Oct–Dec. Monogamous. Solitary and territorial. Male has slow, stiff-winged, butterfly-like display-flight. Nest built mostly by female, a cup of plant fibres and roots, plant down and flower petals, placed in fork or along branch 1–2·5 m above ground in tree or tree-heath (*Erica arborea*). Clutch 2–4 eggs, white or tinged greenish, spotted pale grey and dark brown. No further information.
Movements. Resident, partially migratory and nomadic. Those breeding at higher altitudes in Kenya, Tanzania and Malawi move to lower levels in non-breeding season, mainly Apr–Aug (Kenya), down to c. 1400 m; in NE Zambia and N Malawi resident, but large numbers wander away from breeding areas on Nyika Plateau during Jan–Mar and from Viphya Mts (Malawi) during Mar–Jul.
Status and Conservation. Not globally threatened. Primarily common to locally common. Locally abundant in Kenya; uncommon in SE Sudan. Locally common but not well known in Angola.
Bibliography. Arnaiz-Villena *et al.* (1999), Ash & Atkins (2009), Britton (1980), Clement *et al.* (1993), Dowsett-Lemaire & Dowsett (2006), van den Elzen (1985), van den Elzen *et al.* (1987), Fry & Keith (2004), Hall & Moreau (1970), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952, 1963), Nikolaus (1989), Ryan *et al.* (2004), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

9. Cape Canary

Serinus canicollis

French: Serin du Cap **German**: Gelbscheitelgirlitz **Spanish**: Serín Dorsigrís

Taxonomy. *Crithagra canicollis* Swainson, 1838, Cape of Good Hope, South Africa.
May form a superspecies with *S. flavivertex*; previously considered conspecific, but differs significantly in plumage and habitat, and in preferred altitudinal range, and treatment as two separate species supported by recent studies of mitochondrial DNA. Three subspecies recognized.
Subspecies and Distribution.
S. c. griseitergum Clancey, 1967 – E Zimbabwe and adjacent Mozambique.
S. c. thompsonae Roberts, 1924 – N & E South Africa S, including W Swaziland, to E Free State and S KwaZulu-Natal, and Lesotho.
S. c. canicollis (Swainson, 1838) – S South Africa from Western Cape E to W Free State and NE Eastern Cape.
Introduced (race *thompsonae*) on Mauritius and Reunion I.



Descriptive notes. 11·5–14 cm; 10–19·7 g (South Africa). Rather small, slim, long-tailed finch lacking wingbars. Male nominate race has forehead to most of crown and cheek deep green with yellow or bright golden-yellow suffusion, lores dusky, anterior ear-coverts dull greenish-yellow, becoming ashy grey on rear ear-coverts and on hindcrown to mantle and side of neck (broad collar or shawl); lower mantle, back and scapulars deep olive-green, finely streaked darker, lower back and rump yellowish-green, tail blackish, broadly edged bright yellow or greenish-yellow; median and greater upperwing-coverts like scapulars, but tipped pale greenish-yellow (forming a hint of wingbars); alula and flight-feathers black, edged greenish-yellow, tertials more broadly edged and tipped greenish-yellow; chin and throat dull greenish-yellow, slightly deeper green on side of breast and flanks (may also show grey tips), lower breast to undertail-coverts whitish-yellow; iris brown; bill greyish-horn to dark brown above and paler horn to creamy white below; legs dark pinkish-brown to blackish-grey. Female is similar to male, but paler yellowish-green on forehead and face, duller green and more distinctly streaked on upperparts, except for bright greenish-yellow rump and uppertail-coverts; grey shawl on nape and side of neck extends to chin, throat and breast, rest of underparts off-white to whitish-yellow. Juvenile is mostly buffish-brown with darker streaks on head and upperparts (most noticeably streaked on head, mantle and scapulars), rump and uppertail-coverts warm buff, streaked darker, tail as on adult but dark brown (not blackish), median and greater coverts with dark brown bases and broad pale buff-brown tips, edges of flight-feathers yellowish (or broadly pale yellowish-buff on tertials), underparts pale yellowish-buff, heavily streaked dark brown, streaks becoming thinner or fading on belly, bill dark horn, paler base of lower mandible. Race *thompsonae* is very like nominate, but mantle and scapulars slightly paler grey, and primary coverts and alula brownish-black; *griseitergum* male has forehead, crown and face greener and grey shawl deeper or more bluish-grey, mantle, back and scapulars grey-tinged dark green with prominent dark streaks, underparts more greenish (less yellow), female has forehead green, crown to lower back greenish-grey with dark shaft streaks, rump and uppertail-coverts greenish-yellow, chin and throat deep grey or bluish-grey, underparts as nominate. Voice. Song, by male only, from tops of trees or during display-flight, a loud, lively, jumbled series of rich musical trills, harsher trills and warbles, usually given for up to 20 seconds without pause, or more continuously for up to 15 minutes at height of breeding season; also sings in chorus with other males for up to 30 minutes. Calls include rising "sweet" or "peet", descending "tswee-yew" and upslurred "way-yee" or "dzoo-wee", and a series of short twittering notes, "tiriririr", either in flight or as part of song; alarm or anxiety call a repeated plaintive "sweeet", "tweee", pee-eee" or "twoo-ee" or "sklereee".
Habitat. Lowland and lower montane forest edges and clearings, including juniper (*Juniperus*) forest and *Podocarpus* trees within forest, also moorlands, grasslands and savanna with scattered bushes, thorn-scrub with acacias (*Acacia*) and eucalypts (*Eucalyptus*), pastures and edges of cultivation and gardens; in S of range also *Philippia*, *Protea* and oldwood (*Leucosidea sericea*), plantations including patula pine (*Pinus patula*), scattered woods, fynbos, vineyards, roadside verges, fallow fields, parks and gardens, frequently in stands of non-native trees, also coastal dunes and rocky or sandy beaches. Sea-level to hills and lower mountains; between 1350 m and c. 2300 m in Zimbabwe.
Food and Feeding. Mostly soft green seeds, including those of trees, shrubs, small plants and grasses, mainly *Pinus patula*, *Bidens pilosa*, *Psidium gujava*, *Eriobotrya japonica*, also sunflowers (*Helianthus*) and seeds and buds of *Alyssum*, *Arctotheca*, *Arctotis*, *Athanasia*, *Boerhavia*, *Casuarina*, *Echium*, Ericaceae, *Ursinia*, *Senecio*, *Osteospermum*, *Venidium*, *Cephalaria*, *Inula*, *Lepidium*, *Metalasia*, *Oxalis*, *Olea*, *Chenopodium*, *Gnidia*, *Amaranthus*, *Silene*, *Stoebe*, *Sonchus*, *Stellaria*, *Elytropappus* and *Eriocephalus*, and meadow grasses (Gramineae); buds of *Salvia splendens*, *Salvia chamelaeagnea* and *Buddleia*. Occasionally takes small insects, including grasshoppers (Orthoptera). Forages low down in vegetation, in proteas and among scrub; takes seeds directly from flowerheads or on ground. Forages singly and in pairs, also in flocks of up to c. 50 individuals, and in non-breeding season often in larger flocks of up to 500; joins mixed-species foraging flocks.
Breeding. Season mostly Aug–Feb, occasionally Dec–Mar. Monogamous. Colonial or semi-colonial nester. Male performs slow, butterfly-like display-flight on stiff wings, often accompanied by loud singing, also approaches female on perch while swaying body and singing loudly or giving short mewing note, in both cases usually ending with a dashing flight towards female, followed by chase; female has submissive posture with wings drooped, head down, and body elongated while swaying from side to side. Nest built mostly by female (may be accompanied by male while gathering material), a thick-walled cup mostly of fine roots, plant fibres, soft plant down, *Helichrysum* tendrils, leaves, lichens, moss, pine needles, small twigs, animal hair or wool, feathers and gossamer, placed in fork or along branch 1–20 m above ground in tree, usually non-native, including pine, oak (*Quercus*), peach (*Prunus persica*) and citrus, or in vines, or occasionally in native *Leucosidea sericea*. Clutch 2–5 eggs, white or tinged greenish or pinkish, blotched, speckled or spotted pale brown to reddish or dark brown, slate-grey or black-bluish, with reddish-brown or greyish-purple blotches and fine chocolate-brown and black spots and speckles; incubation by female, period 12–14 days; chicks cared for and fed by both parents, nestling period 15–18 days, but young leave nest up to 2 days before able to fly. Of 78 eggs in South Africa, 76% hatched, and 64% of chicks fledged, most losses due to predation, including by Common Fiscal (*Lanius collaris*), and blood-sucking fly *Passeromyia heterochaeta*; 9% of eggs infertile. Longevity at least 5 years.
Movements. Resident, partially migratory and nomadic. Those at higher altitudes in Zimbabwe move to lower levels in non-breeding season. Wanders nomadically, including to non-breeding areas e.g. N Karoo, where flocks stay for several weeks before moving on; ringed nominate male recovered in range of *thompsonae* in E Limpopo; numbers in S Cape area increase in spring and largely absent from arid N parts of range in summer.
Status and Conservation. Not globally threatened. Common to locally abundant; locally uncommon. Locally common in N of range in Zimbabwe and Mozambique. Has increased in number and range in Karoo with planting of non-native trees, including pines and poplars (*Populus*).
Bibliography. Arnaiz-Villena *et al.* (1999), Clancey (1971), Clement *et al.* (1993), Dean (1987), van den Elzen (1985), van den Elzen *et al.* (1987), Fraser (1997a), Fry & Keith (2004), Ginn *et al.* (1989), Hall & Moreau (1970), Hanmer (1994), Harrison *et al.* (1997), Hockey, Dean & Ryan (2005), Hockey, Underhill *et al.* (1989), Irwin (1981), Mackworth-Praed & Grant (1963), Maclean (1993), Manson (1990), Milewski (1978), Parker, V. (1994), Ryan *et al.* (2004), Sinclair & Ryan (2003), Skead (1948, 1960), Tarboton (2001), Tarboton *et al.* (1987), Urquhart (1992), Winterbottom (1968, 1970, 1973), Wolff & Jacobsen (1980).



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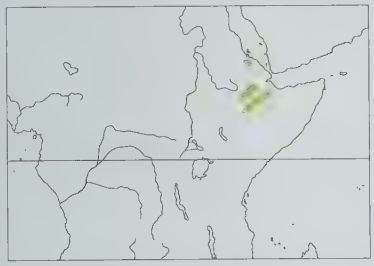
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10. Ethiopian Siskin

Serinus nigriceps

French: Serin à tête noire **German**: Schwarzkopfgirlitz **Spanish**: Serín Cabecinegro
Other common names: Black-headed Siskin(!), Abyssinian Siskin/Canary, African/Ethiopian Black-headed Siskin

Taxonomy. *Serinus nigriceps* Rüppell, 1840, Simen Province, 10,000 feet [c. 3050 m], Ethiopia. Monotypic.
Distribution. N & C highlands of Ethiopia.



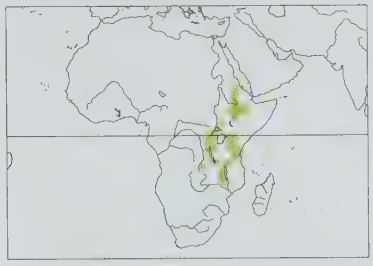
Descriptive notes. 11–12·5 cm. Small finch with thin pointed bill and notched tip of tail. Male has entire head to hindneck, side of neck and throat sooty black, mantle and back dull olive-yellow, scapulars variably pale yellowish-green to bright yellow (duller in worn plumage), rump and uppertail-coverts yellow or olive-tinged yellowish; tail is blackish, narrowly edged yellowish or buffish-white; upperwing-coverts black, median and greater coverts broadly tipped pale lemon-yellow, alula, primary coverts and flight-feathers black, finely edged pale yellow, tertials more broadly edged pale buff or whitish at tips; underparts yellowish, tinged olive-green on side of breast and flanks; iris dark brown or black; bill black; legs dark brown. Female lacks black on head, has forehead to lores and around eye greyish-olive, crown and upperparts duller greenish-olive with darker streaks, except for bright yellowish-green rump, lacks broad yellow band on scapulars, has narrower yellowish tips on median and greater upperwing-coverts; underparts also duller yellow, and finely streaked on chin to flanks; bill dark brown, legs black. Juvenile is similar to female but duller, with dark olive-grey head, heavier streaking above and below, tips of median and greater coverts pale buff or buffish-yellow, may show dark tips on upper rump. Voice. Song, usually from top of tall shrub, weed-head or roadside powerlines, a series of pleasant musical phrases and trills frequently repeated, and in quality reminiscent of *Carduelis carduelis* song but lacking buzzing notes or phrases. Calls include variety of noisy chattering, high-pitched musical twitters, chirps, a buzzing "trrrr", and a short and sharp "chit-chit-chit".
Habitat. Montane forest and open moorland grasslands, usually in open grassy areas of giant heath (*Erica*) with alchemillas (*Alchemilla johnstoni*, *Alchemilla ellenbecki*, *Alchemilla abyssinica*) and giant lobelias (*Lobelia*), St John's wort (*Hypericum lanceolatum*), also *Hagenia abyssinica*, thickets of *Euphorbia depauperata* and edges of cultivation; at 1800–3640 m.
Food and Feeding. Mostly seeds of plants and trees, including St John's wort and *Hagenia abyssinica*. Forages in pairs and small flocks, clinging to vegetation and thin twigs, including slender grass stems and fronds of hagenias; also on ground.
Breeding. Season May–Jun and Aug–Oct. Monogamous; territorial. Nest a compact cup of fine grasses, roots and plant down, placed low down below 1 m in thistles, spurge (*Euphorbia*) or *Laggera* (Asteraceae) or in bush or on outer branch of small tree. Clutch 2–3 eggs, bluish-white, finely spotted with brown; incubation period 14 days; fledging period 17–18 days.
Movements. Sedentary; may move to lower elevations in periods of severe weather.
Status and Conservation. Not globally threatened. Locally common or abundant within restricted range.
Bibliography. Ash & Atkins (2009), Clement *et al.* (1993), Fry & Keith (2004), Mackworth-Praed & Grant (1952), Sinclair & Ryan (2003).

11. African Citril

Serinus citrinelloides

French: Serin d'Abyssinie **German**: Dünnschnabelgirlitz **Spanish**: Serín Etíope
Other common names: Abyssinian Citril (*citrinelloides*); Western Citril (*frontalis*); Kenya Citril (*kikuyensis*); Eastern/East African/Southern/Tanzanian Citril (*hypostictus*)

Taxonomy. *Serinus citrinelloides* Rüppell, 1840, Simen, Ethiopia.
Forms a superspecies with *S. capistratus*. Nominate race (with *brittoni*) and *frontalis* (with *kikuyensis*) have been considered to comprise two separate species, with *hypostictus* comprising a further species; ranges almost continuous, however, and *brittoni* and *kikuyensis* overlap in small area of W Kenya; also, although plumage variation well marked, vocal differences evident only in songs of nominate and *frontalis*. From limited mitochondrial DNA analysis, nominate race and *hypostictus* appear genetically very close, and it has recently been proposed that they be placed in a separate genus, *Dendrospiza*, along with *S. capistratus*, being only distantly related to other members of present genus. Detailed consideration of all taxa currently included in present genus is required, however, before species limits can be determined or full generic revision be made. In addition, birds described from E Angola (Calunda, in E Moxico) proposed as race *martinsi*, but known only from type specimen, and no further records of the species from that country. Five subspecies recognized.
Subspecies and Distribution.
S. c. citrinelloides Rüppell, 1840 – N Eritrea to C & S Ethiopia.
S. c. brittoni Traylor, 1970 – SE Sudan and extreme W Kenya.
S. c. frontalis Reichenow, 1904 – NE, E & SE DRCongo to W, C & S Uganda, W Tanzania and NE Zambia.
S. c. kikuyensis (Neumann, 1905) – SW Kenya.
S. c. hypostictus (Reichenow, 1904) – SE Kenya to extreme NE Zambia and Malawi.
Descriptive notes. 11–12 cm; 10–15 g. Small finch with conical pointed bill and slightly notched tail. Male nominate race has lower forehead and lores to upper throat black or variably blackish to dusky olive-green, ear-coverts also blackish or olive-green, narrow bright yellow line (may be absent) over eye and ear-coverts; rest of forehead to nape and upperparts pale green, finely streaked darker, except for unstreaked paler yellow lower back, rump and uppertail-coverts; tail black, thinly edged pale greenish-yellow; upperwing-coverts blackish, broadly edged pale green or greenish-



olive and tipped pale yellow (forming two wingbars); alula, primary coverts and flight-feathers black, secondaries and tertials broadly edged pale yellowish-green, in fresh plumage primaries tipped pale buff; lower throat to belly bright yellow (sometimes tinged greenish), flanks to undertail-coverts yellow, often dark brown streaks on flanks; iris dark brown or black; upper mandible dark horn, lower mandible pale flesh-pink to yellowish; legs light brown, sometimes tinged pinkish. Female lacks prominent black face of male, above is duller olive-green and more heavily or boldly streaked darker, except for plain yellowish-green rump and uppertail-coverts, face dull olive-green with very thin or short yellow supercilium, mostly pale yellow below, streaked darker on throat, breast and flanks; bill brown above, horn-coloured below. Juvenile is similar to female but greyer (may be tinged brownish or greenish), finely streaked darker on upperparts, except for dull greenish-yellow rump and uppertail-coverts, has median and greater upperwing-coverts tipped pale buffish, flight-feathers edged pale greenish-yellow or buff, below buff or buffish-yellow, streaked darker on throat to breast and flanks. Race *frontalis* has more slender and pointed bill than nominate, broad bright yellow band across forehead joining with supercilium, upperparts brighter green and underparts brighter yellow than nominate, often lacks green tinge on breast, female also has pure yellow unstreaked underparts; *kikuyensis* differs from nominate in having more distinct yellow supercilium often crossing lower forehead (above black frontal band), more heavily streaked mantle and back, female like nominate but duller olive-yellow above and more heavily streaked on throat, breast and flanks; *hypostictus* has black of face replaced by grey or dark grey on lores, cheek and chin, lacks bright yellow supercilium, has short dark streaks on throat and breast, female like male but face paler grey and streaks below extend to flanks; *brittoni* is like last, but face dark green, lacking blackish, has narrow yellowish supercilium (more prominent on male), brighter green upperparts variably streaked darker, greyish-yellow chin, warm yellow below, side of breast and flanks tinged green, heavily streaked from chin to upper breast, finely streaked lower breast and flanks, sexes almost alike, female's supercilium less prominent than male's. Voice. Song, usually from prominent treetop perch, post or roadside powerlines, a loud series of three or four short phrases interspersed with equally short pauses, "tweet-ti-tu" or "turr-eeee tsurr...seet-sew-eet...seeet-tsew-eeeet...sweet seeeeet tsirrr, chwrrr chwereet tsirrr chureet churreet", and may include several faster, high-pitched twitters and other notes; similar to that of *S. canaria*, but much sweeter and unhurried. Song of race *frontalis* a more modulated high-pitched jingle including shorter notes interspersed with thinner "sit-sit" and a buzzing "zzweee". Calls include soft "cheep", "chit" and "t,t tee" or "t-tweee", and a soft or subdued twittering note in flight.
Habitat. Open and rank grasslands in high-rainfall areas, principally clearings and edges of forest, wet or damp woodlands, along edges of streams, rivers or lakes, also secondary bush, acacia (*Acacia*) scrub, pine (*Pinus*) plantations, roadside verges, gardens (including those in large towns and cities) and edges of cultivation, particularly rape (*Brassica napus*), eucalypt (*Eucalyptus*) and banana plantations. Generally above 1000 m, and nominate race occurs at 1230–2500 m; *hypostictus* down to 500–700 m.
Food and Feeding. Mainly seeds, also buds, berries and leaves; also some insects. Seeds include those of black jack (*Bidens pilosus*), sunflower (*Helianthus annuus*), *Salvia*, thistles and similar open flowerheads including *Aspilia* and *Cosmos*, *Cussonia*, *Hagenia*, figs (*Ficus*), *Amaranthus hybridus*, *Nicandra physalloides*, *Erucastrum arabicum*, and acacias, also grass seeds; buds and leaves of *Rumex abyssinicus*, and berries, including strawberries (*Fragaria*), raspberry (*Rubus*), grapes (*Vitis*), together with those of *Cordia*, *Grewia similis*, *Lantana trifolia*, *Lantana camela*, *Solanum nigrum*, *Schinus molle*. Small numbers of insects taken, including small beetles (Coleoptera), ants (Formicidae) and termites (Isoptera) pursued and caught in flight, and larvae of moths (Lepidoptera) and grasshoppers (Orthoptera). In examination of stomach contents, seeds comprised 39% of items, fruit 32%, buds and shoots 10·5%, and small insects 11·5%. Actively forages on ground, to lesser extent in low-growing vegetation. In pairs and in small groups (including during breeding season) of up to 30 individuals.
Breeding. Possibly breeds throughout year, principally Mar–Aug and Oct–Jan, timing largely influenced by onset of rains. Nest built by both sexes, mostly by female, a neat cup of grasses, fine roots, plant down, lichens and gossamer, placed 2–5 m above ground in tall vegetation or bush, often in thornbush, race *brittoni* frequently among fruits in banana plant. Clutch 2–4 eggs, white or very pale blue with sparse small reddish or dark brown spots; incubation by female alone, fed on nest by male, period 12–13 days; nestling period c. 15 days, young usually leaving nest before able to fly.
Movements. Primarily resident. Wanders in non-breeding season and becomes seasonally more numerous between Aug–Dec locally within breeding range; also makes altitudinal movements to lower levels (down to 500–700 m in Malawi); irregular visitor in rainy season to Kerio Valley, in C Kenya. Race *hypostictus* recorded (specimens) N to W & N Ethiopia (last record in 1974), where either a vagrant or possibly a scarce breeding resident.
Status and Conservation. Not globally threatened. Common and widespread. Old records from N highlands of Mozambique, close to border with Malawi, but continued presence in this area lacks recent confirmation.
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Ash & Atkins (2009), Britton (1980), Clement *et al.* (1993), Dowsett & Dowsett-Lemaire (1993), Dowsett-Lemaire & Dowsett (2006), van den Elzen (1985), Fry & Keith (2004), Kleefisch (2008), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952, 1963), Nguembock *et al.* (2009), Nikolaus (1989), Prigogine (1985), Ryan *et al.* (2004), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Wolters (1979), Zimmerman *et al.* (1996).

12. Black-faced Canary

Serinus capistratus

French: Serin à masque noir **German**: Zügelgirlitz **Spanish**: Serín Carinegro

Taxonomy. *Crithagra capistrata* Finsch, 1870, Golungo Alto, 1800–2800 feet [c. 550–850 m], Angola.

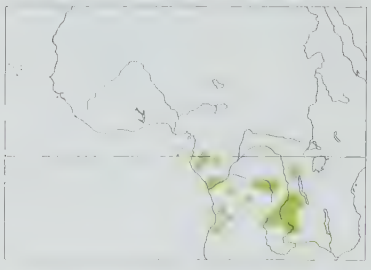
On following pages: 13. Papyrus Canary (*Serinus koliensis*); 14. Forest Canary (*Serinus scotops*); 15. White-rumped Seedeater (*Serinus leucopygius*); 16. Black-throated Canary (*Serinus atrogularis*); 17. Reichenow's Seedeater (*Serinus reichenowi*); 18. Yellow-rumped Seedeater (*Serinus xanthopygius*); 19. Arabian Serin (*Serinus rothschildi*); 20. Yellow-throated Seedeater (*Serinus flavigula*); 21. Salvadori's Seedeater (*Serinus xantholaemus*).

Previously placed in genus *Crithagra*. Recent analysis of mitochondrial DNA indicates only distant relationship with other African members of present genus, and it has been proposed that this species be placed in a separate genus, *Dendrospiza*, along with nominate race and race *hypostictus* of *S. citrinelloides*. Detailed consideration of all taxa in current genus is required, however, before full generic revision can be made. Forms a superspecies with *S. citrinelloides*. Has in the past been treated as conspecific with *S. koliensis*. Two subspecies recognized.

Subspecies and Distribution.

S. c. capistratus (Finsch, 1870) – C & SW Gabon and S PRCongo E, discontinuously, to E DRCongo and W Burundi and S, very locally, to N Angola, SE DRCongo and N Zambia.

S. c. hildegardae Rand & Traylor, 1959 – WC Angola.



Descriptive notes. 11–12 cm. Small finch with short stubby bill and slightly notched tail. Male nominate race has lower forehead to lores, around eye, fore ear-coverts and cheek to chin black, rest of ear-coverts to side of neck greenish-yellow; upper forehead and supercilium bright golden-yellow, crown and upperparts bright greenish-olive, finely streaked darker except for unstreaked greenish-yellowish rump and uppertail-coverts; tail blackish or brownish-black, edged (and sometimes tipped) greenish-yellow; upperwing-coverts black, medians and greaters edged and broadly tipped bright greenish-yellow (forming double wingbar); alula, primary coverts and flight-feathers dark brown, broadly edged greenish-yellow on secondaries and tertials; underparts bright golden-yellow, lightly washed greenish on flanks, and slightly streaked brownish; iris dark brown or black; bill pinkish-brown above, pale whitish-horn below; legs brown or pinkish-brown. Female is similar to male, but lacks black on face, has slightly deeper green head and upperparts, greener rump and edges of outer tail feathers, and is streaked dusky brown on throat, breast and flanks. Juvenile is similar to female, but paler above and below and more heavily streaked. Race *hildegardae* differs from nominate in having forehead and supercilium slightly shorter and more greenish-yellow, upperparts duller olive-green, and underparts more heavily tinged greenish-yellow. Voice. Song, given for prolonged periods from prominent songpost, a jumbled series of high-pitched phrases including fluty trills, whistles and buzzing trills e.g. "tee-ti-yew, trrrrrr, zhway-zhwee, trrrrrr" (recalling trills of *S. canaria*), interspersed with short pauses. Calls mostly a variety of "swee" notes.

Habitat. Edges and clearings in moist evergreen primary and secondary forests, marshes, swamps and edges of lakes, bushy grasslands and thickets; also rank grass at roadside edges and forest patches at base of inselbergs. Usually near water. Sea-level to 1500 m.

Food and Feeding. Generally little known. Food mostly grass and plant seeds. Forages on ground and at seedheads of tall grasses. In small flocks; often associates with flocks of estrildid finches, particularly Bronze Mannikin (*Spermestes cucullata*), and weavers (Ploceidae).

Breeding. Poorly known. Season Dec–Mar and Apr–Jun. One nest described, built by female, accompanied by male, made mostly from grasses and plant fibres, placed 2·5 m above ground on horizontal branch in cluster of leafy twigs in small tree. No further information.

Movements. Resident.

Status and Conservation. Not globally threatened. Uncommon or locally common.

Bibliography. Arnaiz-Villena *et al.* (2008), Borrow & Demey (2001), Clement *et al.* (1993), Fry & Keith (2004), Kleefisch (2008), Mackworth-Praed & Grant (1973), Nguembock *et al.* (2009), Sinclair & Ryan (2003), Wolters (1979).

13. Papyrus Canary

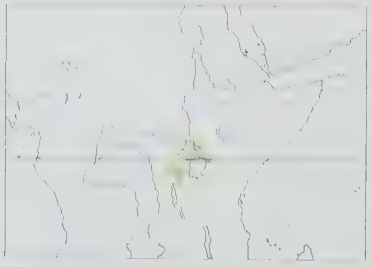
Serinus koliensis

French: Serin du Koli **German**: Papyrusgirlitz **Spanish**: Serín de los Papiros
Other common names: Van Someren's Canary

Taxonomy. *Serinus capistratus koliensis* C. H. B. Grant & Mackworth-Praed, 1952, Onyulu's, Koli River, Lango, Uganda.

Has been treated as conspecific with *S. capistratus*, but probably closest to *S. scotops*, with which possibly conspecific or forming a superspecies. Monotypic.

Distribution. C & SW Uganda, SW Kenya, E DRCongo, Rwanda, Burundi and NW Tanzania.



Descriptive notes. 10–11·5 cm; 11–16 g. Small finch with short conical bill. Male has head deep green, finely streaked darker on forehead and crown (may also be slightly streaked on cheek), lores to eye and base of bill sooty black; upperparts also deep green, heavily streaked blackish, rump and uppertail-coverts plain green to lime-green; tail black or blackish-brown, edged yellowish-green on outer webs; upperwing-coverts blackish, edged and tipped deep green and finely tipped yellow on median and greater coverts; alula, primary coverts and flight-feathers black, finely edged greenish-yellow, tertials with pale green tips; deep yellow to yellowish-green below, streaked darker on throat (where heaviest) to breast and more lightly on flanks; iris dark brown or black; upper mandible pinkish-brown, lower mandible paler or horn-brown; legs pale brown. Differs from very similar *S. citrinelloides* of sympatric race *brittoni* mainly in shorter and more stubby bill with curved culmen. Female is like male, but lores greyer, more heavily streaked below. Juvenile is similar to female, upperparts (except rump and uppertail-coverts) olive-brown, broadly streaked darker brown, median and greater coverts tipped buffish-white, edges and tips of tertials also buffish-white, warm buff with heavy dark streaking below, becoming yellowish and more finely streaked on belly. Voice. Song a short series of high-pitched whistles, e.g. "sweet, tsiew chip, tsipee, tsitsit, tsuweesee, tsisi-pee-tsit chrrrr, chweet-chweet-chweet-chweet, tsuwiwi, tsuweet-sweet, su-cesee, shiew-tiew", occasionally with dry rattle and "see-see-see-surr" incorporated, or concluding with longer "surrreet" with emphasis on rising last syllable. Calls include a whistled "wee-titi-woy" and "wee-chachachacha"; otherwise mostly silent, except for variety of soft wheezing and slurred twittering notes.

Habitat. Almost entirely restricted to papyrus (*Cyperus papyrus*) at 900–1600 m; visits adjacent areas of cultivation, principally bananas, sorghum and maize (*Zea mays*), returning to roost in papyrus.

Food and Feeding. Mostly seeds of papyrus and small seeds from adjacent cultivations. Forages alone, in pairs and in small flocks of up to 15 individuals in papyrus plants, flitting and clambering among stems and seedheads, also on ground.

Breeding. Season Mar–Aug, possibly also Nov. Nest built entirely by female, a deep cup consisting entirely of woven papyrus heads, placed up to 2 m above ground in centre of papyrus head overhanging water or edge of swamp. Clutch 1–2 eggs, dirty white or with small beige and pale reddish to rich brown blotches. No further information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Local; uncommon or locally fairly common. In 1980s was considered Near-threatened because of potential threats of habitat destruction.

Bibliography. Britton (1980), Clement *et al.* (1993), Fry & Keith (2004), Kleefisch (2008), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

14. Forest Canary

Serinus scotops

French: Serin forestier **German**: Waldgirlitz **Spanish**: Serín Forestal

Taxonomy. *Crithagra scotops* Sundevall, 1850, Pietermaritzburg, KwaZulu-Natal, South Africa.

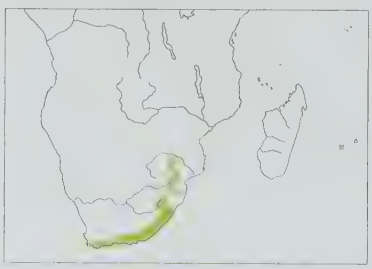
Probably closest to *S. koliensis*, with which possibly conspecific or forming a superspecies. Three subspecies recognized.

Subspecies and Distribution.

S. s. transvaalensis Roberts, 1940 – NE South Africa (N & E Limpopo).

S. s. umbrosus Clancey, 1964 – E & S South Africa from Mpumalanga and W KwaZulu-Natal S through S Eastern Cape (above 1070 m) to S Western Cape.

S. s. scotops (Sundevall, 1850) – N Swaziland, E Lesotho and lowland S KwaZulu-Natal S to coastal Eastern Cape (below 920 m).



Descriptive notes. 12·5–13 cm; 13–18 g. Small finch with stout, robust-looking bill, heavily streaked upperparts and slightly notched tail. Male nominate race has lower forehead to lores, area around eye, cheek and ear-coverts to chin variably black or blackish-olive (lores and chin always black), narrow bright yellow supercilium from upper lores to over ear-coverts; upper forehead, crown and upperparts, including upper rump, deep or dark olive-green, streaked blackish, lower rump and uppertail-coverts unstreaked bright yellowish-green; tail blackish or blackish-brown, edged pale green; upperwing-coverts black, medians and greaters edged and broadly tipped yellow (forming double wingbar); alula, primary coverts and flight-feathers blackish-brown, finely edged yellow (sometimes more broadly edged on secondaries); upper throat black or dull olive, lower throat plain yellow; breast and flanks dull olive or dusky green, heavily and diffusely streaked blackish, belly to undertail-coverts deep yellow; iris brown; upper mandible brown, lower mandible pale brown or pinkish-brown; legs pinkish-brown. Female is similar to male, but face (mostly lores to chin) greyer or greyish-olive, supercilium shorter (fading over eye), slightly heavier streaks on upperparts, streaked dusky brown on throat to belly and flanks. Juvenile is similar to female, but duller or deeper olive on head and upperparts, with paler face and underparts, broad yellowish-buff tips on median and greater upperwing-coverts. Race *transvaalensis* male has upperparts more heavily streaked than nominate, breast slightly darker and streaked blackish-brown, flanks pale lemon-yellow and streaked blackish; *umbrosus* has upperparts duller or slightly darker green, rump slightly streaked. Voice. Song, usually from top of tree, a rich and lively high-pitched warble with tinkling notes, downslurred "sweeeu" whistles and trills; also has softer subsong consisting of a series of jumbled notes. Calls include low "tsik", "tsisk" or "tsip-tsip" and plaintive "pee-pee-pee-pyoow, tseet", also a thin "tweetoo, twee-ee" with middle phrase emphasized and repeated frequently.

Habitat. Edges and clearings in dense bush of highland or submontane evergreen forests, including (in Eastern Cape) dry *Euphorbia*-dominated woodlands on south-facing valley slopes; also remnant forest patches in highveld grasslands, edges of cultivation, principally maize (*Zea mays*), tree plantations, scrub, orchards and gardens. From sea-level to 1800 m.

Food and Feeding. Variety of buds, seeds and fruit, including seeds of *Anthospermum*, *Alternanthera pungens*, *Bidens pilosa*, *Senecio tamoides* and *Senecio polyanthemoides*, also ripe figs (*Ficus*), sneezewood (*Ptaeroxylon obliquum*); also gathers at flowers or fruit of shrubs and trees, and occasionally at feeders in gardens close to forest. Forages on ground in low vegetation and scrub, also in trees from middle levels to canopy; usually keeps to cover, generally much shyer than *S. citrinelloides* and *S. capistratus*. Forages in pairs and small groups; in non-breeding season often in mixed flocks with *S. canicollis*.

Breeding. Season Oct–Mar; occasionally two broods. Monogamous. Territorial; territories evidently small, as two active nests in same tree not unknown. Nest built by female, male assists with collection of material, a small open cup of moss, plant stems, fine plant fibres and lichens, placed up to 1·5 m above ground and well concealed in foliage in bush (frequently thorny bush) or tree. Clutch 2–4 eggs, white or pale bluish-white, sparsely spotted or speckled with greys, reds and browns; incubation by female alone, period 14 days; chicks fed by both parents, nestling period 15–19 days; fledglings fed by both parents.

Movements. Resident and partially nomadic; makes local movements in search of fruiting trees or shrubs.

Status and Conservation. Not globally threatened. Restricted-range species: present in South African Forests EBA. Uncommon or locally common.

Bibliography. Barnard & Dowsett (1991), Clement *et al.* (1993), Dean (1987), Fry & Keith (2004), Ginn *et al.* (1989), Hockey *et al.* (1989), Kleefisch (2008), Mackworth-Praed & Grant (1963), Maclean (1993), Oatley (1997), Parker, V. (1994), Sinclair & Ryan (2003), Skead (1960, 1995), Tarboton (2001), Ward, V.L. *et al.* (2003).

15. White-rumped Seedeater

Serinus leucopygius

French: Serin à croupion blanc **German**: Weißbürzelgirlitz **Spanish**: Serín Culiblanco
Other common names: White-rumped Canary/Siskin/Serin, Grey Canary

Taxonomy. *Crithagra leucopygia* Sundevall, 1850, Sennar, Ethiopia.

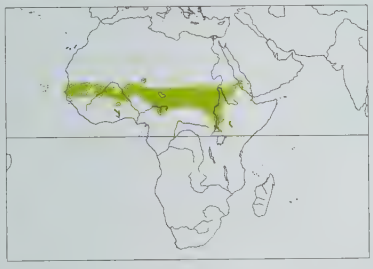
Has previously been placed in genus *Crithagra*. Following recent analysis of mitochondrial DNA, has been proposed that this species, along with *S. citrinipectus*, *S. mozambicus* and *S. dorsostriatus*, be placed in a separate genus, *Ochrospiza*, only distantly related to other African members of present genus; detailed consideration of all taxa in current genus is required, however, before full revision can be made. Was often considered to form a superspecies with *S. atrogularis*, but relationships with latter unclear. Race *pallens* sometimes treated as a synonym of *riggenbachi*. Population in Rift Valley of C Ethiopia may represent an as yet undescribed race. Three subspecies currently recognized.

Subspecies and Distribution.

S. l. riggenbachi Neumann, 1908 – S Mauritania, Senegal and Gambia E to S Niger, N Nigeria, C & S Chad, N Central African Republic and W Sudan.

S. l. pallens Vaurie, 1956 – N Niger (Aïr Mts).

S. l. leucopygius (Sundevall, 1850) – C & S Sudan, N & C Eritrea, W & C Ethiopia, extreme NE DRCongo and NW Uganda.



Descriptive notes. 10–11·5 cm; 8–16 g. Small, plain-coloured finch with conical bill and prominent white rump. Nominate race has forehead to crown and upperparts (except rump) pale grey-brown, streaked darker (paler or less streaked on nape), face pale greyish with slightly darker eyestripe, rump white, becoming grey-brown on uppertail-coverts; tail brown, edged grey-brown; upperwing-coverts brown, edged pale greyish-buff, off-white tips on median and greater coverts (forming wingbars); alula and primary coverts dark brown to black, latter finely tipped whitish, flight-feathers dark brown, narrowly (or more broadly on secondaries) edged dusky whitish; chin and throat ashy grey or light buffish, mottled or diffusely streaked brownish on lower throat and breast, lower breast to undertail-coverts white, flanks streaked grey-brown; iris dark brown or black; bill pinkish-brown with dark culmen and tip, paler or whitish base of lower mandible; legs pale flesh-pink to pale brown. Sexes alike. Juvenile resembles adult, but paler or warmer brown and more heavily streaked above, and prominently mottled or spotted brownish on breast and flanks. Race *riggenbachi* has upperparts, including wings and tail, slightly paler or greyer and more finely streaked, chin and throat whitish, becoming spotted with brown on breast; *pallens* is like previous, but slightly more prominent streaks on upperparts, tinged dusky on breast and belly, and finely streaked on side of throat and breast. Voice. Song poorly known, a series of subdued but sweet whistles, twitters and liquid trills given continuously for long periods. Calls include rising "twee", "twee-eet" or "chuwee" and a nasal "jwer".

Habitat. Lowland, dry, open bushed savanna and scattered trees on sandy soils, acacia (*Acacia*) thorn-scrub, also light woodland at edges of cultivation, including millet (*Panicum*) fields; also villages and gardens. Mostly below 1000 m; nominate race occurs at 600–1970 m.

Food and Feeding. Mostly small seeds, including millet, also *Tridax procumbens*, *Stellaria media*, *Taraxacum officinale*, *Senecio consanguineus*; also buds of *Galinsoga parviflora*. Forages in tall grasses and on ground in the open, where often tame and approachable; pulls stems of millet to ground to reach fruiting heads. Forages in pairs and in association with other small finches, including *S. mozambicus* and waxbills (Estrildidae).

Breeding. Season mainly Sept–Mar, also Jul–Aug in S Niger and Nigeria. Nest a compact cup of plant stems, fibres, leaf fragments, vegetable down, fine roots and gossamer, placed 1·5–5 m above ground in slender twigs in outer branches of tree, frequently acacia tree. Clutch 2–4 eggs, white with bluish or greyish tinge, finely spotted or speckled with black or brown; incubation period 12 days; fledging period 16 days.

Movements. Resident and partially nomadic; makes some local movements in search of ripening millet.

Status and Conservation. Not globally threatened. Common or locally common; rare in N Togo. In S Sudan has extended range N along R Nile following creation of irrigation schemes. Small population in C Ethiopia little known, and not recorded since 1990.

Bibliography. Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Ash & Atkins (2009), Borrow & Demey (2001), Clement *et al.* (1993), Elgood *et al.* (1994), Fry & Keith (2004), Mackworth-Praed & Grant (1952, 1973), Nguembock *et al.* (2009), Nikolaus (1989), Santegoeds (2009), Sinclair & Ryan (2003), Vaurie (1959), Wolters (1979).

16. Black-throated Canary

Serinus atrogularis

French: Serin à gorge noire **German**: Angolagirlitz **Spanish**: Serín Gorjinegro
Other common names: Black-throated Seedeater/Serin, Southern Yellow-rumped Seedeater

Taxonomy. *Linaria atrogularis* A. Smith, 1836, around Kurrichane (Zeerust), North West Province, South Africa.

Thought to form a superspecies with *S. reichenowi* and *S. xanthopygius*, and previously considered conspecific with both. Was often considered to form a superspecies with *S. leucopygius*, but relationships with latter unclear; previously treated as conspecific with *S. rothschildi*. Race *somereni* tentatively recognized, but morphological and vocal differences from nominate not well established; further study desirable. Birds from SW Zambia (Chunga pool, in Sesheke) with cinnamon-buff tinge on underparts described as race *seshekeensis*, but differences from *semideserti* considered minimal. Six subspecies currently recognized.

Subspecies and Distribution.

S. a. somereni E. J. O. Hartert, 1912 – NE DRCongo, C, SW & SE Uganda, W Kenya, Rwanda, Burundi and NW Tanzania.

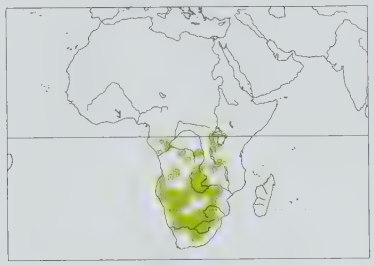
S. a. lwenarum C. M. N. White, 1944 – SE Gabon, S PRCongo, C & S DRCongo, C Angola, N & C Zambia and SW Tanzania.

S. a. semideserti Roberts, 1932 – S & E Angola and SW Zambia S to NE Namibia, N Botswana, W Zimbabwe and N South Africa (NW Limpopo).

S. a. deserti (Reichenow, 1918) – SW Angola S to S Namibia and W South Africa (Northern Cape and North West Province).

S. a. atrogularis (A. Smith, 1836) – Zimbabwe (except W), SE Botswana and N South Africa (SW Limpopo).

S. a. impiger Clancey, 1959 – C South Africa (SE North West Province and Mpumalanga S to Free State, N Eastern Cape and W KwaZulu-Natal) and Lesotho.



Descriptive notes. 10·5–12 cm; 8–14 g. Small, slim and pale grey-brown finch with short, conical bill and bright yellow rump. Male nominate race has forehead to crown and upperparts (to lower back) pale buffish-brown, tinged greyish, and broadly streaked dark brown on mantle to scapulars; face grey-brown (or whitish on cheek), finely streaked on cheek and ear-coverts, with thin or indistinct pale buffish supercilium; rump bright yellow, uppertail-coverts pale brown, edged and tipped whitish; tail dark brown, tipped buffish-white, distal edges of outer feathers also buffish-white; upperwing-coverts dark brown, edged and tipped buffish-white or pale buffish-brown, greater coverts browner, tipped buffish; alula, primary coverts and flight-feathers dark brown, finely edged yellowish-green or buffish-yellow, secondaries finely tipped pale buff, tertials broadly fringed light buffish-brown; chin pale buff, lower chin and throat to upper breast dark grey, variably mottled or smudged dark brown or blackish, rest of underparts whitish or washed buffish-brown; iris brown to dark brown; bill brownish-horn, pink base of lower mandible; legs pinkish-brown. Differs from similar *S. reichenowi* and *S. xanthopygius* in having black or blackish chin and throat and no dark malar stripe. Female is similar to male, but has indistinct small dark spots on chin to breast, side of breast to flanks warm buff-brown with dark streaks, and lower breast, belly and undertail-coverts dull white or buffish-white. Juvenile is similar to adult, but warmer buffish-brown above, cheeks warm brown, chin and throat whitish, underparts tinged warm buff (sometimes yellow wash on lower breast and upper belly), dark brown streaks on breast and flanks. Race *impiger* is slightly paler above than nominate, underparts tinged pinkish-buff; *deserti* has forehead whiter and upperparts paler buff than previous and nominate, prominent pale tips on wing-coverts and pale edges of tertials, less white at tail tips, whiter below, lacks black bib on buffish-white chin and throat or has small blackish spots or streaks mainly at side of throat; *semideserti* is like last, but paler and greyer above, whiter below, prominent black bib on chin and throat, tips of outer tail feathers greyish (not white); *lwenarum* is similar to nominate, but head and upperparts darker brown (except for bright yellow rump), tips of tail white or greyish-white, blackish bib, pale buff malar spot, underparts tinged warm buff-brown; *somereni* is like last, but upperparts darker and browner. Voice. Song, throughout year but mainly Oct–Mar in S of range (where one of the most persistent singers), usually from top of tree or similar prominent perch, a strong, lively and clear series of sweet or musical phrases similar to those of *S. canaria*, "chipit-seeu-tsipitisiew-tsipitispit-tsisew-sipichew-chew-chew-tsip-tsip-tsip", often for prolonged periods with rambling repeated phrases, liquid trills, chatters and twitters. Calls include liquid "tlui", a rising "tswee" or "tsuii" or "wooee" and "weeya", a nasal "jay" or lower-pitched "woy", a thin "tsit", a dry "chattering "trrrt" or "trree", and a short double "chirrup" note in flight.

Habitat. Ranges from lowland dry, open savanna with acacia (*Acacia*) thorn-scrub to broadleaf *Brachystegia* and *Burkea africana* woodland, orchards, edges of cultivation and villages, grassy roadside verges, suburban gardens, also grasslands and parkland; in more arid areas usually in bushes along watercourses (makes regular visits to drink).

Food and Feeding. Mostly seeds, also buds and fruits; some invertebrates. Seeds and buds include those of grasses and flowerheads of Asteraceae, e.g. *Urochloa panicoides*, *Urochloa mosambicensis*, *Poa annua*, *Alternanthera pungens*, *Alternanthera ficoidea*, *Bidens pilosa*, *Flaveria bidentis*, millet (*Panicum laevifolium* and *Panicum maximum*), *Sonchus oleraceus* and sunflowers (*Helianthus*); fruits include those of *Morus mesozygia* and *Rubus rigidus*; also takes nectar of *Aloe greatheadii*, and sap of *Acacia* and other trees. Invertebrates include termites (Isoptera) and aphids (Aphidoidea). Forages on ground and in tall grasses, flowering shrubs, bushes and trees; also pursues and catches insects, mainly termites, in flight. Forages in pairs, and in small and large groups (mainly comprising family groups); in non-breeding season often in larger flocks of up to 60 individuals and in mixed foraging flocks with other seed-eaters.

Breeding. Season Sept–Jun (mainly Nov–Jan or Dec–Apr) in Zambia and Jun–Apr (mainly Oct–Mar) in South Africa; probably two broods. Monogamous. Solitary nester; territorial. Displaying male sings during circular butterfly-like flight with slow stiff wingbeats, lands near female on perch in tree, and with wings half-spread and swaying from side to side approaches female, which flies off with male in pursuit; on landing, male jumps over her from side to side. Nest built by both sexes, a neat cup of dry grasses, fine twigs, plant tendrils (frequently those of *Asparagus*), plant-fibre strips and woolly plant down (proteas), some feathers and coarse or dry cobwebs, usually well concealed 1–15 m above ground in fork of tree or among slender outer foliage or flowerhead in *Protea* bush, at base of palm frond, or in fir among cones; has also nested on rafter in shed. Clutch 2–4 eggs, white or pale greenish-blue, sometimes with fine specks of black, brown or purple; incubation by female only, fed on nest by male throughout, period 12–13 days; chicks fed by both parents, nestling period 15–17 days; fledglings tended by both parents.

Movements. Resident and partially nomadic. In non-breeding season large flocks wander in search of food over large areas within range, particularly in Zimbabwe and Botswana, occasionally to coastal areas of South Africa, particularly around Cape; low recapture rate of ringed individuals at single site suggests extensive amount of movement by local populations.

Status and Conservation. Not globally threatened. Common in S of range; local in N & E areas. Race *somereni* scarce in W Kenya. Has expanded into arid areas of range following irrigation schemes and changes in land use. Large numbers captured, legally and illegally, for cagebird trade.

Bibliography. Ash & Miskell (1998), Borrow & Demey (2001), Britton (1980), Brooke (1970), Clement *et al.* (1993), van den Elzen (1981, 1985, 1999), van den Elzen & Nemeschkal (1991), Fry & Keith (2004), Ginn *et al.* (1989), Hall (1956), Hockey *et al.* (2005), Irwin (1981), Kemp *et al.* (2001), Lepage (1989), Lewis & Pomeroy (1989), Lorber (1973), Mackworth-Praed & Grant (1963), Maclean (1993), McCarthy (2006), Nikolaus (1989), Nuttall (1997b), Oatley & Skead (1972), Ripley & Heinrich (1966), Short *et al.* (1990), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960), Skinner (1995), Stevenson & Fanshawe (2002), Tarboton (1980, 2001), Traylor (1965), Vernon (1973), Winterbottom (1969), Zimmerman *et al.* (1996).

17. Reichenow's Seedeater

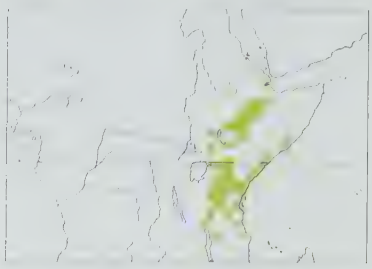
Serinus reichenowi

French: Serin de Reichenow **German**: Reichenowgirlitz **Spanish**: Serín de Reichenow
Other common names: Reichenow's Serin, Kenya(n) Yellow-rumped Seedeater

Taxonomy. *Serinus reichenowi* Salvadori, 1888, Cialalaka, Shoa Province, Ethiopia.

Thought to form a superspecies with *S. atrogularis* and *S. xanthopygius*; previously considered conspecific with both, but differs morphologically and vocally and not known to interact or associate with *S. atrogularis* in areas of range overlap. Smaller birds with whiter underparts from E

coastal areas proposed as race *hilgerti* (described from Afgooye, in coastal S Somalia), but differences from birds elsewhere in species' range minimal. Monotypic.
Distribution. Djibouti, C & S Ethiopia, extreme SE Sudan, NE Uganda, Kenya, S Somalia and NE, C & S Tanzania.

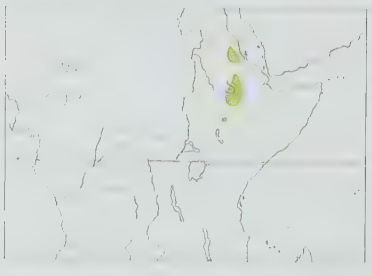


Descriptive notes. 10–11 cm; 9·4–13 g. Small, short-tailed and streaky finch with bright yellow rump. Has lower forehead and long supercilium buffish-white, broad brown eyestripe; face brown (or cheek whitish) with short buffish-white subocular crescent, and short, broad dark brown malar stripe; upper forehead, crown and upperparts pale buffish-brown, streaked dark brown on mantle and scapulars, rump bright yellow, uppertail-coverts dull brown, edged and tipped greyish-white; tail dark brown, with pale greyish-buff fringes; upperwing-coverts dark brown, broadly tipped whitish-buff (forming prominent wingbars), greater coverts finely edged buffish-white; alula, primary coverts and flight-feathers dark brown, primaries finely edged yellowish, secondaries and tertials edged pale buffish-brown, tertials also tipped greyish-white and broadly fringed light buffish-brown; chin and throat whitish, upper breast warm buff-brown, streaked darker, rest of underparts whitish or washed buffish, flanks washed brownish and streaked darker; iris brown; bill brownish-horn, pale flesh-pink or whitish base of lower mandible; legs pale brown to pinkish-brown. Differs from *S. atrogularis* in browner and plainer upperparts, pale buffish-white forehead and well-defined supercilium, whitish throat and brownish breast, and darker streaks on breast and flanks. Sexes alike. Juvenile is like adult, but more buffish and broadly spotted on upper breast, and streaked on rest of underparts. Voice. Song a long and continuous series of rich rapid warbling notes, trills and whistles, e.g. "chipiti-seeu-tisipitisiew-tisipitispit-tsisew-sipichew-chew-chew-tsip-tsip-tsip", given repeatedly. Calls include a rising "tweee" and a dry "chit" or "chit-chee", sometimes as a longer whistled "chit-chee-chiddly-oo".
Habitat. Lowland and lower montane open, dry, arid scrubby areas with bush, thorn-scrub, open woodland, river valleys and edges of cultivation, also roadside edges. From sea-level to 2430 m.
Food and Feeding. Diet not well studied; mostly seeds of flowering plants, and small numbers of insects. Forages unobtrusively in vegetation, on flowering seedheads and on ground. In pairs and small flocks of up to 15 individuals; in non-breeding season occurs in larger flocks of up to 50, often at water-holes.
Breeding. Not well known. Season Dec–Jun/Jul. Nest a small cup of plant fibres and down, rootlets, grass stems and cobwebs, placed on branch in low bush or tree. Clutch 3 eggs, bluish-white with pale mauve blotches and small brown and black spots. No further information.
Movements. Largely sedentary; also nomadic, and wanders in Nov–Apr non-breeding season.
Status and Conservation. Not globally threatened. Fairly common to locally common; uncommon in SE Sudan.
Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Britton (1980), Clement *et al.* (1993), van den Elzen (1985, 1999), van den Elzen & Nemeschkal (1991), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952), Nikolaus (1989), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

18. Yellow-rumped Seedeater
Serinus xanthopygius

French: Serin à croupion jaune **German**: Graubrustgirlitz **Spanish**: Serín Culigualdo
Other common names: White-throated Serin/Seedeater, Abyssinian Yellow-rumped Seedeater, Yellow-rumped Serin

Taxonomy. *Serinus xanthopygius* Rüppell, 1840, Schoada Valley, Simen Province, Ethiopia.
Thought to form a superspecies with *S. atrogularis* and *S. reichenowi*; previously considered conspecific with both, but differs morphologically and vocally and not known to interact or associate with *S. reichenowi* in areas of range overlap. Monotypic.
Distribution. Eritrea and N & WC Ethiopia.



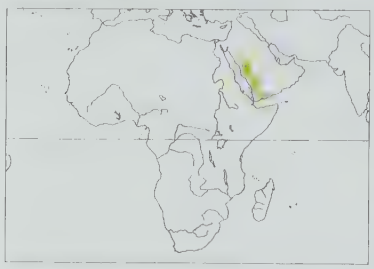
Descriptive notes. 11–12 cm. Small, slim, plain-coloured finch with white throat and yellow rump. Has forehead to crown and upperparts drab brown, broadly and indistinctly streaked darker (more uniform in worn plumage), with narrow, indistinct buffish-brown supercilium; face brown to greyish-brown, short dark malar stripe, whitish submoustachial area and pale buff-brown side of neck; rump bright yellow, uppertail-coverts dull brown, washed yellowish and streaked darker; tail dark brown; upperwing-coverts dark brown, narrowly fringed paler or buffish-brown; flight-feathers dark brown, finely edged yellowish, tertials edged pale buffish-brown; chin and throat whitish, underparts mainly pale grey-brown, tinged browner on breast, fine or indistinct dark streaks from breast to flanks, underwing-coverts brownish-white; iris brown; bill brownish-horn to dark brown, yellowish base of lower mandible; legs dark brown. Differs from *S. reichenowi* in paler and less heavily streaked upperparts, indistinct supercilium, less prominent malar stripe, and paler or greyish underparts only indistinctly streaked. Sexes alike. Juvenile is like adult, but heavier grey-brown streaks on breast and flanks, and sometimes has yellowish throat patch. Voice. Song a series of short, high-pitched and unmelodic whistled "see-see-chewit" or a longer "see-tsi-chew-sit-tsuwee". Calls include thin "tseet" or "tseesu" and high-pitched chattering note.
Habitat. Lower montane plateaux and upland scrub, avoiding dense vegetation and woodland; at 900–2500 m.
Food and Feeding. Diet not well studied; mostly seeds of flowering plants, also small numbers of insects. Forages on ground in open areas and in patches of scrubby vegetation; also perches on roadside wires. In pairs and in small flocks.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common. A relatively poorly known species.

Bibliography. Ash & Atkins (2009), Clement *et al.* (1993), van den Elzen (1985, 1999), van den Elzen & Nemeschkal (1991), Fry & Keith (2004), Mackworth-Praed & Grant (1952), McCarthy (2006), Sinclair & Ryan (2003).

19. Arabian Serin
Serinus rothschildi

French: Serin d'Arabie **German**: Medinagirlitz **Spanish**: Serín Árabe
Other common names: Olive-rumped/Arabian Yellow-rumped/Rothschild's Serin/Canary/Seedeater

Taxonomy. *Serinus rothschildi* Ogilvie-Grant, 1902, Ichaf Ravine, Haméráh and Dthubiyât, upper Haushabi, Yemen.
Previously considered conspecific with *S. atrogularis*, but such as relationship now thought unlikely. Monotypic.
Distribution. CW & SW Saudi Arabia and W Yemen.

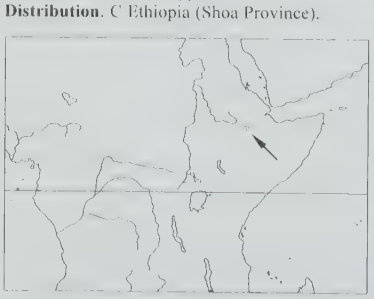


Descriptive notes. 11–12 cm; one bird 14 g. Small grey-brown, stubby-billed finch with green or greenish-yellow rump. Male has forehead to crown and upperparts to lower back olive-brown, tinged grey, diffusely streaked darker, more heavily streaked on mantle and scapulars; face generally pale grey-brown (palest around eye), with short pale buff supercilium over eye, narrow dark eyestripe; rump green or greenish-yellow (may be restricted to small area of upper rump), bordered by grey-brown, latter colour extending to uppertail-coverts; tail and upperwing dull dark brown, median and greater upperwing-coverts edged slightly paler and tipped buff in fresh plumage (forming poorly defined double wingbar), tertials with broad pale buff or buffish-brown edges; chin and throat pale buff (may be whiter on chin) with some obscure streaking, becoming greyer or buffish-brown with short brownish streaks on breast and flanks (streaks may be visible only at close range), belly to undertail-coverts off-white to buff; iris dark brown or black; bill variably dull pinkish-brown or horn-grey to brownish-grey; legs pink or light pinkish-brown. Differs from *S. menachensis* in less obviously streaked crown, darker cheeks, no dark moustachial stripe, greenish (not brown) rump, slightly darker underparts, also less sharply pointed bill without contrastingly paler lower mandible, and slightly longer tail. Female is very similar to male, but slightly paler (less olive) or more buffish above, and at close range pale buff streaks visible on crown and nape. Juvenile is very like adult. Voice. Song a variable series of warbling notes similar to that of *Carduelis cannabina*, e.g. "tsoo-tsoo-tsit-tsoo" or "tsoo-tsi-tsi-tsoo" or more prolonged "seeoo tee-teecher, seeoo teete-teecher, seeoo tee tee seeoo", also "zi juu chi-chi chichi" or " ti-tiiu-tui-tsu" beginning with rising trill and terminating with jumbled series of notes with quality like those of *Carpodacus erythrinus*. Calls include quiet "tseetsee" or "tsit-tsit", often given frequently in flight.
Habitat. Dry, open rocky hill and mountain tops with trees, bushes and shrubs; also in areas of sparse vegetation, scattered shrubs, bushes or well-wooded areas and edges of cultivation. At 1000–2800 m, occasionally down to 700 m.
Food and Feeding. Mainly seeds, including millet and grass seeds, also buds of shrubs, including *Aloe* and *Agave*; occasionally takes some insects and larvae. Forages on ground and in vegetation; active and acrobatic, including hanging upside-down on vegetation; behaviour like that of *S. serinus* and *S. menachensis*, but has characteristic action of gently pumping or flicking tail. In pairs and in small groups, possibly family parties.
Breeding. Season Mar–Jul, and recently fledged young seen also in Nov; probably two broods. Nest a compact cup of thorny twigs, grass, bark strips, plant fibres, animal hair and string, placed 2–4 m from ground against main trunk or along branch in low bush or tree, frequently in juniper (*Juniperus*). Clutch 2–3 eggs, pale blue, spotted and speckled with pale reddish-brown or purplish-black; incubation by female, period not known; nestling period probably 13–14 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Uncommon or locally common. Widespread within its rather restricted range.
Bibliography. Castell *et al.* (2001), Clement *et al.* (1993), Everett (1987), Hollom *et al.* (1988), Jennings (1981), Porter *et al.* (1996).

20. Yellow-throated Seedeater
Serinus flavigula

French: Serin à gorge jaune **German**: Gelbkehlgirlitz **Spanish**: Serín Gorjigualdo
Other common names: Yellow-throated Serin

Taxonomy. *Serinus flavigula* Salvadori, 1888, Ambokarra, Shoa Province, Ethiopia.
Forms a superspecies, and formerly treated as conspecific, with *S. xantholaemus*; both have been treated as conspecific with *S. atrogularis*. Geographical variation of *S. xantholaemus* problematic and insufficiently known, and position further confused by population on Mt Fantalle (C Ethiopia), which intermediate in characters between latter and present species. Present taxon was once thought to be a synonym of *S. xanthopygius* or even a hybrid between that and *S. dorsostriatus*. Provisionally considered a separate species pending further research, including analysis of mitochondrial DNA. Monotypic.
Distribution. C Ethiopia (Shoa Province).



Descriptive notes. 10–11·5 cm. Small, plain-coloured finch with yellowish throat and rump. Has forehead and lores to crown and upperparts to lower back pale grey-brown or grey-tinged buffish-brown, heavily streaked darker (dark brown feather centres) on mantle to scapulars; face and side of neck pale buffish, finely streaked browner, short dusky eyestripe; lower back and rump pale yellow, uppertail-coverts pale brown; tail brown, broadly edged pale buffish-brown; upperwing dark brown, flight-feathers and tertials very narrowly edged buffish-brown (edges broader when plumage worn); mostly whitish or pale buffish-white

below, diffuse yellow spot on centre of throat (may be visible only when feathers ruffled) sometimes extending to centre of upper breast, and gorget of faint streaks across side and centre of lower breast towards upper flanks; iris dark brown or black; bill and legs pale brown. Differs from *S. xantholaemus* in having less extensive yellow on throat and no black bar on throat. Sexes alike. Juvenile undescribed. Voice. Song, by male from top of acacia (*Acacia*) during at least early Dec to Feb, a monotonous "wheee-chi-weeet", occasionally limited to "wheee-chit". Calls include "sip" and "tsree" typical of genus, repeated several times in flight.

Habitat. Poorly known. Appears to prefer arid and semi-arid desert and steep, rocky hillsides with scattered patches of scrub and light acacia thornbush, also tussock grassland with the tussock-grass *Cymbopogon* and small shrubs such as lavender (*Lavandula*); not recorded from cultivated or highly degraded land. At 1300–1600 m.

Food and Feeding. Little information. Known to take lavender seeds. Forages in long dry grass and low vegetation, also on ground beneath acacias; perches in open on top of trees and bushes up to c. 6 m tall; also makes frequent visits to water to drink. Occurs alone, in pairs and in small groups of up to ten individuals, once a flock of 30.

Breeding. Pair feeding recently fledged young in early Jan; only known nest was on top of a small acacia. No other information.

Movements. Sedentary.

Status and Conservation. ENDANGERED. Restricted-range species: present in Central Ethiopian Highlands EBA. Rare; estimated global population fewer than 1000 individuals. Until recently known only from three 19th-century records (in 1880, 1885 and 1886), all within small area of c. 30 km²; rediscovered in Mar 1989, when seven individuals found in same area. In 1996, this species was discovered in a further two sites: Awash National Park, where thought to be not uncommon, and minimum of 25 seen on Mt Fantalle; and Aliyu Amba-Dulecha, in E lowlands, where uncommon. Has been reported also from Aigaber–Ambokarra (Shoa) and Melka Jebdu (Dire Dawa). Threatened by increasing human pressure, including habitat conversion and intensification; also, presence of livestock within Awash National Park, coupled with regular outbreaks of fire, likely to be having serious adverse impacts on habitat. This finch, which has never been found in cultivated or highly degraded land areas, seems highly susceptible to habitat alteration and human disturbance.

Bibliography. Anon. (1996b, 2009i), Ash & Atkins (2009), Ash & Gullick (1990), Atkins & Harvey (1996), Butchart & Stattersfield (2004), Clement *et al.* (1993), Collar & Stuart (1985), Érard (1974), Farnsworth *et al.* (2000), Fry & Keith (2004), Mackworth-Praed & Grant (1952), Rand (1968), Redman *et al.* (2009), Sinclair & Ryan (2003), Stattersfield & Capper (2000).

21. Salvadori's Seedeater

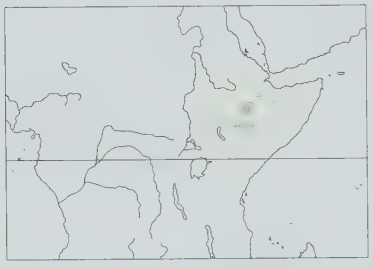
Serinus xantholaemus

French: Serin de Salvadori **German**: Salvadorigirlitz **Spanish**: Serín de Salvadori
Other common names: Salvadori's Serin

Taxonomy. *Serinus xantholaema* Salvadori, 1896, between Wabi Shabelle and Lake Stephanie, southern Ethiopia.

Forms a superspecies, and formerly treated as conspecific, with *S. flavigula*; both have been treated as conspecific with *S. atrogularis*. Was previously considered a hybrid between *S. xanthopygius* and *S. mozambicus* or *S. dorsostriatus*, or a mutation of *S. reichenowi*. Geographical variation problematic and insufficiently known, and position further confused by population on Mt Fantalle (C Ethiopia), which intermediate in characters between present species and *S. flavigula*. Provisionally considered a separate species pending further research, including analysis of mitochondrial DNA. Monotypic.

Distribution. C & S Ethiopia: C Harar, N Bale and C Sidamo (C Borena Zone).



Descriptive notes. 11 cm; 11–12 g. Small, plain-coloured, stout-billed finch with slightly forked tail. Has lower forehead to narrow superciliary stripe whitish, rest of forehead to crown and upperparts to lower back pale grey or grey-brown, heavily streaked darker (dark brown feather centres) on mantle and scapulars; face and side of neck ash-grey, or slightly darker on ear-coverts, short dusky eyestripe behind eye; rump bright yellow, becoming duller on uppertail-coverts; tail brown, broadly edged pale buffish-brown, all outer feathers edged olive-green at base; upperwing dark brown, median and greater coverts edged and tipped slightly warmer brown, flight-feathers blackish, primaries edged olive-green, secondaries and tertials more broadly edged pale buffish-brown (extending to tips of tertials); chin white (white sometimes restricted to area beside bill base) or yellow, throat and centre of upper breast bright yellow, divided by fairly broad black or blackish-brown band; rest of underparts whitish or pale greyish-white with faint streaks, lower belly to vent white; iris dark brown or black; bill pale brown or brownish-horn; legs brown or pale brown. Sexes alike. Juvenile undescribed. Voice. Song, from top of tall tree, a typical series of short whistled phrases rising in pitch, including "chweep-widdy", "way-weeo-chip", "way-sichoo-wee", and "weeo-way-chichi" or variations, and often run together in a longer "way-weeo-woo-chichi-wee". Calls include a fairly sharp or abrupt "tsip".

Habitat. Semi-arid desert wadis and steep-sided valleys with scattered acacia (*Acacia*) thornbush, light *Acacia–Commiphora* woodland, also juniper (*Juniperus*) woodland, rocky limestone gorges and streambeds and watercourses; seems to favour scrubby vegetation. At 300–1970 m, mainly 1000–1500 m.

Food and Feeding. Diet little known, but mostly seeds of a variety of dry-country plants. Forages on the ground. Usually alone or in pairs, occasionally in small groups of up to six individuals.

Breeding. No information. Season possibly Sept–Dec.

Movements. Sedentary.

Status and Conservation. VULNERABLE. Poorly known. Discovered in 1880, and seen subsequently on c. 30 occasions between 1900 and 1970, and more frequently, perhaps annually, in recent years. Considered uncommon, but fairly widespread and may be more numerous than is presently known. At nearly all sites where recorded, including at least three which are listed as officially protected, increasing human population, combined with expansion of subsistence agriculture in previously uncultivated areas, and intensive grazing and cutting of trees and bushes for firewood at a number of sites, as well as gold-mining and hotel development, believed to be having an adverse impact on this species' small population.

Bibliography. Anon. (1996b, 2009i), Ash & Atkins (2009), Ash & Gullick (1989), Butchart & Stattersfield (2004), Clement *et al.* (1993), Collar & Stuart (1985), David & Gosselin (2002a), Érard (1974), Fry & Keith (2004), Mackworth-Praed & Grant (1952), Sinclair & Ryan (2003), Stattersfield & Capper (2000).


PLATE 34
inches 3
cm 8
22
ssp mozambicus
23
ssp grotei
ssp barbatus
24
25
ssp dorsostriatus
27
ssp maculicollis
ssp flaviventris
26
ssp sulphuratus
ssp sharpii
28
ssp damarensis
ssp crocopygius
29
ssp reichardi
30
ssp striatipectus
ssp gularis
31
ssp humilis
ssp albogularis
32
33

22. Lemon-breasted Canary

Serinus citrinipectus

French: Serin à poitrine citron **German**: Gelbbrustgirlitz **Spanish**: Serín Pechilimón
Other common names: Lemon-breasted Seedeater

Taxonomy. *Serinus citrinipectus* Clancey and Lawson, 1960, near Panda, Inhambane, Sul do Save, southern Mozambique.
Following recent analysis of mitochondrial DNA, has been proposed that this species, along with *S. leucopygia*, *S. mozambicus* and *S. dorsostriatus*, be placed in a separate genus, *Ochrospiza*, only distantly related to other African members of present genus; detailed consideration of all taxa in current genus is required, however, before full revision can be made. Further, this species sometimes thought to be a hybrid between *S. atrogularis* and *S. mozambicus*. Monotypic.
Distribution. S Malawi, NE & SE Zimbabwe, NW & S Mozambique and NE South Africa (NE Limpopo and N KwaZulu-Natal).



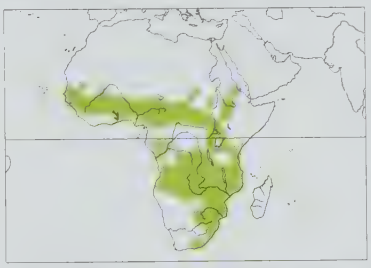
Descriptive notes. 12 cm; 9·6–12·7 g (Malawi). Small finch with conical bill, bold face markings and bright yellow rump. Male has centre of forehead to crown and upperparts to lower back grey or greyish-brown, streaked darker on mantle and scapulars and less prominently streaked on nape; white or whitish spot at side of forehead to upper lores, thin or indistinct (sometimes absent) pale yellow supercilium behind eye, most of face dark grey, lower face white or yellowish-white with dark grey stripe running down from gape to most of malar area; rump and tips of uppertail-coverts bright yellow (bases dark grey or blackish); tail dark grey or blackish with white, pale buff or greenish-yellow edges, whitish-buff tips, broadest on outer two feathers; upperwing-coverts dark grey-brown with thin buffish or off-white edges and tips (forming thin double wingbar), alula and flight-feathers dark grey-brown, remiges with pale greenish-yellow edges; chin to breast usually deep bright yellow, but variable in extent, side of breast and flanks buffish, rest of underparts white or flanks pale peach-buff; iris dark brown; upper mandible greyish-horn, lower mandible paler, dull pinkish or flesh-coloured with dark tip; legs pinkish-brown. Female is similar to male, but has paler face pattern, and yellow below replaced by pale pinkish or peach-buff. Juvenile is like female, but paler rump, little or no yellow on throat, and breast and flanks streaked brownish. Voice. Song a brief, rapid and fairly tuneless series of short, slightly rising and falling twittering notes, very similar to that of *S. xanthopygius* but higher-pitched. Calls include a dry "treeet".
Habitat. Lowland palm savannas, principally of ilala palms (*Hyphaene natalensis*, *Hyphaene coriacea*), clearings in dry *Brachystegia* woodland, scrub, semi-arid grassland, gardens and edges of cultivation; in Malawi in open woodland near water, also in fringe vegetation and reedbeds. Usually below 750 m; below 600 m in SE Zimbabwe, where occurs in mopane (*Colophospermum*) woodland.
Food and Feeding. Mostly small weed seeds and flowering grasses, including seeds of *Bidens pilosa*, *Sonchus oleraceus*, *Poa trivialis* and *Digitaria sanguinalis*, also buds and shoots of *Flaveria bidentis*, *Galinsoga parviflora* and *Stellaria*; also some insects, particularly termites (Isoptera). Forages on the ground in or under vegetation. In pairs and small flocks; in non-breeding season often in larger flocks of up to 250 individuals, and in mixed-species foraging flocks with *S. mozambicus*.
Breeding. Season Dec–May, mainly Jan–Feb. Monogamous. Solitary; territorial. Displaying male, with head held high and wings slightly spread and drooped, sings loudly next to female; also courtship-feeds female. Nest material collected by both sexes; nest an open cup of dried petals, dry grasses, plant fibres and strips of ilala palm or creeper stems, bark strips and dead leaves, matted together with cobweb or with silk from caterpillar cases, placed 1·5–6 m above ground in axil of palm and extremely well camouflaged, with very narrow entrance usually through slit in palm frond. Clutch 3–4 eggs, white or very sparsely marked with fine red-brown specks and pale rust-brown streaks; incubation by female alone, period 12–14 days; nestling period 14–16 days.
Movements. Sedentary and partially nomadic; in non-breeding season flocks move at random within range in search of flowering grasses.
Status and Conservation. Not globally threatened. Restricted-range species: present in South-east African Coast EBA. Local or uncommon, sometimes seasonally locally abundant; most numerous in S Mozambique S to N KwaZulu-Natal. Considered "Near-threatened" in South Africa. Population in Mozambique estimated at 50,000 individuals. Possible threats include destruction of ilala palms for furniture-making and tapping for wine-making. Moreover, until recently up to 2000 exported annually from Mozambique as cagebirds; effects of trade unknown, but presumably have cumulative effect on total population; more recent restrictions on international trade in wild-bird populations (especially into Europe) may have stemmed the numbers now trapped for cagebird market. Occurs in iSimangaliso (Greater St Lucia) Wetland Park, Hluhluwe-Umfolozi Game Reserve and Mkuzi Game Reserve, all in KwaZulu-Natal; smaller numbers also in Kruger National Park, in Limpopo–Mpumalanga.
Bibliography. Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Barnes (2000), Berruti (1997), Brickell (1983, 1997), Brooke & Markus (1967), Chittenden (1998), Clancey (1971), Clement *et al.* (1993), Cyrus & Robson (1980), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Ginn *et al.* (1989), Hanmer (2002c), Hockey *et al.* (2005), Hustler (1991), Irwin (1981), Kemp *et al.* (2001), Lawson (1970), Mackworth-Praed & Grant (1963), Maclean (1993), Marshall (1990), Nguembock *et al.* (2009), Parker (1999), Robson (1990), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Tarboton (2001), Wolters (1979).

23. Yellow-fronted Canary

Serinus mozambicus

French: Serin du Mozambique **German**: Mosambikgirlitz **Spanish**: Serín Frentiamarillo
Other common names: Yellow-eyed/Icterine/Green Canary, Green Singing Finch

Taxonomy. *Fringilla mozambica* Statius Müller, 1776, Mozambique.
Following recent analysis of mitochondrial DNA, has been proposed that this species, along with *S. leucopygia*, *S. citrinipectus* and *S. dorsostriatus*, be placed in a separate genus, *Ochrospiza*, only distantly related to other African members of present genus; detailed consideration of all taxa in current genus is required, however, before full revision can be made. Birds on São Tomé, previously separated as race *santhome*, were introduced on that island in late 19th century and exhibit features within range of variation of mainland *tando*. Ten subspecies recognized.
Subspecies and Distribution.
S. m. caniceps (d'Orbigny, 1839) – extreme S Mauritania, Senegal and Gambia S to N Sierra Leone and E to Nigeria and N Cameroon.
S. m. punctigula Reichenow, 1898 – C & S Cameroon.
S. m. barbatus (Heuglin, 1864) – S Chad, Central African Republic and W & S Sudan S to E DRCongo, Uganda, SW Kenya and NW & C Tanzania.
S. m. grotei W. L. Sclater & Mackworth-Praed, 1931 – E Sudan and W & SW Ethiopia.
S. m. gommaensis C. H. B. Grant & Mackworth-Praed, 1945 – C & NW Ethiopia and W Eritrea.
S. m. tando W. L. Sclater & Mackworth-Praed, 1918 – São Tomé, Gabon, PR Congo, W & S DRCongo and Angola.
S. m. samaliyae C. M. N. White, 1947 – SE DRCongo, SW Tanzania and NE Zambia.
S. m. vansoni Roberts, 1932 – extreme SE Angola and NE Namibia E to SW Zambia.
S. m. mozambicus (Statius Müller, 1776) – E Kenya S to C & S Mozambique, Zimbabwe, E & SE Botswana and NE South Africa (Limpopo and North West Province S to Free State).
S. m. granti Clancey, 1957 – extreme S Mozambique, E Swaziland and E South Africa (Mpumalanga and KwaZulu-Natal S to S Eastern Cape).
Introduced to Mafia I, Mauritius, Reunion, Rodrigues, Assumption I, Hawaiian Is and Puerto Rico.



Descriptive notes. 11–13 cm; 8·5–16·2 g. Small, short-tailed finch with broad supercilium and prominent face pattern. Male nominate race has lower forehead and supercilium bright yellow, lores and eyestripe broadly dark brown, becoming greyer at rear of ear-coverts, fairly broad blackish malar stripe, bright yellow cheek and anterior ear-coverts; rest of forehead to nape and side of neck olive-grey or greyish-green, finely streaked blackish on forehead to hindneck; mantle, back and scapulars grey-green, streaked dark brown, rump and uppertail-coverts deep yellow (may be tinged greenish); tail black or blackish, finely edged yellow and tipped whitish or yellowish-white (pale tips may be absent through abrasion); upperwing-coverts blackish-brown, broadly edged and tipped dull yellowish (forming usually indistinct double wingbar); alula, primary coverts and flight-feathers blackish, finely edged pale green; chin to breast rich yellow, washed brownish on side of breast (greyish in winter), rest of underparts pale yellow or whitish; iris dark brown or black; bill dark brown or horn-brown above, paler pinkish or greyish-horn below; legs pinkish-brown to blackish-grey. Differs from *S. dorsostriatus* mainly in shorter tail, brighter plumage and better-defined head pattern; from *S. sulphuratus* in smaller size, smaller bill, distinctive face pattern, bright yellow rump and white tips on tail; from slightly larger *S. flaviventris* in greyish nape and yellow rump. Female is slightly greyer or duller (except for rump) than male, face pattern less well defined and greyer, edges of wing-coverts and flight-feathers narrower, and underparts duller yellow. Juvenile is similar to female, but slightly deeper grey on head and upperparts, rump dull greenish-yellow, tips of median and greater wing-coverts broadly pale buff or yellowish-buff, face and breast pale or washed-out yellow, very thin malar stripe, and lightly streaked or spotted at side of breast (markings heavier or more pronounced on juvenile female than on male). Races differ mainly in degree of green and yellow on upperparts and underparts, also vary from yellowish-green with fine or thin streaks in N of range to greyish-green with heavy streaks in S: *caniceps* has slightly less yellow on forehead than nominate, yellow on face to throat slightly duller, broad dark eyestripe, crown to nape grey or pale grey, mantle and scapulars dull olive-green, female has chin and throat spotted blackish or spots extending as gorget across lower throat; *punctigula* has less extensive yellow on forehead, dark olive-green crown and upperparts, female has blackish spots on throat similar to previous; *barbatus* has dark olive-grey eyestripe, lacks grey on head, upperparts more yellowish olive-green, side of breast olive-green, flanks tinged greenish; *samaliyae* is like previous on upperparts, with mantle and scapulars more heavily streaked darker, ear-coverts olive-green, underparts golden-yellow; *tando* is like last, but darker green above, and side of breast and flanks also tinged green; *grotei* is extensively yellow on forehead, has upperparts yellowish-green with brownish tinge, eyestripe and malar stripe greyish-olive, underparts slightly paler yellow; *gommaensis* is similar to *barbatus*, but less extensive yellow on forehead, upperparts darker olive-green or tinged brownish; *granti* is like nominate, but with greyer moustachial area often meeting grey on side of neck, also crown and upperparts deeper green and more heavily dark-streaked, ear-coverts dark olive-green; *vansoni* is like nominate, but yellow paler, and greyish-green upperparts less heavily streaked. Voice. Song, often given in short bursts, a lively series of sweet, musical phrases e.g. "tseeu-tseeu", "see-woo", "way-tsee-way" or "way-tsrrr", "toway-towee" and similar variations, including "toway-pu-tseep", and liquid trills and twittering notes, reminiscent in tone and quality of *S. canaria*, with many phrases repeated; males often sing in concert with others. Often very vocal, especially when in flocks; calls include single or repeated "chirrip", "tsssp", "tseeuu", "tuwu-tsilip", "swee-et" and sharper "zizzit", also a more prolonged "zeee-zereee-chereeo".
Habitat. Lowland open woodlands, savannas with occasional trees and acacia (*Acacia*) thorn-scrub, light *Brachystegia* woodland, plantations, edges of cultivation, especially around millet fields, also in and around farm buildings in grain-growing areas; also bushes along streams, rivers and dry watercourses, grassy areas in marshes, reedbeds, roadside verges, gardens and around villages; in coastal areas occurs in scrub and mangroves. To c. 1550 m in Cameroon, to 1600 m in Zimbabwe, at 1650–2300 m in Eritrea, to 2000 m in Burundi, 2200 m in W Kenya and 2300 m in Uganda.
Food and Feeding. Mostly seeds, buds, flowers, leaves and some insects. Seeds principally of grasses and weed species, including those of *Poa trivialis*, *Helianthus annuus*, *Sorghum caffrorum*, *Panicum maximum*, *Panicum laevifolium*, *Casuarina equisetifolia*, *Alternanthera pungens*, *Bidens pilosa*, *Chenopodium glaucum*, *Trema orientalis*, *Sonchus oleraceus*, and of the family Asteraceae *Ursinia* and *Vernonia*, also those of eucalypts (*Eucalyptus*); flowers of *Combretum microphyllum*, *Kniphofia*, flowers and leaves of *Hibiscus rosasinensis*, *Tagetes minor*, and leaves of *Lycium ferocissimum*,

On following pages: 24. Northern Grosbeak-canary (*Serinus donaldsoni*); 25. Southern Grosbeak-canary (*Serinus buchanani*); 26. Yellow Canary (*Serinus flaviventris*); 27. White-bellied Canary (*Serinus dorsostriatus*); 28. Brimstone Canary (*Serinus sulphuratus*); 29. White-throated Canary (*Serinus albogularis*); 30. Reichard's Seedeater (*Serinus reichardi*); 31. Streaky-headed Seedeater (*Serinus gularis*); 32. Black-eared Seedeater (*Serinus mennelli*); 33. Brown-rumped Seedeater (*Serinus tristriatus*).

Acacia karroo, *Senecio tamides*, *Alternanthera ficoidea* and *Flaveria bidentis*; some small fruits, including figs (*Ficus*); nectar taken from aloes (principally *Aloe marlothii*, *Aloe candelabrum*, *Aloe arborescens*, *Aloe ferox*, *Aloe greatheadii*), *Erythrina latissima* and *Strychnos innocua*. Insects include termites (Isoptera), grasshoppers (Orthoptera), aphids (Aphidoidea) and fly larvae (Diptera) and caterpillars. Forages on the ground, in low vegetation (including grasses) and in trees; perches on tall grasses to bring seedhead down to ground level, also perches in shrubs to reach seedheads; extracts *Casuarina* seeds from small cones and strips outer casing of ripe *Sorghum*. Termites pursued and taken on the ground and in flight, but returns to perch to remove wings before swallowing food. Forages in pairs and small groups. Occurs in mixed-species groups, including with congeners and waxbills (Estrildideae); in non-breeding season often in flocks of about 100 individuals.

Breeding. Season May–Nov in W Africa, throughout year in E Africa, Nov–Apr (mostly Dec–Mar) in Zimbabwe, Sept–Mar in Mozambique and Sept–Apr in S Africa. Monogamous. Solitary or semi-colonial; up to three nests in single tree. Territorial; territory often very small. Displaying males usually pursue females, often in small groups, through branches of tree or bush, and flight interspersed with periods of rapid wingbeating and prolonged singing. Nest built by female, often accompanied by male (but he rarely assists with collection of material), a small, deep, compact cup of grasses, plant stems and fibres, leaves, dry seedheads, bark strips, plant down and wool, animal hair and cobwebs, placed 1–8 m (usually below 4 m) above ground in branch fork of tree or shrub and often includes fine branches or foliage of tree, occasionally near end of branch, also in top of sapling, pine (*Pinus*), eucalypt or acacia tree or *Protea* bush; other recorded locations are sloping frond of oil palm (*Elaeis guineensis*), bunches of bananas and among mistletoe (Loranthaceae). Clutch 2–4 eggs, pure white to bluish-white or pale cream, sometimes blotched with lilac or sparsely spotted orange-brown or dark brown; incubation by female alone, fed on nest by male, period 13–14 days; chicks fed by both parents, nestling period 16–24 days; young and parents often remain together in family party for protracted period of time. Breeding success 65% per year. Longevity 8 years 5 months; average lifespan 2–3 years.

Movements. Resident and partially nomadic. In non-breeding season large flocks wander in search of feeding areas; occurs coastal and E Kenya Nov–Jul (most regularly Dec–Mar) and absent Jul–Oct; in S Africa a scarce or rare non-breeding visitor to E Karoo. Ringed individuals in South Africa recovered 6–35 km from ringing site; eight ringed at Bulawayo, in Zimbabwe, still present in same location 3 years later and two almost 5 years later.

Status and Conservation. Not globally threatened. Common, locally abundant and widespread; absent from some areas of apparently suitable habitat. Estimated population in S Mozambique in excess of 2,000,000 individuals; in Swaziland c. 600,000 individuals. Densities in acacia savanna in Swaziland 10–1280 birds/km². Some evidence of recent range expansion to S in W Africa owing to forest degradation. First recorded in Liberia (Mt Nimba) in 1965, and subsequent increase in numbers due largely to expansion of cultivation. Tame and confiding, this species is frequently captured for cagebird trade (where known by name of "Green Singing Finch"), and is commonly kept as cagebird in Africa and throughout Europe and N America; 10,000 exported annually from S Mozambique, and likely that equal or greater numbers are traded illegally. Has been introduced and has prospered on several Indian Ocean islands (but now extinct in Amirante Is), as well as in Hawaiian Is and Puerto Rico.

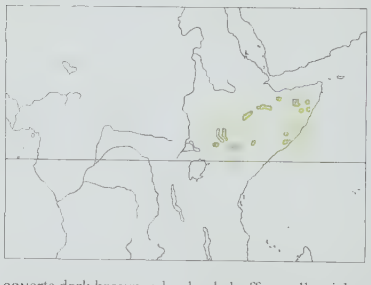
Bibliography. Archer (1992), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Borrow & Demey (2001), Britton (1980), Broadley (1973), Brooke (1970), Clancey (1996), Clement *et al.* (1993), Colston & Curry-Lindahl (1986), Dowsett-Lemaire & Dowsett (2006), Earlé (1981), Elgood *et al.* (1994), van den Elzen (1981), Fry & Keith (2004), Fry *et al.* (1988), Ginn *et al.* (1989), Hall (1956), Hanmer (2002c), Hockey *et al.* (2005), Irwin (1981), Jones & Tye (2006), Kemp *et al.* (2001), Leventis & Olmos (2009), Lewis & Pomeroy (1989), Macdonald & Birkenstock (1980), Mackworth-Praed & Grant (1952, 1963, 1973), Maclean (1993), Manson (1986), McCarthy (2006), Monadjem (2002), Nguembock *et al.* (2009), Nikolaus (1989), Nuttall (1997a), Oatley (1964), Oatley & Skead (1972), Parker, V. (1994, 1999), Short *et al.* (1990), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skinner (1995), Stevenson & Fanshawe (2002), Tarboton (1980, 2001), Urquhart (1992), Vernon (1973), Wolters (1979), Zimmerman *et al.* (1996).

24. Northern Grosbeak-canary

Serinus donaldsoni

French: Serin à gros bec **German**: Donaldsongirlitz **Spanish**: Serín Piquigordo Norteño
Other common names: Abyssinian Grosbeak-canary

Taxonomy. *Serinus donaldsoni* Sharpe, 1895, Darde or Smith River, near Sheik Hussein, Ethiopia.
Forms a superspecies with *S. buchanani* and previously considered conspecific; *S. sulphuratus* may be part of same superspecies. Monotypic.
Distribution. EC & S Ethiopia, Somalia and N & C Kenya.



Descriptive notes. 15–15·5 cm; 16–27 g. Large finch with large head, stout bill and slightly notched tail. Male has forehead to nape and upperparts to lower back greenish-yellow, finely streaked darker on crown, and with blackish-brown centres and paler green or greenish-yellow edges on feathers of mantle, back and scapulars; sides of lower forehead and broad supercilium bright yellow, rest of face olive-green but for small yellow crescent beneath eye and oval yellow patch on lower ear-coverts; rump and uppertail-coverts bright yellow; tail dark brown, finely edged green or greenish-yellow on outer feathers; upperwing-coverts dark brown, edged pale buff or yellowish, median and greater coverts tipped broadly yellow; alula and primary coverts dark brown, latter finely fringed pale yellow, flight-feathers dark brown, finely edged buffish or yellowish on secondaries and tertials; throat and underparts almost entirely rich yellow except for olive-green side of breast, and sometimes dark streaks on flanks, palest yellow on lower belly to undertail-coverts; iris dark brown or black; bill pale flesh or pinkish-orange, paler base of lower mandible; legs brown. Differs from *S. buchanani* mainly in much better-marked face pattern, bright yellow rump and white lower belly and ventral area; from *S. sulphuratus* in slightly larger size and less dark plumage, heavier upperpart streaking, brighter yellow rump and slight streaking on flanks. Female slightly smaller-billed and less bright, has greenish-yellow of head and upperparts (except yellow on rump and uppertail-coverts) replaced by buffish-brown, tips of median and greater wing-coverts pale buff, dark brown tail finely edged pale yellow, supercilium and cheek patches pale buff, underparts whitish or off-white, with dark brown malar stripe, heavily streaked dark brown on breast and flanks. Juvenile is similar to female, but more buffish-brown on face and side of head, lacks cheek patch and moustachial stripe, may be greyer on upperparts and/or more heavily streaked on underparts. Voice. Song, usually from prominent perch, a rapid series of "seu" notes repeated up to 20 times, may also be interspersed with sweet, short and fairly metallic, rising or upslurred "sreeeet-wriseet-seew-sreet-wreet-sew-sreet-wreet", also a dry, ringing, monotonous "tri-tri-tri-tri-tri-tri..." trill; otherwise usually silent, except for drawn-out "seep", "pee-chu" or loud "suweer" or "tweea".

Habitat. Lowland dry savannas, acacia (*Acacia*) thorn-scrub, semi-desert scrub and arid bush; avoids coastal areas. At 370–1790 m in Ethiopia; 200–1600 m in NW Kenya.

Food and Feeding. Mainly grass seeds and variety of weed seeds, also small acacia fruits. Forages on ground and in trees. Singly and in pairs; occasionally in small flocks in non-breeding season.

Breeding. Season Jun–Nov, also Mar. Solitary. Nest undescribed; clutch 2 eggs. No further information.

Movements. Resident or partially nomadic. In non-breeding season wanders throughout range in search of foraging areas; possibly only irregularly S of 1°30' N.

Status and Conservation. Not globally threatened. Uncommon to scarce; local.

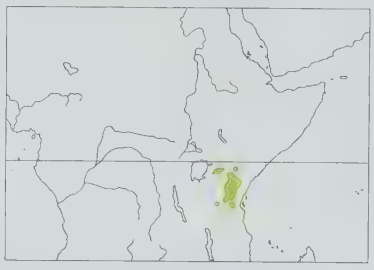
Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Britton (1980), Clement *et al.* (1993), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

25. Southern Grosbeak-canary

Serinus buchanani

French: Serin de Buchanan **German**: Buchanangirlitz **Spanish**: Serín Piquigordo Sureño
Other common names: Kenya Grosbeak-canary

Taxonomy. *Serinus buchanani* E. J. O. Hartert, 1919, Maktan, south-eastern Kenya.
Forms a superspecies with *S. donaldsoni* and previously considered conspecific; *S. sulphuratus* may be part of same superspecies. Monotypic.
Distribution. S Kenya and N Tanzania.



Descriptive notes. 14–15 cm. Large finch, large-billed and with slightly notched tail. Male has forehead to nape and upperparts to lower back greenish-yellow, finely streaked darker on crown, and with dark feather centres and paler green or greenish-yellow edges on mantle, back and scapulars; narrow supercilium bright yellow (sometimes absent), lores, eyestripe, cheek and ear-coverts concolorous with crown and upperparts, or eyestripe slightly darker; rump and uppertail-coverts yellow, tinged greenish; tail dark brown, finely edged greenish-yellow on outer feathers; upperwing-coverts dark brown or blackish, broadly edged yellowish, greater coverts tipped broadly yellow; alula and primary coverts dark brown, finely fringed pale yellow, flight-feathers dark brown, finely edged yellowish on secondaries and more broadly so on tertials; almost entirely deep or rich yellow below, except for olive-green wash on lower throat and breast, sometimes faint streaks on side of breast and flanks; iris dark brown or black; bill pale flesh-coloured or salmon pink; legs brown or pinkish-brown. Differs from *S. donaldsoni* mainly in plainer face pattern, duller greenish-yellow rump, and rich yellow of underparts extending to undertail-coverts; from *S. sulphuratus* in slightly larger size and less dark plumage, lack of well-marked face pattern, heavier upperpart streaking, slight streaks on flanks, and paler bill. Female is very similar to male, but has upperparts slightly duller or browner, underparts paler, and is more extensively streaked on lower throat (often forming gorget), breast and flanks. Juvenile is poorly known; similar to female, but perhaps more uniformly buffish-brown on face, greyer above and/or more heavily streaked below. Voice. Song a series of low chipping notes interspersed with higher-pitched trilling notes or whistles, "chrk chrk chrk chrrrrr seeeeeee, tk-tk chrk chrk chrk chrk chrk tsik tsur squeeeeeeeeeee". Calls include whistled trisyllabic "tyew-oo-lee" or "tyew-ee-yew", upslurred "suweer" or "tuweeer", similar "queeeleet" and longer or prolonged "seeeek".

Habitat. Lowland dry thorn-scrub and acacia (*Acacia*) savanna, also *Commiphora* thickets and degraded or heavily grazed grasslands with scrub; often along dry watercourses.

Food and Feeding. Diet poorly known; mostly grass seeds and weed seeds, also ripe fruit of acacias. Forages low down in vegetation and on ground, also feeds on acacia fruit in manner of weavers (Ploceidae); sings and possibly forages in tops of trees, usually after growth of green shoots. Singly and in pairs.

Breeding. Solitary. Nest a flat platform or saucer of fine roots, twigs, vegetable down and gossamer, placed low in tree; eggs pale blue with small purple-blackish spots and fine lines. No further information.

Movements. Resident; wanders locally within breeding range in non-breeding season.

Status and Conservation. Not globally threatened. Uncommon or scarce.

Bibliography. Britton (1980), Clement *et al.* (1993), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

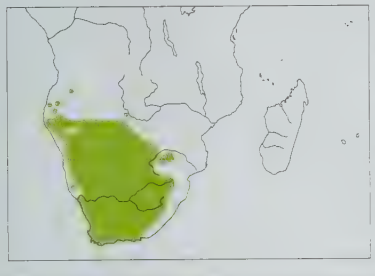
26. Yellow Canary

Serinus flaviventris

French: Serin de Sainte-Hélène **German**: Gelbbauchgirlitz **Spanish**: Serín Amarillo
Other common names: Shell Canary, Yellow Sysie

Taxonomy. *Loxia flaviventris* J. F. Gmelin, 1789, Cape of Good Hope = Berg River, Cape Province, South Africa.
Sometimes considered conspecific with *S. dorsostriatus*, but may not be closely related. Races intergrade. In South Africa, proposed race *hesperus* (described from Port Nolloth, in NW Northern Cape Province) is considered an intergrade between nominate race and *marshalli*, and *quintoni* (from Hillmore, near Beaufort West, in E Western Cape) is likewise a synonym of nominate; *aurescens* (from Kenhardt–Brandvlei road, in C Northern Cape) is synonymized with *marshalli*. Four subspecies recognized.
Subspecies and Distribution.
S. f. damarensis (Roberts, 1922) – SW Angola, Namibia (except extreme S), Botswana and adjacent South Africa (extreme NE Northern Cape).
S. f. flaviventris (J. F. Gmelin, 1789) – extreme S Namibia and W & SW South Africa (E to W Eastern Cape).

S. f. marshalli Shelley, 1902 – SE Botswana, N & C South Africa (Limpopo Province S to Northern Cape, Free State and N Eastern Cape) and lowlands of Lesotho.
S. f. guillarmodi (Roberts, 1936) – highlands of Lesotho.
Introduced (nominate race) on Ascension I and St Helena, in S Atlantic Ocean.



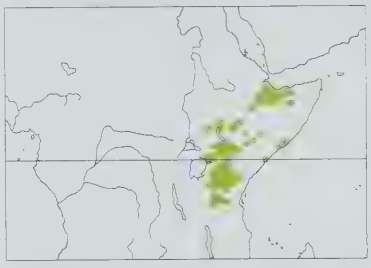
Descriptive notes. 13–14 cm; 10·3–20 g. Medium-sized to large finch with conical bill. Male nominate race has lower forehead and supercilium (to rear of ear-coverts) rich or bright yellow; lores, cheek and ear-coverts olive-green, small crescent of yellow below eye, bright yellow circular or oval patch on lower cheek bordered at front by dusky or olive-green moustachial stripe, latter broadening on side of throat; upper forehead to crown and upperparts green, becoming slightly darker on nape and finely streaked darker, rump and uppertail-coverts unstreaked pale green or yellowish-green; tail blackish-brown, fringed yellow or edged yellowish-green on outer feathers; upperwing blackish-brown, median and greater coverts edged green and tipped yellowish-green, inner secondaries and tertials edged greenish or yellowish; throat and underparts entirely golden-yellow, tinged with green on breast side; iris brown; bill blackish or dark horn, pinkish base of lower mandible; legs dark brown. Differs from yellow races of *S. sulphuratus* in slimmer bill; from *S. mozambicus* in less well-defined face pattern and moustachial stripe. Female has forehead and supercilium pale buff, crown and upperparts olive-brown, broadly streaked darker except for dull olive-yellow rump and uppertail-coverts, and greenish-yellow edges of outer tail feathers; median upperwing-coverts dark brown, finely tipped buffish, greater coverts more broadly tipped buff, tertials finely fringed buffish-white; face pattern like that of male, but lower cheek patch pale buff, broad dark or olive-brown moustachial stripe; whitish-buff underparts streaked brown on breast and flanks; bill greyish-horn above and paler flesh-coloured below. Juvenile is similar to female, but sexes separable, young male has dark brown feather centres and buff-brown edges on mantle to scapulars, tips of median and greater wing-coverts broadly buffish-brown, underparts pale yellow and streaked heavily dark brown or blackish, juvenile female greyer above and whiter or tinged buffish-brown below and less heavily streaked. Race *damarensis* has face pattern much less contrasting than nominate, upperparts more yellowish-olive (slightly paler on face) and finely streaked dusky brown, becoming bright yellow on rump, female has rump yellow, tips of wing-coverts pale yellow-buff, edges of greater coverts and of flight-feathers yellowish, underparts paler or buffish with fewer streaks on breast and flanks; *marshalli* has paler or more yellowish-green upperparts more prominently streaked than nominate and paler yellow rump, female has finer or much less streaking on white or yellow-tinged underparts; *guillarmodi* is larger than other races, upperparts slightly darker than nominate and more heavily streaked on mantle and scapulars, female has face pattern less boldly defined than nominate and more heavily streaked upperparts, also greyer with darker streaks below. Voice. Song, usually from top of bush, tree or high perch, also in display-flight, a fairly long and varied series of rapid musical twitters and warbled phrases, frequently includes "chissick" and "cheree" notes in jumbled or random manner; several males may sing in concert. Calls include "peeoo", "peetyo" and "peelee", also rising or upslurred "peclyip" and distinctive and far-carrying "chirrup" or "tirriyip".
Habitat. Lowland plains of bush and scrub, including acacia (*Acacia*) and *Terminalia* woodland patches, also in dry grassland and semi-desert foothills, rocky hillsides, dunes and dune fynbos with grassy scrub cover; also sandy areas near seashore with *Euphorbia mauretanica*, edges of cultivation and gardens, occasionally along seashore. In Lesotho occurs along edges of lower montane forest and in alpine shrubberies, to 1530 m.
Food and Feeding. Mostly seeds and flowers, including those of *Amaranthus angustifolius*, *Amaranthus thunbergi*, *Sonchus oleraceus*, *Arctotheca*, *Bidens*, *Senecio*, *Elytropappus*, *Stoebe*, *Eriocephalus*, *Dorotheanthus*, *Diascia*, *Cannomis*, *Cliffortia*, *Erica*, *Rumex*, *Chenopodium* (mainly *Chenopodium murale*), *Metalasia*, *Salsoka kali*, *Hordeum maritinum*, *Mesembryanthemum crystallinum*, *Pelargonium* and *Tetragonia decumbens*, also ripe and unripe seedheads of *Microstephium populifolium*. Also small numbers of insects, mainly ants (Formicidae) and termites (Isoptera). At study site in SW South Africa, more than 50% of foraging was done in *Chenopodium*. Lively and active, foraging on the ground, in flowering plants and in bushes and trees; hops and walks while on ground. Forages in pairs and small groups; in non-breeding season in flocks of up to 20 individuals, and up to 100 on migration, occasionally in single-sex flocks; also in mixed-species gatherings with *S. albogularis*, *S. mozambicus*, *Alario alario*, House Sparrows (*Passer domesticus*), Cape Sparrows (*Passer melanurus*) and Golden-breasted Buntings (*Emberiza flaviventris*).
Breeding. Season Jul–Apr. Monogamous. Solitary breeder; territorial. Male displays in rising, butterfly-like, slow circular flight with shallow wingbeats, sometimes ending by landing on bush where no female present; rarely pursues female in flight. Nest built by female, a shallow cup of dry grass stalks, leaves and seedpods, plant fibres including *Clematis* tendrils, seedheads, and plant down (mainly of *Eriocephalus*), often placed low down (to c. 3 m) inside bush or tree. Clutch 2–5 eggs, white, pale blue or pale green, sparsely and finely spotted or lined with purple, black and brown; incubation by female, sitting very tightly, period 12–14 days; chicks fed by both parents, nestling period 14–19 days; young fed by both parents. Nests occasionally parasitized by Diederik Cuckoo (*Chrysococcyx caprius*).
Movements. Resident and partial migrant, and nomadic in non-breeding season. Gathers in flocks in non-breeding season and wanders throughout range or beyond in search of feeding areas; moves into S Karoo from N and leaves much of Western Cape during austral winter. Race *damarensis* possibly only a passage migrant in N Botswana; *marshalli* occurs annually in E South Africa (KwaZulu-Natal); an infrequent visitor in S Angola, and vagrant in W Zimbabwe.
Status and Conservation. Not globally threatened. Common, locally common or locally abundant; uncommon to rare in Angola. One specimen and a single sight record from SW Zambia. Recorded breeding densities in South Africa of 17 birds in 40 ha of S Karoo and 74 pairs along 63 km of R Modder (in Northern Cape).
Bibliography. Brown & Barnes (1984), Clement *et al.* (1993), Dean (1997a, 2000), Friedmann & Northern (1975), Fry & Keith (2004), Ginn *et al.* (1989), Hockey *et al.* (1989), Johnson & Maclean (1994), Mackworth-Praed & Grant (1963), Maclean (1993), Milewski (1978), Oatley & Skead (1972), Penry (1994), Rowlands *et al.* (1998), Ryan *et al.* (2004), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960), Skinner (1995), Tarboton (2001), Vernon (1973), Ward (2002a), Winterbottom (1970, 1973).

27. White-bellied Canary

Serinus dorsostriatus

French: Serin à ventre blanc **German**: Weißbauchgirlitz **Spanish**: Serín Dorsiestriado
Other common names: Somali Canary

Taxonomy. *Crithagra dorsostriata* Reichenow, 1887, Wembere, Tabora, Tanzania.
Has previously been placed in genus *Crithagra*. Following recent analysis of mitochondrial DNA, has been proposed that this species, along with *S. leucopygia*, *S. citrinipectus* and *S. mozambicus*, be placed in a separate genus, *Ochrospiza*, only distantly related to other African members of present genus; detailed consideration of all taxa in current genus is required, however, before full revision can be made. Has sometimes been thought conspecific with *S. flaviventris*, but probably closer to *S. mozambicus*. Three subspecies recognized.
Subspecies and Distribution.
S. d. maculicollis Sharpe, 1895 – extreme SE Sudan, E, C & S Ethiopia, Somalia, NE Uganda and N Kenya.
S. d. dorsostriatus (Reichenow, 1887) – SE Uganda, W Kenya and N Tanzania.
S. d. taruensis van Someren, 1921 – C & SE Kenya S to NE Tanzania.



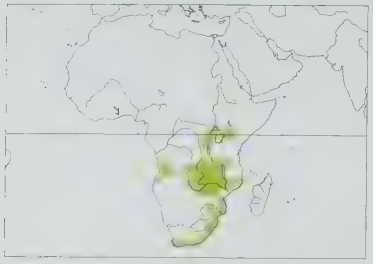
Descriptive notes. 11·5–13 cm; 12–18 g. Small to medium-sized, stubby-billed finch with slightly notched tail and prominent white belly. Male nominate race has forehead and lores to supercilium and side of neck deep yellow, forecrown to nape green or deep greenish-yellow, finely streaked blackish, becoming olive-green on mantle to scapulars; cheek and ear-coverts bright yellow, bordered above by dusky-olive eyestripe and upper edge of ear-coverts and by thin olive-green malar stripe; rump yellow, becoming green on uppertail-coverts; tail blackish-brown, finely edged greenish-yellow; upperwing-coverts blackish-brown, edged and tipped pale yellow on medians and olive-buff on greater coverts; alula and flight-feathers dark brown with fine yellowish or yellowish-green edges, tertials more broadly edged greenish and tipped with buff; chin and throat to lower breast deep yellow, upper belly, flanks and undertail-coverts pale yellowish, lower belly and vent white; iris dark brown or blackish; bill brown or brownish-horn above, pale horn below; legs blackish or dark greyish-horn. Differs from *S. mozambicus* mainly in slightly longer tail, yellow belly and more diffuse face pattern. Female is similar to male, but with more greenish-olive on ear-coverts, and prominent streaks on side of breast and flanks. Juvenile has head and upperparts pale brown or buffish-brown, streaked darker, often yellow or green tinge on mantle and back, rump yellow, flight-feathers and tail dark brown, edged paler or yellowish-green, tips of median and greater wing-coverts pale yellowish-buff or buff, short supercilium and face off-white, edge of cheek, ear-coverts and malar stripe grey-brown, chin to breast pale buff-brown, spotted dark brown on lower throat and upper breast, lower breast to undertail-coverts white. Race *maculicollis* male has narrower yellow band on forehead, upperparts slightly greener or tinged grey-green, more extensively white on rear underparts, flanks prominently streaked blackish, female like nominate but yellow on head paler, crown and upperparts tinged brown, chin and throat whitish, broadly streaked blackish-brown across upper breast; *taruensis* has upperparts brighter green than previous, broadly yellow on forehead and supercilium, and yellow on breast deeper and extending to upper belly. Voice. Song a series of loud, sweet, musical phrases and trills interspersed with several harsher notes, e.g. "chu-weez, chu-weez" or "weez-cha, weez-cha", "cher-weez-cha" and "sweet suer weet-sip, sweeur-tsee-tsip, chweeur wee-chip, swee tsur-eep" or with a short rattle or rattling trill; reminiscent of song of *Carduelis carduelis*. Calls include shrill "whee", "suweee", "zwee-weez" and "zweess".
Habitat. Lowland and submontane arid and semi-arid bush, acacia (*Acacia*) woodland, dense thorn-scrub, sparse woodland in grasslands and open savannas, also woodlands at edges of cultivation. Usually at 400–1400 m; exceptionally to 2100 m, and to 2650 m on Mt Nyiru, in Kenya.
Food and Feeding. Mostly seeds of grasses and small shrubs. Forages on the ground, in low vegetation and in bushes and low trees. Singly, in pairs and in small groups of about six individuals; in non-breeding season in large flocks.
Breeding. Season Mar–Jul, also Sept–Feb. Nest a small cup of plant fibres, lichens, dry grass, fine roots, twigs, animal hair and feathers, placed 1–8 m from ground in fork near outer end of horizontal branch in bush, or in thick foliage or clump of leaves at side or top of bush or tree. Clutch 1–4 eggs, variably whitish, pale blue to greenish-blue, occasionally with fine blackish or reddish-brown spots; incubation by female alone; no information on duration of incubation and nestling periods.
Movements. Resident and partially nomadic. Outside breeding season, gathers in large flocks that roam throughout range in search of feeding areas; in more arid parts of range, e.g. Tsavo East (Kenya), usually occurs only following rainy season. Race *maculicollis* perhaps only a vagrant in SE Sudan.
Status and Conservation. Not globally threatened. Locally common to common; rare S of 5°30' S. Common around Dar-es-Salaam, on Tanzanian coast, where population is considered to have originated from birds escaped from captivity.
Bibliography. Arnaiz-Villena, Alvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Ash & Atkins (2009), Ash & Miskell (1998), Britton (1980), Clement *et al.* (1993), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952), McCarthy (2006), Nguembock *et al.* (2009), Nikolaus (1989), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Wolters (1979), Zimmerman *et al.* (1996).

28. Brimstone Canary

Serinus sulphuratus

French: Serin soufré **German**: Schwefelgirlitz **Spanish**: Serín Azufrado
Other common names: Brimstone Serin, Bully Canary/Seedeater

Taxonomy. *Loxia sulphurata* Linnaeus, 1766, Cape of Good Hope, South Africa.
May be part of the superspecies formed by *S. donaldsoni* and *S. buchanani*. Proposed races *loveridgei* (described from Lumbo, in NE Mozambique) is synonymized with *sharpii*, and *languens* (from Manhica, in S Mozambique) with *wilsoni*. Three subspecies recognized.
Subspecies and Distribution.
S. s. sharpii Neumann, 1900 – C, SW & E Angola, NE & SE DRCongo E to WC & S Kenya, NE & S Tanzania, Zambia, Zimbabwe and N & C Mozambique.
S. s. wilsoni (Roberts, 1936) – S Mozambique, Swaziland and E South Africa (E Limpopo S to KwaZulu-Natal and Eastern Cape).
S. s. sulphuratus (Linnaeus, 1766) – S South Africa (S Western Cape and W Eastern Cape).
Descriptive notes. 13·5–16 cm; 20·3–35·3 g (South Africa), 22–30 g (*wilsoni*), 15–26·5 g (*sharpii*). Medium-sized to large, stout-billed finch with notched tail. Male nominate race has upper forehead to upper crown olive-green finely streaked dusky, becoming plainer on nape and with broader dusky centres on mantle and scapulars, rump and uppertail-coverts paler and less heavily streaked



pale yellow, becoming duller greenish-yellow on edges at base of blackish-brown tail; upper lores and supercilium to over ear-coverts bright yellow, lower lores, cheek and ear-coverts olive-green, small yellowish crescent below eye, larger bright yellow patch on lower cheek bordered by slightly deeper olive-green malar stripe; upperwing blackish, median and greater coverts finely edged greenish and tipped yellowish, flight-feathers finely edged greenish, tertials more broadly edged greenish-yellow; bright yellow below, breast heavily washed green, fading across upper flanks; iris brown; bill dark brown, or dark horn above and paler pink or yellowish at base of lower mandible; legs dusky or pinkish-brown. Differs from *S. flaviventris* in slightly larger size, larger bill, duller greenish-yellow rump, and greenish wash on breast; from both *S. donaldsoni* and *S. buchanani* in smaller size and less heavily streaked upperparts, from former also in greenish-yellow rump and bright yellow underparts, from latter also in better-defined head pattern, no streaks on flanks. Female is similar to male but duller, has less well-defined face pattern (paler cheek patch often very small), paler supercilium, duller tips of wing-coverts and edges of flight-feathers, breast and flanks washed greener, and belly to undertail-coverts paler primrose-yellow. Juvenile is very like female but duller, with greyish-olive upperparts, pale yellow tips on upperwing-coverts, and dull yellowish underparts with brownish streaks on breast and flanks. Race *wilsoni* is smaller than nominate, head and upperparts more yellowish-green, face pattern less well defined, dark green replaced by paler yellowish-green or green, forehead and crown and mantle, back and scapulars paler and dark streaks more restricted, fringes of median and greater coverts bright yellow, underparts also brighter yellow; *sharpii* is smaller-billed than nominate, otherwise like previous, except that underparts deeper yellow or golden-yellow. VOICE. Song, by both sexes, usually from prominent perch, a series of slow sweet or musical phrases, warbles, churrs, twitters and high-pitched tinkling notes, and usually includes long rolling trills, e.g. "shya-shya-plew-plew-srrrrrrrreeeeee-shee-shee-shee-jaja-chrrrree-eeeeee-dididrrrrrr", interspersed with short and long pauses and including "see-sitsitsitsitsit..."; song varies regionally with different endings, also has soft subsong of trills and warbles; song of female generally sweeter and louder than that of male. Calls include harsh or dry "drit", "chirrup" or "chee-u-wee", and fairly tuneless scratchy trills e.g. "swirriwirrit", "prr zip" and longer "chirr-rirr-rir"; alarm a deep "poy" or "see-it".

Habitat. Lowland, coastal and submontane open woodlands and bushes with scattered trees, including acacia (*Acacia*) thorn-scrub, conifers, wattles (*Acacia*) and eucalypts (*Eucalyptus*), hillsides with *Protea* bushes, gorges, broadleaf woodland and forest edges; also montane grasslands and scrub, grassy areas in marshes and rank vegetation along rivers and streams; also fallow fields and edges of cultivation and gardens. To 2400 m; most numerous at 1000–1500 m.

Food and Feeding. Variety of seeds, leaves, flowers, berries, buds and ripe fruit; also termites (Isoptera). Seeds include those of *Olea*, *Aspilia*, introduced zinnias (*Zinnia*), sunflowers (*Helianthus*), *Diospyros*, *Pelargonium*, *Pinus*, *Cassytha*, *Chenopodium*, *Psoralea*, *Acacia*, *Othonna*, *Euryops*, *Ursinia*, *Protea*, *Lycium*, *Stellaria*, *Ehretia rigida*, *Eriocephalus*, also *Digitaria horizontalis*, *Raphanus rapanistrum*, *Clutia pulchella*, *Emex australis*, *Euphorbia ingens*, *Euphorbia triangularis*, *Ligustrum lucidium*, *Ficus burttdavyi* and *Tribulus terrestris*, together with various grasses; leaves of *Arctotheca calendula* and *Senecio*; fruit includes pulp and seeds of figs (*Ficus*), *Rhus dentata*, *Cassytha*, *Harpephyllum caffrum*, *Scutia myrtina*, *Chrysanthemoides*, *Cotoneaster*, *Diospyros*, *Ehretia*, *Lantana camara*, *Ligustrum*, *Lycium*, *Pelargonium*, *Psoralea*, *Vaccinium exul*, *Grewia hexamina*, *Grewia villosa*; buds include those of *Sisymbrium capense*; nectar of *Aloe marlothii* and *Erythrina latissima* also taken. Forages on the ground, in bushes and in trees; uses strong bill to open large or hard seedcases; also pursues termites in flight, but returns to perch or ground to swallow them. Unobtrusive and generally less active than other African serins, spends long periods perched in a bush; more conspicuous in breeding season, when perches prominently on bushes and fence posts. Forages alone and in pairs; in non-breeding season may gather in small flocks, exceptionally to c. 30 individuals; occasionally in mixed species flocks with other serins.

Breeding. Breeds throughout year within range, mostly Mar–Jan in E Africa, and in South Africa mostly Jul–Nov in Western Cape and May–Jan in Eastern Cape. Monogamous. Solitary or in loosely associated groups. Territorial. Male displays with butterfly-like flight near female, and with vigorous singing from perch or ground with bill pointing vertically and wings partly spread and shivered. Nest built by female, a deep cup of plant fibres and down, seedheads, roots, dry grasses, small twigs, leaves or flowers, animal hair and cobwebs, placed 1–7 m above ground in fork near top of bush or sapling, including conifer, occasionally in bananas. Clutch 2–4 eggs, pure white, or faintly greenish or bluish and with scattered black or brown specks and swirls; incubation by female, period 12–14 days; chicks fed and cared for by both parents, nestling period 14–21 days. In study in Malawi and N Mozambique, 52% of young survived to more than six months. Maximum recorded longevity 11 years 6 months.

Movements. Resident and partially nomadic; an erratic dry-season visitor to parts of Zimbabwe and Eastern Cape Province (South Africa).

Status and Conservation. Not globally threatened. Common to locally common, and widespread. Estimated population in S Mozambique 50,000 individuals and in Swaziland 5000 individuals.

Bibliography. Archer (1992), Britton (1980), Brooke (1970), Clancey (1962, 1971), Clement *et al.* (1993), Dean (1987), Donnelly & Donnelly (1983), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Ginn *et al.* (1989), Hanmer (2002c), Hockey *et al.* (2005), Irwin (1981), Johnson & Maclean (1994), Kemp *et al.* (2001), Lewis & Pomeroy (1989), Macdonald & Birkenstock (1980), Mackworth-Praed & Grant (1963), Maclean (1993), Manson (1986, 1990), Milewski (1978), Oatley (1964), Parker, V. (1994, 1999), Short *et al.* (1990), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960, 1995), Stevenson & Fanshawe (2002), Tree (1997a), Zimmerman *et al.* (1996).

29. White-throated Canary

Serinus albogularis

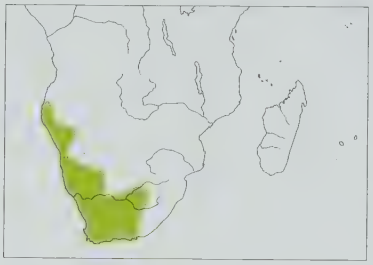
French: Serin à gorge blanche **German**: Weißkehlgirlitz **Spanish**: Serín Gorjiblanco
Other common names: White-throated Seedeater

Taxonomy. *Crithagra albogularis* A. Smith, 1833, near Piquetberg, Western Cape Province, South Africa.

Proposed race *hewitti*, described from Kleinpoort farm (Albany, in Cape Province), in South Africa, synonymized with nominate. Four subspecies recognized.

Subspecies and Distribution.

S. a. crocopygius (Sharpe, 1871) – SW Angola and NW Namibia.
S. a. sordahlae (Friedmann, 1932) – S Namibia and NW South Africa (W Northern Cape).
S. a. orangensis (Roberts, 1937) – N South Africa (S North West Province and W Free State).
S. a. albogularis (A. Smith, 1833) – coastal W & SW South Africa (E to C Eastern Cape).



Descriptive notes. 13·5–15 cm; 13–34 g. Large, stout-billed and unstreaked finch with white throat and greenish-yellow rump. Male nominate race has forehead to crown, nape, face and most of upperparts to lower back greyish-brown, finely streaked darker on crown and more broadly streaked darker on mantle to scapulars; hindneck and side of neck paler brown; supercilium to behind eye pale buff or whitish, narrow whitish subocular crescent; lores to eye and moustachial stripe to ear-coverts dark brown, enclosing slightly paler buff-brown cheek; rump and uppertail-coverts bright greenish-yellow, longest tail-coverts grey-brown with greenish-yellow tips; tail dark brown or grey-brown, finely edged paler; upperwing dark greyish-brown, fringed pale greyish-buff on alula and primary coverts and on tips of median and greater coverts, flight-feathers finely edged buffish-brown; chin and throat white with variable dark markings, dingy buff or grey-brown on breast and flanks; belly and undertail-coverts whitish; iris brown; bill brownish-horn above and pale yellowish to horn-brown below; legs brown to pinkish-brown. Female is very like male, but has duller olive rump. Juvenile is like adult, but browner on upperparts and underparts, heavily streaked darker on mantle to scapulars and spotted or streaked brownish on breast. Race *crocopygius* is slightly larger and larger-billed than other races, has more prominent pale supercilium and cheek patch, upperparts paler or greyish-buff to fawn-brown, streaked dark brown, rump bright yellow and underparts paler; *orangensis* has upperparts darker, yellow centre of rump broadly edged green or greenish-yellow; *sordahlae* has more prominent supercilium, upperparts paler or greyer than nominate, rump olive-yellow, underparts also slightly paler. VOICE. Song, by male from prominent perch at top of bush, tree or roadside wires, a highly varied series of rolling musical notes interspersed with dry churrs and harsh nasal notes, e.g. "weetle, weetle, frrra, weetle, frree tee, chipchipchipchip", and may include brief mimicry of other birds' songs; very similar to songs of *S. sulphuratus*, *S. gularis* and *S. flaviventris*, but distinguished by inclusion of rich, mellow and rounded "louie" note. Call a nasal upslurred "dzlui" and a deep "squee-yik", usually given when taking flight; also trills and chirps.

Habitat. Lowland dry or arid savannas and grasslands with scattered bush and thorn-scrub, also coastal fynbos, edges of deserts, dunes, rocky hillside scrub, dry riverbeds, edges of cultivation and occasionally gardens; frequently near water.

Food and Feeding. Mostly seeds, berries and buds, including those of *Euphorbia* (particularly *Euphorbia mauretanica*), also sunflowers (*Helianthus*), aloes (*Aloe*), *Senecio* and other Asteraceae; also seeds, buds and leaves of *Polycarena*, *Zygophyllum*, *Erodium*, *Kleinia*, *Lepidium*, *Relhania*, *Othonna*, *Euryops*, *Chrysanthemoides*, *Boerhavia repens*, *Sonchus*, *Stoebe*, *Zaluzianskia*, *Emex*, *Eriocephalus*, *Microloma*, *Psilocaulon junceum*, *Malephora lutea*, *Salsola*, *Chenopodium*, *Atriplex*, *Protea*, *Raphanus*, *Acacia* and *Olea*; also berries of *Atriplex semibaccata*, *Carissa bispinosa*, *Chrysanthemoides monilifera*, *Lycium afrum*, *Lycium austrinum*, *Grewia bicolor*, *Grewia occidentalis*, *Grewia retinervis*, *Maytenus*, *Portulacaria afra*. Occasionally small insects, including ants (Formicidae), termites (Isoptera) and small grasshoppers (Orthoptera). Forages on the ground and in vegetation, in bushes on flowerheads and among aloes, also in low trees. Digs out termites and larvae from ground tunnels, occasionally pursues termites in flight. Forages singly, in pairs and in small flocks, flocks of up to 30 gathering at drinking places; in non-breeding season often in mixed flocks with *S. sulphuratus*, *S. flaviventris* and *Alario alario*.

Breeding. Breeds throughout year, but determined mainly by rainfall; in arid regions irregular, and may not breed in every year. Monogamous. Solitary; up to three active nests within 40 m. Territory not large. Nest built by female alone, a loose cup of thorn twigs, plant fibres and grass stems, rootlets and plant down, often including wild clematis tendrils, fluffy seedheads and some feathers, placed 1–3·5 m above ground in fork towards outer edge of thornbush, tamarisk (*Tamarix*) or other tree. Clutch 2–4 eggs, white or tinged greenish, bluish or pink, may be finely spotted or lined with reddish-brown to blackish-purple; incubation by female, or perhaps by both sexes, period 14–18 days; nestling period 15–19 days.

Movements. Resident and partially nomadic; in non-breeding season wanders widely throughout range in search of foraging areas, and becomes seasonally common before moving on. Often makes regular and long-distance flights to water.

Status and Conservation. Not globally threatened. Common to locally common.

Bibliography. Clement *et al.* (1993), Dean (1997b, 2000), Fry & Keith (2004), Ginn *et al.* (1989), Hockey, Dean & Ryan (2005), Hockey, Underhill *et al.* (1989), Kok & Louw (2000), Mackworth-Praed & Grant (1963), Maclean (1993), Milewski (1978), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960, 1995), Tarboton (2001), Vernon (1973), Ward *et al.* (2004), Winterbottom (1968, 1970).

30. Reichard's Seedeater

Serinus reichardi

French: Serin de Reichard **German**: Miombogirlitz **Spanish**: Serín de Reichard
Other common names: Stripe-breasted Seedeater/Serin

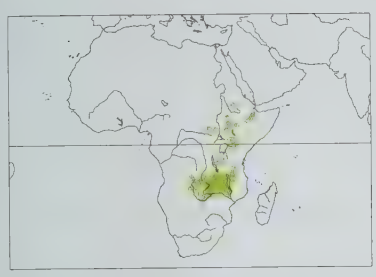
Taxonomy. *Poliospiza reichardi* Reichenow, 1882, Kakoma, near Tabora, Tanzania.

Thought to form a superspecies with *S. gularis*, and previously considered conspecific. On basis of limited mitochondrial DNA analysis, both species, together with *S. mennelli*, sometimes placed in genus *Poliospiza*, indicating only distant relationship with other African members of present genus; further, race *striatipectus* possibly a distinct species. Detailed consideration of all taxa in current genus is required, however, before species limits or a full generic revision can be made. Two subspecies recognized.

Subspecies and Distribution.

S. r. striatipectus (Sharpe, 1891) – extreme S & SE Sudan, W & CS Ethiopia and W & C Kenya.
S. r. reichardi (Reichenow, 1882) – W, C & S Tanzania, S & SE DRCongo, Zambia and Malawi.

Descriptive notes. 12·5–13·5 cm; 11·3–17·2 g (Malawi). Medium-sized, slender-billed, brown finch. Nominate race has forehead to hindcrown dark brown, heavily streaked buffish-white (lower forehead may be all white; all feathers white at base, tipped dark brown), nape and side of neck lighter brown, streaked darker (or finely tipped with white); long, broad white supercilium to side of nape; lores, cheek and ear-coverts dark brown; upperparts brown, indistinctly streaked darker brown, rump and uppertail-coverts unstreaked plain brown; tail dark brown; upperwing dark brown, median and greater coverts narrowly fringed paler brown and tipped greyish-buff, flight-feathers finely edged buffish on secondaries and tertials (in fresh plumage), tertials also tipped greyish-buff; chin and throat white, tinged or washed buffish, becoming greyish-buff on breast and flanks, heavy brown streaks across breast and more lightly streaked on lower breast and flanks, with belly



to undertail-coverts buffish-white; iris dark brown or black; bill dark brown to pale grey or slate-grey, paler base of lower mandible; legs dark brown or blackish. Distinguished from *S. gularis* mainly by shorter supercilium and heavy streaks on paler breast; from *S. striolatus* mainly by slightly smaller size, whitish streaks on forehead and crown, no whitish patch on lower ear-coverts, less heavily streaked upperparts, and greyish-buff ground colour of underparts. Sexes alike. Juvenile is similar to adult, but has warmer buffish-brown upperparts with heavy dark streaks, supercilium dull buffish, warm buff-brown tips on median and greater upperwing-coverts forming distinct double wingbar, tertials also fringed warm buff-brown, and underparts finely streaked on breast and flanks. Race *striatipectus* has upperparts warmer brown, less greyish, with heavy streaking from chin and throat down onto upper belly and flanks. Voice. Song, from tops of trees and during display-flight, a series of mixed musical phrases and buzzing trills interspersed with harsher twittering, frequently repeats single notes and phrases, "djee-djee-djee-djee-tchuee-tchuee-tchuee-tititititititit-tsitsi-tsuee-tsuee-tsuitit-tsuiti" or "twe-twe-twe teedle-ew, weet-weet-weet-weet, queedle-queedle-queedle whicher-whicher chrrrrrrrrrr, teu, teu-teu", with various phrases randomly repeated, and may also include mimicry of other birds' calls. Calls include high-pitched and nasal "zee-zwee" or "zu-weeo" together with trilling "tchirry" or "chirru" and more sibilant "tissy"; race *striatipectus* has a querulous or rising "siyuah".

Habitat. Nominate race apparently confined to *Brachystegia* and *Baikiaea* woodlands or, in S Tanzania, woodlands comprising mainly *Faurea–Protea–Uapaca* and *Brachystegia*, at 500–1500 m; *striatipectus* occurs at 1200–2000 m on grassy hillsides and escarpments with shrubs and scattered trees.

Food and Feeding. No information on diet; presumably variety of small seeds. Forages low down in vegetation and on ground; perches higher in bushes and trees, also known to pursue insects in flight from treetop. Generally shy and inconspicuous unless singing. In pairs and small flocks; in non-breeding season may gather in larger flocks of up to 20 individuals, and in Malawi often found with *S. mennelli*.

Breeding. Season Jan–Mar and again Jul–Aug. Territories may be fairly large, as male sings over wide area; performs circular display-flight during courtship. Nest mostly of roots, plant fibres and down, placed low down in tree; clutch 2–4 eggs. Longevity at least 5 years. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Locally common to scarce; uncommon in Malawi. In Malawi, range rapidly contracting and expected soon to be restricted to protected areas.

Bibliography. Arnaiz-Villena *et al.* (2008), Ash & Atkins (2009), Britton (1980), Clement *et al.* (1993), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952, 1963), Nguembock *et al.* (2009), Nikolaus (1989), Ryan *et al.* (2004), Short *et al.* (1990), Sinclair & Ryan (2003), Zimmerman *et al.* (1996).

31. Streaky-headed Seedeater

Serinus gularis

French: Serin gris **German**: Brauengirlitz **Spanish**: Serín Gris
Other common names: Streaky-headed Canary; West African Seedeater/Serin (*canicapilla*)

Taxonomy. *Linaria gularis* A. Smith, 1836, Latakoo, Northern Cape Province, South Africa.

Thought to form a superspecies with *S. reichardi*, and previously considered conspecific. On basis of limited mitochondrial DNA analysis, both species, together with *S. mennelli*, sometimes placed in genus *Poliospiza*, indicating only distant relationship with other African members of present genus, but detailed consideration of all taxa in current genus is required before full generic revision can be made. Considerable variation among races in ventral streaking; further, *elgonensis* from S Sudan and W Kenya does not respond to playback of taped songs of nominate. Proposed race *uamensis* (described from Basum, near R Ouham, in S Chad) is treated as a synonym of *elgonensis*. Race *montium* originally described as "*montanorum*" but incorrect Latin must be rectified. Eight subspecies recognized.

Subspecies and Distribution.

S. g. canicapilla (du Bus de Gisignies, 1855) – Guinea, Sierra Leone, S Mali and N Ivory Coast E to S Niger and N Cameroon.

S. g. montium (Bannerman, 1923) – highlands of E Nigeria and C & W Cameroon.

S. g. elgonensis (Ogilvie-Grant, 1912) – S Chad, NW Central African Republic, N DRCongo, S Sudan, N Uganda and extreme W Kenya.

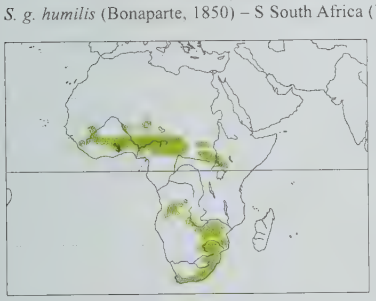
S. g. benguellensis (Reichenow, 1904) – C Angola, W Zambia and extreme NE Namibia.

S. g. mendosus Clancey, 1966 – NE Botswana, Zimbabwe and adjacent NW Mozambique.

S. g. gularis (A. Smith, 1836) – SE Botswana and N South Africa (Limpopo and N North West Cape Province).

S. g. endemion (Clancey, 1952) – S Mozambique, Swaziland, E South Africa (Mpumalanga S to C Free State and KwaZulu-Natal) and Lesotho.

S. g. humilis (Bonaparte, 1850) – S South Africa (Western Cape and Eastern Cape).



Descriptive notes. 13–16 cm; 10–26 g, 17–25 g (nominate race and *humilis*). Medium-sized to large, comparatively slender-billed, plain finch with white supercilium. Nominate race has forehead to hindcrown white, finely streaked dark brown (all feathers white at base, tipped dark brown), hindcrown and nape to side of neck lighter brown, streaked darker (may be finely tipped with white); long, broad white supercilium to over ear-coverts; lores to side of bill blackish, cheek and ear-coverts dark brown; upperparts brown or greyish-brown, streaked darker, tail also dark brown; upperwing dark brown, median coverts fringed paler brown, greaters more broadly fringed buff-brown and tipped paler (forming indistinct wingbar), flight-feathers finely edged pale buffish (broadest on secondaries and tertials in fresh plumage); centre of chin and throat white, underparts warm buff-brown to sandy brown, paler or greyish-white on lower belly and undertail-coverts; iris hazel-brown; bill dark horn, paler pinkish-brown base of lower mandible; legs pale flesh to dark brown. Sexes similar, female sometimes with streaks on lower throat and breast. Juvenile is like adult or slightly paler above, less streaked on crown and nape, but more prominently streaked on mantle and scapulars, supercilium dull buffish, upperwing-coverts broadly tipped pale buff, tertials edged pale buff, and greyer underparts clearly and broadly streaked on breast to flanks and belly. Race *endemion* is like nominate, but upperparts darker and greyer, more heavily streaked on crown and nape, and chin finely spotted blackish; *humilis* is like previous (with bill larger than nominate), but has whitish-buff supercilium, forehead to nape streaked buffish and dark brown, upperparts darker grey-brown, chin whitish-buff more prominently spotted black, throat to belly and undertail-coverts greyish-buff; *canicapilla* has heavier streaking on forehead to nape, upperparts unstreaked, lores and face slightly darker, few small blackish spots on white chin, and underparts mostly pale buff; *montium* is like last, but darker above and below; *elgonensis* also is similar, but upperparts paler grey-brown; *benguellensis* has forehead to nape pale brown with few pale or whitish streaks, upperparts deeper brown than *canicapilla* and finely streaked, underparts more heavily brown and finely dark-streaked; *mendosus* has larger bill and longer tail than other races, upperparts paler and greyer than *canicapilla* and faintly streaked darker, lacks spots on chin, has breast and flanks pale grey-brown and belly greyish-white. Voice. Song variable regionally, in W Africa loud prolonged song of liquid trills, buzzes and rattles at varying speeds and pitch, similar to that of *S. canaria*, a series of rising, phrases and trills, "wit-chee-chee-chee-cha, cha, cha, cha, cha, chip", interspersed with hard rattles, trills and mimicry of other birds' calls and songs; in E Africa first 3 notes often upslurred and concludes with "siu siu siu st st ttttttit tyo"; in breeding season often gives repeated "tweu, tweu tirrirrit-tirik" during display-flight. Calls include a thin or high-pitched "tsee-ee" or "tsrr-tsip", also "tsee-sweep", "see-e-ee", "shewee-uee" and a rolling "zwoo-weeyo-weeyip", also "chip", "chirrup" or "chirirrit" and a soft or subdued "trreet".

Habitat. Lowland to submontane scrub and open or sparsely wooded savanna with scattered trees, including acacia (*Acacia*) and *Terminalia* woodlands and thorn-scrub, also clearings and edges of dry *Brachystegia* and *Burkea africana* woodland, slopes and hillsides with scattered trees and *Protea* stands, secondary woods and bushes; also orchards and edges of cultivation, plantations, and occasionally entering gardens and suburban areas. To 2100 m; race *montium* at 1200–2000 m, and in Zimbabwe *mendosus* not below 900 m.

Food and Feeding. Mostly a wide variety of seeds, flowers, buds, fruit and small insects. Seeds include those of sunflowers (*Helianthus*), *Pennisetum americanum*, *Pennisetum glaucum*, *Amaranthus*, grasses and cereals and *Protea roupelliae*, *Celtis africana*, *Acacia karoo*, *Carica papaya*, *Hyparrhenia hirta*, *Nicotiana tabaccum*, also pines (*Pinus*), *Casuarina*, *Opuntia*, *Sorghum*; seeds, buds and shoots of *Maytenus*, *Aspalanthus*, *Chenopodium*, aloes (*Aloe*), *Nymania*, *Chironia*, *Lampranthus*, *Melianthus*, *Salsola*, *Eriocephalus* and *Olea*; buds, petals and flowers of aloes, peach (*Prunus persica*), apricot (*Prunus armeniaca*), *Salvia africana*, *Erythrina*, *Amaranthus hybridus*, *Taretes erecta*, *Taretes patula*, *Tecoma capensis*, *Rhus pyroides*, *Morus mesozygia*, *Lycium afrum*, *Lycium austrinum*, *Lantana rugosa*, *Rumex* and figs (*Ficus*); nectar of *Kniphofia*, *Erythrina*, *Aloe* (of at least six species), *Tecomaria capensis* and *Hibiscus*; fruits include those of *Anogeissus schimperi*, *Morus*, *Euphorbia ingens*, *Lantana rugosa*, *Lantana camara* and figs. Insects include termites (Isoptera), hoverflies (Syrphidae) and caterpillars. Forages on ground, more frequently on seeding heads of grasses and other plants, also in bushes and trees. Holds down seeding plant with foot while seeds extracted, plucks fruit (e.g. mulberries) and holds it in foot against perch while eating in small portions; probes and pierces base of flowers to extract nectar; strips outer covering of *Aloe* flowers; pursues and catches insects in flight. Generally shy and unobtrusive, on ground moves with short hops. Forages alone, in pairs and in small or fairly large flocks; also in mixed flocks with other canaries, usually with *S. mozambicus*, *S. sulphuratus* and *S. mennelli*.

Breeding. Season Sept–Mar, possibly also earlier (Jun–Aug) in W Africa. Monogamous. Solitary or loosely colonial, with several pairs in close proximity. Displaying male sings from high perch or, less frequently than other serins, in high circling flight with slow butterfly-like wingbeats; when perched near female, he points bill skywards and sways head from side to side, body feathers fluffed out, and fans and slightly raises tail while moving towards female. Nest built by female alone, a small neat cup of plant fibres, roots, bark strips, dry grasses, leaves, small twigs, plant down (e.g. from *Protea*), feathers and cobweb, placed in concealed position in fork at or near end of branch or top of tree, sometimes in cluster of seedpods or pine cones, once behind peeling tree bark. Clutch 2–4 eggs, white or pale greenish-blue, finely spotted with brown or pale violet; incubation by female, fed on nest by male, period 12–15 days; nestling period 17 days. Longevity at least 9 years 5 months.

Movements. Resident and partial migrant; in non-breeding season large flocks wander at random throughout range in search of foraging areas. Race *elgonensis* moves N annually into S Sudan during Nov–Mar.

Status and Conservation. Not globally threatened. Common to variably locally common, uncommon or scarce; rare in Kenya and Uganda. Estimated population in S Mozambique 40,000 individuals and in Swaziland 20,000.

Bibliography. Archer (1992), Arnaiz-Villena *et al.* (2008), Borrow & Demey (2001), Britton (1980), Brooke (1970), Clancey (1971), Clement *et al.* (1993), David & Gosselin (2002a), Donnelly & Donnelly (1983), Elgood *et al.* (1994), Forsberg (1996), Fry & Keith (2004), Ginn *et al.* (1989), Hockey *et al.* (2005), Irwin (1981), Kemp *et al.* (2001), Mackworth-Praed & Grant (1952, 1963, 1973), Maclean (1993), Manson (1986), Milewski (1978), Milstein (1973), Nguembock *et al.* (2009), Nikolaus (1989), Nuttall (1997c), Oatley (1964), Oatley & Skead (1972), Parker, V. (1994, 1999), Ryan *et al.* (2004), Short *et al.* (1990), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960, 1995), Stevenson & Fanshawe (2002), Tarboton (1980, 2001), Vernon (1973), Ward (2002b), White (1963), Zimmerman *et al.* (1996).

32. Black-eared Seedeater

Serinus mennelli

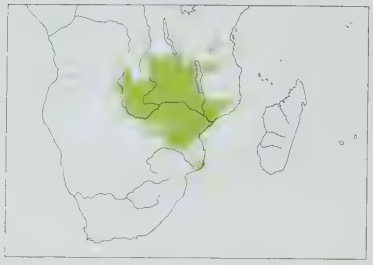
French: Serin oreillard **German**: Schwarzwangengirlitz **Spanish**: Serín Orejinegro
Other common names: Black-eared Canary/Serin

Taxonomy. *Poliospiza mennelli* E. C. Chubb, 1908, Shangani River, Zimbabwe.

On basis of limited mitochondrial DNA analysis, this species, together with *S. reichardi* and *S. gularis*, sometimes placed in genus *Poliospiza*, indicating only distant relationship with other African members of present genus, but detailed consideration of all taxa in current genus is required before full generic revision can be made. Monotypic.

Distribution. W & E Angola E to SE Tanzania, S Zimbabwe and Mozambique.

Descriptive notes. 13–14 cm; 13–17 g. Medium-sized, conical-billed, pale grey finch with white supercilium and dark face. Male has upper forehead to hindcrown streaked blackish-brown and white, long, broad white supercilium from lower forehead to side of nape; lores, cheek and ear-coverts sooty black, side of neck whitish; nape and upperparts grey-brown, streaked darker brown on mantle and scapulars; tail dark brown, edged paler on outer feathers; upperwing dark brown, median coverts tipped pale brown or greyish-buff and greaters more broadly fringed pale buff-brown, tips whitish (forming double wingbar), alula, primary coverts and flight-feathers dark grey,



finely edged buffish on secondaries and more broadly greyish-buff on tertials (in fresh plumage); white below, side of chin often finely spotted brownish-black, short brown streaks on breast to lower flanks; iris brown; bill pink or pinkish-horn, paler base of lower mandible; legs slate-grey or blackish-brown. Differs from *S. gularis* mainly in black (not grey) cheek and in streaks on breast. Female is similar to male, but has crown streaks and face brown to dark brown, upperparts browner, and underparts more boldly streaked. Juvenile is similar to female, but with browner face, pale buffish-brown fringes of wing-coverts and inner secondaries, and more heavily streaked underparts. Voice. Song, usually from treetop or other prominent perch or during courtship flight, a series of uneven twitters, whistles and trills, "teeu-twee-teu-twiddy-twee-twee", "chichiwee-weechoo, wyli, jeewa" or "chee-waylee, cheeya-weeya-chu" with second note higher than first. Call of 3 or 4 notes, "ess-ee-dee", a nasal "jwaylulee", "shoowee" or a slightly longer "shooweeyoo".

Habitat. Lowland and lower montane dry *Brachystegia* and *Baikiaea* woodland, including *Julbernardia* and *Brachystegia* woodlands in SE Zimbabwe and *Uapaca* woodland in areas of high rainfall in E Zimbabwe; also acacia (*Acacia*) mixed woodland, coastal forests, wooded hillsides, eucalypt (*Eucalyptus*) plantations; occasionally at edges of cultivation and large gardens. To c. 2000 m, but most numerous above 600 m.

Food and Feeding. Mostly small seeds, buds, flowers, nectar, some fruit; some small insects. Seeds include those of a variety of grasses e.g. *Panicum maximum*, *Panicum laevifolium*, *Alternanthera pungens*, *Bidens pilosa*, *Hyparrhenia* and *Loudetia simplex*, also sunflowers (*Helianthus*); buds, flowers and leaves of *Flaveria bidentis* and *Senecio tamoides*; fruit includes *Uapaca*, *Trema orientalis*, *Berchemia discolor*, *Vaccinium exul*, *Harpephyllum caffrum*, *Morus mesozygia*, *Rhus dentata* and *Rhus rigidus*; probes flowers of *Brachystegia* and *Loranthus* presumably for nectar. Insects include small termites (Isoptera), which it pursues and catches in flight. Forages usually in flowering plants, bushes and trees, also on the ground in grass tufts; generally shy or unobtrusive, except when male singing (almost continually) in breeding season. Forages in pairs and in small groups of up to 20 individuals; in non-breeding season often found in larger flocks, especially at flowering *Brachystegia spiciformis* trees, and in Malawi often occurs with *S. reichardi*.

Breeding. Season possibly Sept–Apr, mostly Dec–Mar or May. Monogamous. Presumed to be solitary and territorial. Displaying male sings almost continuously from prominent high perch; also in courtship flight, rising high and then diving fairly rapidly, before slowing to make undulating swoop with several slow, butterfly-like wingflaps, finally swooping down on to perch; displaying partners sit side by side, pointing bills at each other and upward at 45°, with lowered and quivering wings, tails semi-erect, before silently and alternately hovering over each other. Nest a small cup of lichens (mostly *Usnea barbata*), *Brachystegia* flowerheads, twigs, bark strips, roots, moss and some feathers, bound together with spider webs, usually placed 1–9 m from ground in fork of *Brachystegia* tree. Clutch 2–4 eggs, pale green, finely spotted with pale grey and black; incubation by female alone, fed by male for duration, period c. 13 days; nestling period 18 days. Longevity at least 6 years in captivity.

Movements. Resident and partially nomadic; in non-breeding season large flocks wander at random throughout range in search of foraging areas. Has occurred in Shire Valley, in Malawi; more numerous in Zimbabwe during Aug–Feb than at other times; breeding-season visitor Sept–Mar to Masvingo area of SE Zimbabwe.

Status and Conservation. Not globally threatened. Common to locally common or uncommon; uncommon in E Angola. Estimated population in S Mozambique in excess of 10,000 individuals. In *Brachystegia* woodland in Zimbabwe, breeding density 4 pairs/km² and post-breeding density 22 birds/km². In Malawi range considered rapidly declining, and likely soon to be present only in protected areas.

Bibliography. Arnaiz-Villena *et al.* (2008), Barnes (2000), Benson & Benson (1980), Benson *et al.* (1964), Brooke (1970), Clancey (1971), Clement *et al.* (1993), Dowsett-Lemaire & Dowsett (2006), Fry & Keith (2004), Ginn *et al.* (1989), Hall (1956), Hockey *et al.* (2005), Irwin (1977, 1981), Mackworth-Praed & Grant (1963), Maclean (1993), Nguembock *et al.* (2009), Parker (1999), Ryan *et al.* (2004), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960), Tarboton (2001), Tree (1997b), Vernon (1979).

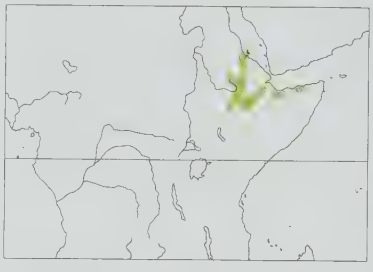
33. Brown-rumped Seedeater

Serinus tristriatus

French: Serin à trois raies **German**: Rüppellgirlitz **Spanish**: Serín Culipardo
Other common names: Brown-rumped Serin

Taxonomy. *Serinus tristriatus* Rüppell, 1840, Taranta Mountains, 8000 feet [c. 2440 m], Ethiopia. Birds from N Somalia, supposedly paler or greyer and with more prominent streaks on mantle, sometimes separated as race *pallidior*, but probably matched by others elsewhere in range. Monotypic.

Distribution. W Eritrea, N & C Ethiopia and N Somalia.



Descriptive notes. 13 cm; 12–19·5 g. Smallish, drab finch with conical bill. Has forehead and crown dull brown, indistinctly streaked darker (sometimes white tips on lower forehead), long, broad white supercilium from base of upper mandible to rear of ear-coverts; lores dark brown, becoming slightly paler brown on cheek, ear-coverts and side of neck, sharply demarcated from sides of chin and throat at moustachial line (where may show some small dark spots); nape and upperparts uniformly brown, or slightly darker brown on rump and uppertail-coverts, tail also dark brown; upperwing dark brown, median and greater coverts tipped slightly paler brown, alula, primary coverts and flight-feathers dark brown, fine paler buff edges on secondaries and tertials; centre of chin and throat white, underparts buff or washed dull grey-brown, centre of belly to undertail-coverts white, undertail-coverts with dark centres; iris hazel-brown or red-brown to dark brown; bill horn-coloured or pale pinkish-horn, often with duskier culmen; legs flesh-brown. Sexes alike. Juvenile is similar to adult, but crown more clearly streaked, mantle and scapulars streaked, underparts buffish with short dark brown streaks. Voice. Song a weak but high-pitched "sip-sip-twis-twis" or an extended version of call, "sis-sis-sissis", similar to notes given by *S. striolatus*. Call a shrill "tsooee" or "swee" with rising inflection, also "pss-chip", "wee-chu", "pss-chuwee", and single "sip" "chip", "zit" or "siss".

Habitat. Lower montane and montane scrub, juniper (*Juniperus*) woodland, undergrowth and scrub, and open mixed deciduous and juniper woodland, on rocky hillsides; also in large gardens, and common within suburbs and centre of Addis Abeba, in Ethiopia. At 1060–3300 m.

Food and Feeding. Mostly small seeds of small plants, including herbs and small shrubs. Forages in undergrowth, bushes, low trees and on ground; in pairs and small flocks.

Breeding. Breeds throughout year. Monogamous. Solitary; territorial. In head-up and tail-up display, male and female fluff out and ruffle loose plumage; male also presents female with nest material. Nest a neat cup of fine dry grasses, plant fibres, animal hair, wool and cobwebs, usually on horizontal branch in bush or tree, most frequently in juniper. Clutch 3 eggs, greenish-white or very pale greenish-blue, finely spotted blackish, violet or reddish. No other information.

Movements. Resident and partially nomadic; small numbers may wander within range in search of foraging areas in non-breeding season.

Status and Conservation. Not globally threatened. Locally common to abundant.

Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Clement *et al.* (1993), Fey (1985), Fry & Keith (2004), Haarmann (1963), Hemmer (1976b), Mackworth-Praed & Grant (1952), Sinclair & Ryan (2003).

PLATE 35 ➤



PLATE 35

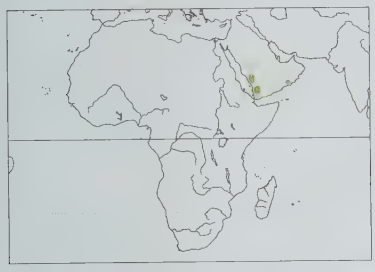
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34. Yemen Serin

Serinus menachensis

French: Serin du Yémen **German**: Jemengirlitz **Spanish**: Serín Yemení
Other common names: Menacha Seedeater/Serin

Taxonomy. *Poliospiza menachensis* Ogilvie-Grant, 1913, Menacha, Yemen.
Monotypic.
Distribution. SW Saudi Arabia, W Yemen and S Oman.



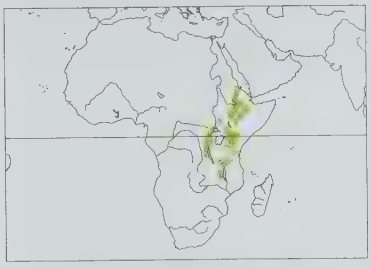
Descriptive notes. 11–12 cm. Small finch with conical bill and long primary projection. Has forehead, crown, nape and upperparts grey-brown, finely streaked darker on crown and indistinctly darker on mantle and back; rump and uppertail-coverts unstreaked brown or grey-brown; lores brown, cheek and ear-coverts slightly paler buffish-brown or tan-brown, small pale buffish subocular crescent, and narrow olive-brown malar stripe (variable individually); tail uniformly dark grey-brown; upperwing grey-brown, median and greater coverts finely fringed buffish-brown (pale buff tips in fresh plumage), alula and primary coverts slightly darker brown, and flight-feathers thinly edged buff, more broadly buffish on edges of tertials; pale buffish or whitish-buff below, heavily streaked pale brown on lower throat to lower breast and flanks, belly to undertail-coverts white; iris dark brown or black; bill pale brownish-horn above, variably pinkish to orange-yellow below; legs dull pinkish-brown. Differs from similar *S. rothschildi* in having more sharply pointed bill with contrastingly paler lower mandible, slightly shorter tail, streaked crown, paler cheeks and narrow dark malar, slightly paler underparts, also brown (not greenish-yellow) rump. Sexes alike. Juvenile is similar to adult, but duller. Voice. Song a short "chew-chee-chee-chwee". Calls include drawn-out "teee-oo" like that of *Carduelis spinus* and high-pitched "tseep", "dweep" or wheep", occasionally repeated; also rapid rolling twittering "chi-chip", "twi-twitwi-tuu" and "chi chi chi chi" or "ti-ti-ti", reminiscent of similar notes of *Carduelis flammea*, occasionally given with various other notes; contact call among members of flock a soft "cheep-cheep".
Habitat. Lower montane to submontane dry scrub and vegetation on rocky hillsides, stony plateaux and cliffs, including those in villages and towns, e.g. outskirts and centre of San'a', in Yemen; often in treeless areas. Mainly at 2000–3200 m, occasionally to 3650 m; lower, at c. 650–700 m, in Oman.
Food and Feeding. Mostly small seeds, including those of grasses, millet and other plants and shrubs, e.g. docks (*Rumex*) and *Salvia*. Forages on rocks and on ground, occasionally in low vegetation. In pairs and in small flocks of up to 30 individuals, often in company with *Carduelis yemenensis*.
Breeding. Season late Aug to Dec and Mar–Apr. Colonial in Oman, up to ten nests together in rock overhang, inter-nest distance c. 5–15 m, but laying not synchronized. Nest made from coarse grasses, twigs and sometimes string, lined with animal hair and feathers, placed in hole or cavity in cliff or rock face or in wall of house, or interior of disused shelter, or in old or disused nest of Rock Martin (*Ptyonoprogne fuligula*). Limited information suggests clutch of 3 pure white eggs; nests in Oman contained 1–3 chicks, fed by both parents; no information on duration of nestling period.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in South-west Arabian Mountains EBA. Common or locally common. First discovered in S Oman in 1997, and found to be regular breeder: isolated colony found at Tawi Attair sinkhole, in Dhofar (Zafur).
Bibliography. Clement *et al.* (1993), Deetjen (1970, 1971), Everett (1987), Hollom *et al.* (1988), Jennings (1981), Ogilvie-Grant (1913), Phillips (1982), Polak (2001), Porter *et al.* (1996).

35. Streaky Seedeater

Serinus striolatus

French: Serin strié **German**: Strichelgirlitz **Spanish**: Serín Estriado
Other common names: Streaky Serin; Yellow-browed Seedeater, Southern Streaky Seedeater (*whytii*)

Taxonomy. *Pyrrhula striolata* Rüppell, 1840, Halai and Simen, 8000–10,000 feet [c. 2440–3050 m], Ethiopia.
Has previously been placed in genus *Crithagra*, and more recent mitochondrial DNA analysis indicates only distant relationship with other African serins, but detailed consideration of all taxa in present genus is required before full generic revision can be made. Race *whytii* sometimes treated as a separate species on basis of structure and morphology, but possibly best considered an incipient species; limited evidence from DNA analysis indicates close relationship between nominate and *whytii*. Proposed race *affinis* (described from Mt Kilimanjaro, in N Tanzania) synonymized with nominate. Three subspecies recognized.
Subspecies and Distribution.
S. s. striolatus (Rüppell, 1840) – N Eritrea, Ethiopia and extreme SE Sudan S to W & C Kenya and N Tanzania.
S. s. graueri E. J. O. Hartert, 1907 – E DRCongo, SW Uganda, Rwanda and Burundi.
S. s. whytii Shelley, 1897 – S Tanzania and N Malawi.
Descriptive notes. 13·5–15 cm; 18–26·5 g. Medium-sized, heavily streaked finch with long, slightly notched tail. Nominate race has forehead to crown brown, finely streaked darker and tipped white or whitish, nape paler with broad pale buffish edges; long, broad white or buffish-white supercilium to rear of ear-coverts, deep brown lores, broad eyestripe and across ear-coverts, whitish crescent below eye and across lower ear-coverts and cheek, dark brown malar stripe broadening onto side of neck; mantle, back and scapulars like crown or slightly paler, heavily streaked blackish-brown and edged buffish-white, rump and uppertail-coverts pale brown, streaked darker; tail blackish-brown, finely edged greenish-yellow; upperwing dark brown, coverts finely edged paler brown or warm buffish-brown, secondaries and tertials edged buff to yellow-olive; chin and throat dull whitish or tinged yellow, often more buffy or sandy and always with heavy, broad blackish-brown streaks on lower throat to belly and flanks, lower belly to undertail-coverts white or whitish; iris dark brown to black; bill dark horn or blackish; legs light brown to deep reddish-brown. Differs from *S. reichardi* in slightly larger size, lack of whitish streaks on forehead and crown, presence of whitish patch on lower ear-coverts, heavier or prominent streaking on upperparts and whitish to buff ground colour of underparts. Sexes alike. Juvenile is similar to adult, but duller, has pale buff forehead and crown finely streaked darker, and thinner streaks on buffish underparts. Race *graueri* is slightly darker than nominate on upperparts, fine or indistinct green edges on flight-feathers, more heavily streaked on deeper or rich buff-brown underparts; *whytii* is distinctive, has smaller bill and shorter wing than nominate, forehead to nape yellow, finely streaked blackish, long yellow supercilium to side of neck, edges of remiges and rectrices dull yellow or greenish-yellow, chin to centre of upper breast bright yellow, sometimes small blackish spots on chin, underparts white, streaked blackish, female similar but slightly paler or duller and face patch greyer (less black). Voice. Song variable, a series of clear, downslurred whistles, "tway, tway, tsitsi-peeew, tsiway-tslo", or more prolonged version with liquid trills and dry chatters; also a fairly monotonous version of the call, "sweee" or "chweee-chip-chip-chip-chip" or "chididi see-leep", fading toward end. Other call notes include high-pitched "sooee", "seeeeeeeit" or "suwee-ip" with rising inflection, similar to a call given by *S. tristriatus*; call of race *whytii* similar but lower-pitched, "siyuuee".



Habitat. Lower montane to submontane open country and woodland edge and clearings, moist secondary evergreen forest and tree-heath (*Erica arborea*), juniper (*Juniperus*), alpine moorland and meadows, undergrowth of *Hagenia* forest, bamboo, thickets, bracken scrub; also edges of cultivation and gardens, including those on outskirts of large cities e.g. Addis Abeba (Ethiopia) and Nairobi (Kenya). At 1510–4100 m; race *whytii* restricted to undergrowth and edges of evergreen forests and secondary growth at 1600–2400 m.
Food and Feeding. Mostly small seeds, including those of *Lobelia giberroa*, berries including blackberries (*Rubus*), and insects, including aphids (Aphidoidea), termites (Isoptera), small beetles (Coleoptera) and larvae. Actively forages to middle height in low vegetation or on the ground. Singly and in pairs; in non-breeding season frequently in mixed-species foraging flocks.
Breeding. Breeds in all months, mostly Apr–Aug and Oct–Jan, at higher altitudes (above 2200 m) Apr–Jul; up to three broods. Monogamous. Solitary; territorial. Nest a deep, compact cup of plant fibres, dry grasses, twigs, flower stalks, strips of bark, animal hair and feathers, concealed by leaves and placed low down, within 1·5 m of ground, in fork of branch in creeper, low bush or tree. Clutch 3–6 eggs, pale blue or whitish, sparingly spotted or lined with brown and greyish-purple; incubation by female alone, fed on nest by male, period 12 days; chicks fed by both parents, nestling period 14–17 days, depending on weather conditions; fledglings fed and cared for by both parents. High mortality rate of adults and young, frequently preyed on by shrikes (Laniidae), mongooses (Herpestidae), tree-rats (Muridae), genets (Viverridae), snakes, and coucals (*Centropus*); nestlings of high-altitude breeders vulnerable to heat-stroke and frost.
Movements. Resident; some short-distance and random movements in non-breeding season in Apr–May and Aug–Oct in search of feeding areas.
Status and Conservation. Not globally threatened. Race *whytii*, sometimes treated as a full species, is a restricted-range taxon: present in Tanzania–Malawi Mountains EBA. Common to locally very common; race *whytii* only locally common.
Bibliography. Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Ash & Atkins (2009), Britton (1980), Clement *et al.* (1993), Dowsett-Lemaire & Dowsett (2006), van den Elzen & Nemeschkal (1991), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952), Nguembock *et al.* (2009), Nikolaus (1989), Ryan *et al.* (2004), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

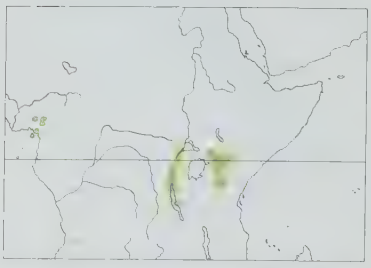
36. Thick-billed Seedeater

Serinus burtoni

French: Serin de Burton **German**: Dickschnabelgirlitz **Spanish**: Serín de Burton
Other common names: Thick-billed Serin

Taxonomy. *Strobilophaga burtoni* G. R. Gray, 1862, Cameroon Mountains, 7000 feet [c. 2130 m]. Has previously been placed in genus *Crithagra*, and more recent mitochondrial DNA analysis indicates distant relationship with present African congeners, but detailed consideration of all taxa in current genus is required before full generic revision can be made. This species and *S. melanochrous* and *S. rufobrunneus* sometimes thought to form a superspecies; has been treated as conspecific with *S. melanochrous*, but differs morphologically and vocally. Four subspecies recognized.
Subspecies and Distribution.
S. b. burtoni (G. R. Gray, 1862) – extreme SE Nigeria, SW Cameroon and Bioko I (Fernando Póo).
S. b. tanganjicae Granvik, 1923 – WC Angola; E DRCongo E to W Uganda, W Rwanda and W Burundi.
S. b. kilimensis (Richmond, 1897) – extreme E Uganda, SW Kenya and N & W Tanzania.
S. b. albifrons (Sharpe, 1891) – C Kenya.
Descriptive notes. 15–16 cm; 24–35 g. Large, stoutly built, drab-coloured finch with heavy bill. Nominate race has head and upperparts dark olive-brown, streaked darker or blackish on mantle and back, uppertail-coverts like back but edged paler; variably broad whitish patch across forehead and forecrown or restricted to pale spot at side (above lores); face dark brown or blackish, whitish tips on lower cheek; tail dark brown, finely edged greenish-yellow; upperwing blackish-brown, median and greater coverts edged browner or olive-green and finely tipped white or buffish-white, alula, primary coverts and flight-feathers blackish-brown, remiges finely edged olive-yellowish, tertials similar or edged buff-brown or more broadly buffish-grey towards tips; chin to side of throat dark brown (may show a few white feather tips), breast and flanks paler olive-brown, broadly streaked dark brown, streaks continuing narrowly to side of undertail-coverts, rest of underparts pale buff; iris black; bill blackish or dark horn above, whitish-horn below; legs dull pinkish-brown. Differs from *S. melanochrous* in having white on forehead, darker underparts, white tips on wing-coverts and tertials, and in lacking short supercilium. Sexes alike. Juvenile is like adult, but paler brown, forehead to crown whitish with fine black streaking, lores to cheek, chin and side of throat

On following pages: 37. Kipengere Seedeater (*Serinus melanochrous*); 38. Principe Seedeater (*Serinus rufobrunneus*); 39. Protea Canary (*Serinus leucopterus*); 40. Mountain Serin (*Serinus estherae*); 41. Cape Siskin (*Pseudochloroptila totta*); 42. Drakensberg Siskin (*Pseudochloroptila symonsi*); 43. Black-headed Canary (*Alario alario*); 44. Sao Tome Grosbeak (*Neospiza concolor*).



whitish, finely spotted with black (pale bases and blackish tips of feathers), broad pale buff tips on median and greater upperwing-coverts, paler and more diffusely streaked underparts, blackish bill with paler base of lower mandible. Race *tanganjicae* is slightly smaller than nominate and has smaller, weaker bill, less white on forehead (white sometimes absent), olive-brown upperparts less heavily streaked, edges of flight-feathers greenish, underparts also more extensively browner, in C Angola darker or greyish-olive and tips to wing-coverts greyer; *albifrons* has rather narrow line of white (sometimes lacking) across base of upper mandible, has dark streaks on crown, mantle and scapulars, yellowish wash on (less black) upperparts, brighter green edges of flight-feathers, paler belly and flanks streaked dark brown; *kilimensis* is slightly darker above than nominate, upperparts tinged greenish-olive, normally no white on forehead. Voice. Song, rarely or infrequently given, a soft or weak series of high-pitched, warbling notes including churrs, twitters, squeaky notes and trills, usually introduced with a thin "sit-sit-sit...", or "tsi-tsi-tsi-tsi-tsew chureet tseweet-tseet, tswi-tswi-tswi". Only occasionally calls, a soft plaintive or squeaky "pleet", "sseeeeeet", "sreeep" or "sssssss" as contact, or longer "seee-sew", "seweeeee-see-see" or "weet-seeut-syup", similar to phrase included in song.

Habitat. Undergrowth of lower montane to submontane bush, in clearings and edges of forest, including strips of riverine forest, and in open heath with grassland or scattered woodland on hillsides with small bushes above tree-line. At 1370–3000 m in W Africa and 1700–3000 m in E, exceptionally down to 1200 m in Kenya.

Food and Feeding. Mainly seeds, including hard-shelled tree seeds, e.g. those of *Senecio montuosum*, *Nuxia* and *Gnidia*, also ripe and unripe *Rubus* berries, and fruits including *Musanga* and *Trema* and *Schefflera goetzenii*. Forages in undergrowth and creepers, occasionally in lianas, also in treetops; slow or sluggish and generally shy, unobtrusive and easily overlooked, its presence usually indicated only by occasional contact call. Singly, in pairs and in small groups.

Breeding. Season Jun–Dec, also Feb–May. Monogamous. Solitary. Nest a small open cup of grass, plant fibres, lichens and twigs, placed 2–8 m from ground in bush, in epiphytes along horizontal branch of tree or in clump of bamboo leaves. Clutch 2 eggs; incubation apparently by both parents. No further information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Locally abundant, common, uncommon or scarce. Easily overlooked.

Bibliography. Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Borrow & Demey (2001), Britton (1980), Clement *et al.* (1993), Elgood *et al.* (1994), van den Elzen & Nemeschkal (1991), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952, 1963, 1973), Nguembock *et al.* (2009), Ryan *et al.* (2004), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

37. Kipengere Seedeater

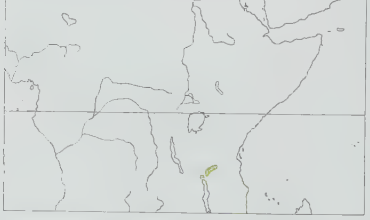
Serinus melanochrous

French: Serin des Kipengere **German**: Tansaniagirlitz **Spanish**: Serín de los Kipengere
Other common names: Tanzania Seedeater

Taxonomy. *Serinus melanochrous* Reichenow, 1900, Ukinga, southern Tanzania.

Has previously been placed in genus *Crithagra*, and more recent mitochondrial DNA analysis indicates distant relationship with present African congeners, but detailed consideration of all taxa in current genus is required before full generic revision can be made. This species and *S. burtoni* and *S. rufobrunneus* sometimes thought to form a superspecies; has been treated as conspecific with *S. burtoni*, but differs morphologically and vocally. Size and plumage suggest possible closer relationship with *S. striolatus*, but detailed DNA needed. Monotypic.

Distribution. Iringa and Njombe highlands, in S Tanzania.



Descriptive notes. 15 cm. Medium-sized, stout-billed finch with heavily streaked underparts. Has head and upperparts dark olive-brown, streaked darker on mantle and back, uppertail-coverts like back but edged paler; forehead sometimes with some white streaks or flecks; lores and face dark brown or blackish, short, narrow whitish supercilium, short whitish subocular stripe or patch, and small buffish-white patch at base of bill and on lower ear-coverts; tail dark brown, finely edged olive; upperwing dark brown or blackish-brown, median and greater coverts with blackish centres, browner edges and paler buff-brown tips, alula, primary coverts and flight-feathers edged olive-brown, tertials edged deep olive-brown and fringed paler; chin and throat whitish, underparts buffish or pale buff, broadly streaked dark brown, streaks continuing narrowly to lower flanks; iris dark sepia-brown; upper mandible dark sepia-brown, paler dull yellowish or pale flesh cutting edges and lower mandible; legs dull dark brown to blackish. Distinguished from *S. burtoni* by smaller size, lack of white on forehead, of bright greenish-yellow edges on flight-feathers, and of pale wingbars. Sexes alike. Juvenile undescribed. Voice. Not well known; a long rambling series of rattling notes, unlike song/call of *S. burtoni*.

Habitat. Montane forest and bushland between 1500 m and 3000 m.

Food and Feeding. Diet not well known; mostly seeds of grasses, flowering plants, shrubs and trees, also fruits. Forages mostly in low to middle levels of trees, sometimes also in canopy of trees and on ground; unobtrusive. Singly, in small groups and in family parties.

Breeding. No information.

Movements. Resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Fairly common within small global range; easily overlooked. Present on Mt Rungwe, N & S of R Little Ruaha near Iringa, and S of Mtandika; fairly common at 1700 m in Chita Forest and at 1800 m in Kigogo Forest and Dabaga; not uncommon also at Mufundi and in Kisinga Rugaro Forest Reserve, in W Ndundulus. Range not fully determined; may occur also in forests near Zambian and Malawian borders. Although this species is present within the large Udzungwa Mountains National Park and in several forest reserves, elsewhere it is potentially at risk through clearance of habitat for agriculture, development of plantations and selective logging and firewood-cutting; as a consequence its range and numbers are thought to be decreasing.

Bibliography. Anon. (2009i), Arnaiz-Villena *et al.* (2008), Butchart & Stattersfield (2004), Clement *et al.* (1993), Dowsett & Dowsett-Lemaire (1993), Fry & Keith (2004), Hall & Moreau (1970), Jensen & Brøgger-Jensen (1992), Mackworth-Praed & Grant (1952, 1963), Nguembock *et al.* (2009), Short *et al.* (1990), Sinclair & Ryan (2003), Stattersfield & Capper (2000), Stevenson & Fanshawe (2002), White (1963).

38. Principe Seedeater

Serinus rufobrunneus

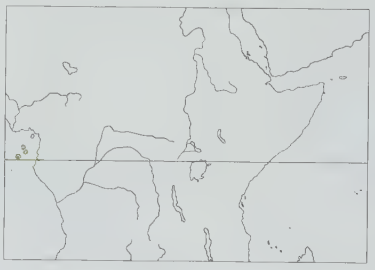
French: Serin roux **German**: Principegirlitz **Spanish**: Serín de Príncipe

Taxonomy. *Linurgus rufobrunneus* G. R. Gray, 1862, Príncipe Island, Gulf of Guinea, West Africa.

Three subspecies recognized.

Subspecies and Distribution.

S. r. rufobrunneus (G. R. Gray, 1862) – Príncipe I, in Gulf of Guinea.
S. r. fradei (de Naurois, 1975) – I Bone de Jókei (Caroco), off S Príncipe.
S. r. thomensis (Bocage, 1888) – São Tomé I, in Gulf of Guinea.



Descriptive notes. 11–12·5 cm; c. 21–26 g, 28–35 g (*fradei*). Smallish, rather short-tailed drab-coloured finch with conical bill. Nominate race is almost entirely warm cinnamon-brown, streaked dark brown on crown to nape, upperparts rufous or rufous-brown with less distinct streaks; lores dark brown, becoming paler or rufous-brown on cheek and ear-coverts, sometimes with indication of blacker moustachial streak; tail brown, outer feathers finely edged orange-rufous; upperwing-coverts dark brown or blackish, broadly fringed rufous-brown, alula, primary coverts and flight-feathers blackish-brown, secondaries edged warm rufous, tertials fringed light rufous-brown; chin and throat light rufous or cinnamon-buff, finely spotted blackish at side, becoming slightly darker or brownish-cinnamon on underparts, obscure spots and streaks on breast to upper flanks; iris dark brown or black; bill dark horn above, paler horn below; legs brown. Sexes alike. Juvenile is like adult, but generally lacks warm cinnamon tones and is duller brown. Race *fradei* is slightly larger and deeper rufous than nominate, bill also darker; *thomensis* is much duller or greyish olive-brown, lacking rufous in plumage, has forehead and crown streaked buffish and dark brown, duller brown below, with off-white or buffish lower throat patch and whitish vent and undertail-coverts. Voice. Song a slow series of warbling notes, trills and twitters, including high-pitched "pss-pss-pss" and a chattering "cha-cha-cha-cha", and ending with loud and rising "twee", similar to song of *S. canaria*. Fairly noisy; frequent calls include clear "tsweet", "zeewee", "weeyoo", "weeyip", "witup" and a more nasal " zwoey" or "zweeya".

Habitat. Primary and secondary forests, including gallery forest, dry woodlands, riverine and coastal woodlands, also open areas with scattered trees, edges of cultivation, cocoa plantations and coconut palms, on São Tomé also in city, suburban and town gardens; on I Bone de Jókei (race *fradei*) occurs only in oil palms (*Elaeis guineensis*). Sea-level to c. 1500 m.

Food and Feeding. Mainly seeds, leaves and fruits; some insects. Includes fruits of *Cecropia*, *Cestrum levigatum*, leaves of *Musanga* and *Carica papaya*, and buds of *Erythrina* and *Schefflera*, also pulp of oil-palm fruit. Forages on and close to ground, in bushes and high in trees, also at edges of streams; climbs tree trunks and branches in manner of a nuthatch (Sittidae), probing and pecking at bark and lichens while foraging for insects and larvae. Singly, in pairs and in small flocks.

Breeding. Season Mar, May–Aug and Oct–Jan. Solitary. Male sings for prolonged periods, spreading tail and fluttering half-opened wings while twisting body to right and left. Nest an open cup of thin twigs and dry plant stems. Clutch 2–3 eggs, white. No further information.

Movements. Resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Príncipe EBA and São Tomé EBA. Common on São Tomé; uncommon or scarce on Príncipe. Tiny island of Bone de Jókei densely populated, with endemic race *fradei* estimated to number well over 1000 individuals. On Príncipe presence in certain areas fluctuates annually, most numerous along narrow fringe of S coast.

Bibliography. Borrow & Demey (2001), Clement *et al.* (1993), Fry & Keith (2004), Jones & Tye (2006), Leventis & Olmos (2009), Mackworth-Praed & Grant (1973), de Naurois (1975), Sinclair & Ryan (2003), Snow (1950).

39. Protea Canary

Serinus leucopterus

French: Serin bifascié **German**: Proteagirlitz **Spanish**: Serín de las Proteas
Other common names: Protea/White-winged/Layard's Seedeater

Taxonomy. *Crithagra leucoptera* Sharpe, 1871, Paarl, south-west Western Cape, South Africa.

Monotypic.

Distribution. SW South Africa (S Western Cape E to SW Eastern Cape).



Descriptive notes. 15–16 cm; 18–24·8 g. Large, drab-coloured finch with black chin and whitish throat, and conical bill. Forehead to upperparts are grey-brown, finely streaked darker on forehead to nape and broadly on mantle to scapulars; uppertail-coverts like back, tipped whitish or buff; short and poorly defined pale buff supercilium; lores to eye, cheek and chin blackish or dusky brown, becoming greyer on ear-coverts and side of neck and indistinctly streaked darker; tail dark brown, finely edged greenish-yellow or buffish-white; upperwing dark brown or blackish, median and greater coverts finely edged greyish-buff and tipped buffish or whitish (forming double wingbar, which indistinct in worn plumage and not always obvious on perched bird when plumage fresh), secondaries finely edged olive or pale buffish-brown and tertials fringed pale whitish-buff; throat to upper breast white, becoming

buff-brown on lower breast to belly, streaked darker brown or grey-brown on breast and flanks, with vent and undertail-coverts white or whitish-buff, streaked browner; iris brown; bill variably pale buffish, pinkish-flesh or yellowish, with darker culmen and tip; legs blackish-brown or black. Differs from *S. gularis* in white wingbars and tertial fringes, black chin and darker underparts, and lack of broad white supercilium. Sexes alike. Juvenile resembles adult, but more heavily streaked above and below. Voice. Song, from tops of bushes and trees, loud and fairly typical of genus, including various fluty notes, warbles and liquid trills, chattering notes and buzzes, e.g. "weety weety chipip cheewee witty wipwipwip chiriri cheewip jeeer", interspersed with several more nasal notes and occasional mimicry of calls and songs of other birds, including Cape Robin-chat (*Cossypha caffra*), Bar-throated Apalis (*Apalis thoracica*), Victorin's Scrub-warbler (*Bradypterus victorini*), Cape Grass-warbler (*Spenoeacus afer*), Karoo Prinia (*Prinia maculosa*), Cape White-eye (*Zosterops pallidus*), Cape Sugarbird (*Promerops cafer*), Orange-breasted Sunbird (*Anthobaphes violacea*), Malachite Sunbird (*Nectarinia famosa*), Greater Striped Swallow (*Cecropis cucullata*) and Cape Bulbul (*Pycnonotus capensis*). Calls include distinctive "trillywazeet", "twee-oo" and a more typical "sweet"; alarm or anxiety call "tree-lee-loo".

Habitat. Coastal and lower montane bush, particularly mature *Protea* shrubs and dense tall shrubs, fynbos, semi-arid scrub, woods and evergreen mixed forest and pine (*Pinus*) forest.

Food and Feeding. Mostly seeds, buds, flowers and fruit of *Protea*, also of other plants; some insects taken. Seeds include those of *Protea nitida*, *Protea neriifolia*, *Protea repens*, *Cliffortia cuneata*, *Diosma*, *Elegia*, *Eriocephalus*, *Restio*, *Metalasia*, *Chenopodium*, *Salvia*, *Raphanus*, *Leucadendron*, *Hakea*, *Senecio*, *Maytenus*, *Erica* and *Rhus anarcardia*; buds, shoots and flowers of *Cliffortia dregeana meyeriania*, *Cliffortia ruscifolia*, *Euphorbia mauretanica*, *Halleria elliptica*, *Chenopodium*, *Cullumia*, *Othonna amplexicaulis*, *Inula graveolens*, *Erica plukenetii*, *Euryops*, *Gymnodiscus*, *Ursinia*, *Aspalathus* and *Zygophyllum*; also fruits and fruit pulp of *Kiggelaria africana*, *Olea europaea* (of subspecies *africana*), *Asparagus*, *Diospyros*, *Maytenus*, *Oftia*, *Pollichia*, *Rhus* and *Protoasparagus*; nectar of *Protea repens*, *Erica*, *Halleria* and *Salvia*. Small numbers of insects, principally termites (Isoptera) and beetles (Coleoptera). Forages in low cover, on ground and under shrubs or bushes; usually unobtrusive and retiring, but also approachable when feeding in preferred bush; spends long periods in thick vegetation. Probes into floral bracts to obtain nectar, extracts seeds from open *Protea* flowerheads and tears into flowering buds. Forages singly, in pairs and in small groups, exceptionally in larger gatherings of up to 40 individuals at common food source.

Breeding. Season Aug–Oct. Monogamous. Solitary nester. Male displays by making long gliding flight, interspersed with deep wingflaps and loud twittering, between bushes; also courtship-feeds perched female, which begs food by leaning towards male with slightly open bill, raised crown feathers and slightly quivering wings, male feeding her by regurgitation. Nest a flimsy cup of plant fibres, twigs and stems (usually includes stems of *Helichrysum crispum*), fine plant down (usually of proteas) and fine grasses, usually placed up to 4 m above ground in fork or along depression in branch of *Protea* bush, occasionally in pine tree or other shrub or tree. Clutch 2–4 eggs, white or very pale blue, finely speckled or lined with reddish-brown to purple-black; incubation period 17 days; chicks fed by both parents, nestling period 14 days.

Movements. Resident. Probably some short-distance wandering, e.g. has occurred N of breeding area in semi-arid thornbush of Little Karoo.

Status and Conservation. Not globally threatened. Restricted-range species: present in Cape Fynbos EBA. Uncommon to locally common. Formerly categorized as Near-threatened, but appears not to be at any current risk. Possibly vulnerable to burning and afforestation of mountain fynbos and to urban coastal developments. Periodic monitoring of population advisable.

Bibliography. Barnes (2000), Bligh (1986), Broekhuysen & Martin (1965), Clement *et al.* (1993), Collar *et al.* (1994), Fraser (1997b), Fraser & Richardson (1989), Fry & Keith (2004), Ginn *et al.* (1989), Harrison *et al.* (1997), Hockey *et al.* (2005), Mackworth-Praed & Grant (1963), Maclean (1993), MacLeod & Stanford (1958), Milewski (1978), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960, 1967), Tarboton (2001).

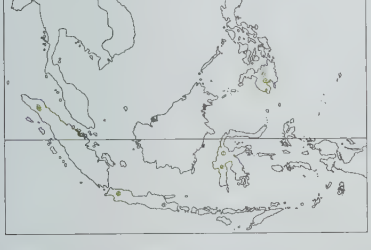
40. Mountain Serin

Serinus estherae

French: Serin malais **German**: Malaiengirlitz **Spanish**: Serín Montano
Other common names: Malaysian Serin/Finch/Goldfinch; Sunda Serin (Sunda races); Javan Greenfinch (*estherae* and *orientalis*); Indonesian Serin (*estherae*); Mindanao Serin (*mindanensis*)

Taxonomy. *Crithagra Estherae* Finsch, 1902, Mount Pangrango, 6000 feet [c. 1830 m], western Java. Apparently an isolated or relict outpost of this genus, and may in fact be more closely linked to *Carduelis*. Exact relationship of widely dispersed races to one another unclear, and they may represent more than one species; taxonomic identity of population in NC Sulawesi unknown. Further research required. Five subspecies currently recognized.

Subspecies and Distribution.
S. e. vanderbilti Meyer de Schauensee, 1939 – N Sumatra (Mt Leuser area).
S. e. estherae (Finsch, 1902) – W Java (Mt Pangrango).
S. e. orientalis Chasen, 1940 – E Java (Tengger Mts and W Yang).
S. e. mindanensis Ripley & Rabor, 1961 – C Mindanao (Mt Kitanglad and Mt Apo), in S Philippines.
S. e. renatae Schuchmann & Wolters, 1982 – Mt Rantekombola, in S Sulawesi.
Also present, race unknown, in NC Sulawesi (Mt Rano Rano and Mt Rorekatimbu).



Descriptive notes. 11–12 cm. Small, blunt-billed finch with yellow wingbars and rump, and whitish around eye. Male nominate race has forehead and lower side of crown yellow (can appear spotted, with dark feather bases showing), rest of crown and nape grey-brown; area surrounding eye whitish-buff, ear-coverts grey-brown, submoustachial area yellow; mantle, back and scapulars olive-brown, tinged grey, rump and uppertail-coverts deep golden-yellow (uppertail-coverts may show broad dark centres), tail blackish-brown; upperwing-coverts blackish-brown, pale yellow tips on median and greater coverts (forming double wingbar); alula, primary coverts and flight-feathers blackish-brown, in fresh plumage secondaries thinly edged pale yellowish-white and tertials edged pale yellow on outer webs; chin to lower throat brownish, breast pale buffish-white or yellow, heavily spotted or streaked blackish-brown, markings continuing onto whitish flanks, belly to undertail-coverts unstreaked white; iris dark brown or black; bill dark brown to olive-brown above, pale brown below; legs brown or dark brown. Female is like male but has yellow paler, little or no yellow on forehead and crown, may show white lores and narrow eyering, also yellow on rump and yellow tips of wing-coverts paler or duller, breast mostly buffish-white with slight tinge of yellow at side, streaks on underparts slightly more extensive. Juvenile undescribed; juvenile of race *vanderbilti* resembles female, but has pale grey-brown shawl or collar, bright yellow on rump and uppertail-coverts, and lacks yellow on underparts. Race *vanderbilti* has small bill, male has dark lores, small area of white around eye, secondaries and inner primaries narrowly edged white, chin and throat brown, breast yellow with dark brown spots, female like male but darker on chin, less olive on throat and upperparts; *orientalis* is not well known, apparently very like nominate, but only small area of yellow on moustachial area (not extending across chin), dark lores, small area of white around eye, tips of wing-coverts pale yellow, breast yellow with black streaks; *mindanensis* has bill more bluntly tipped than other races, is also darkest, dark olive-brown upperparts with greenish-olive edges on mantle, back and scapulars, bright yellow rump, wing-covert tips and tertial edges, also forehead to crown, cheek, throat and breast bright yellow, area around eye dark olive, underparts off-white, finely streaked darker; *renatae* is similar to *vanderbilti*, but bill larger, lores dark with little or no white around eye, tips of wing-coverts and edges of tertials bright yellow, chin and throat dark brown, underparts whitish, finely streaked brown on breast and flanks (some individuals erythristic, have yellow areas replaced with reddish-orange). Voice. Song poorly known, but gives short tinkling song similar to that of Black-capped White-eye (*Zosterops atricapilla*). Calls include a dull, metallic chittering note.

Habitat. Alpine and subalpine grasslands and heather-dominated meadows with scattered bushes and scrub above tree-line, at 1400–3400 m; on Mindanao occurs above 1500 m in montane rainforest and moss forest or edges of ericaceous forest. In Sulawesi, found at 1900–2300 in NC and at 2000–3000 m in S; down to 1300 m in W Java.

Food and Feeding. Diet largely unknown; probably a variety of seeds and small fruit. Forages low down in low bushes or other vegetation and on ground; recorded as foraging on flowers of large terrestrial orchid. Shy and retiring, spends long periods perched unobtrusively in a bush. Singly and in small groups.

Breeding. No information.

Movements. Resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Mindanao and the Eastern Visayas EBA, Sumatra and Peninsular Malaysia EBA, Java and Bali Forests EBA, and Sulawesi EBA. Poorly known. Rare, scarce and infrequently recorded. In Sumatra, occurs within Gunung Leuser National Park.

Bibliography. Bishop & King (1986), Clement *et al.* (1993), Dickinson *et al.* (1991), Kennedy *et al.* (2000), King *et al.* (1975), MacKinnon & Phillipps (1993), van Marle & Voous (1988), Meyer de Schauensee & Ripley (1940), Schuchmann & Wolters (1982), White & Bruce (1986).

Genus *PSEUDOCHLOROPTILA* Wolters, 1950

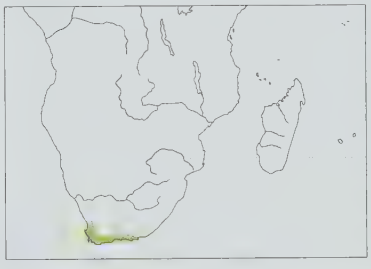
41. Cape Siskin

Pseudochloroptila totta

French: Serin totta **German**: Hottentottengirlitz **Spanish**: Canario de El Cabo
Other common names: South African Siskin

Taxonomy. *Loxia totta* Sparrman, 1786, Cape Province, South Africa.
Genus formerly subsumed within *Serinus*, but differs morphologically, in display behaviour and in breeding ecology. This species forms a superspecies with *P. symonsi*, and previously considered conspecific. Monotypic.

Distribution. SW South Africa (Western Cape E to SW Eastern Cape).



Descriptive notes. 12–13 cm; 10–20·3 g. Small to medium-sized, drab-brown finch with conical bill and prominent white tips on primaries and tail. Male has forehead and most of crown streaked dull olive-brown and olive-yellow, becoming brownish-grey with fine darker steraks on nape, thin and rather indistinct dull yellowish supercilium; face dusky olive, streaked yellowish on cheek and ear-coverts; mantle, scapulars and back warm brown, tinged olive, rump yellowish-olive, uppertail-coverts brown, longest coverts with pale grey fringes; tail black, broadly tipped white; upperwing-coverts dark brown, fringed warm brown, flight-feathers blackish-brown, finely edged browner, tertials dark brown, tipped paler, tips of outer secondaries and primaries white or pale whitish-buff; yellow or olive-yellowish below, browner on belly and flanks, chin finely spotted with brown, vent to undertail-coverts grey-brown with greyish-white tips; iris brown; bill dark horn or blackish, paler pinkish-brown base of lower mandible; legs pale brown. Distinguished from *P. symonsi* mainly by white tips on primaries and tail feathers. Female is similar to male, but head buffish-brown, streaked darker, upperparts dark brown, thinner white tips on primaries, outer secondaries and tertials (pale tips may be lost through wear), dull olive-yellow or buffish on chin and throat, streaked darker brown from chin to breast and decreasingly so onto flanks. Juvenile resembles female but duller, underparts browner and more heavily streaked buffish-brown, young male yellow on throat and breast; acquires adult plumage within first three months. Voice. Song a weak, musical warble with liquid twitters and including several "peechee" notes, e.g. "chewy-chewy-chee-chee-tsew-tsew-peechee-peechee-titsew-lirrrrrr-chewy". Calls include high-pitched, metallic "tchwing, tchwing, tchwing" and sibilant "tsip" or "tsi-peew"; in flight "peechee" or "pitchee".

Habitat. Lowland and lower montane rocky hills, foothills, fynbos and edges of coastal scrub and woodland, including macchia scrub and stands of *Protea* bushes, also plantations of pines (*Pinus*), both native and introduced species, and stands of *Acacia cyclops*; in non-breeding season occurs in lower-lying valleys, parks and gardens close to mountain areas, including suburban areas of Cape Town.

Food and Feeding. Mostly small seeds, buds, flowers, also insects. Seeds include those of proteas, *Leucadendron*, *Erica plukenetii*, *Dicerothamnus rhinoceros*, *Restio*, *Ficinia*, *Thamnocortus*, *Athanasia*, *Metalasia*, *Cliffortia*, *Elytropappus*, *Stoebe* and *Chenopodium*, also variety of grasses and trees, including casuarinas (*Casuarina*); in areas of recent bush fires moves to forage on seeds of *Widdringtonia nodiflora* and *Leucadendron*, extracting them from cones on burnt trees or on ground. Forages quietly on ground among bushes and grasses or in small shrubs and bushes. Fairly shy and unobtrusive, spends long periods on ground or beneath shrubs; perches on taller vegetation when disturbed. Makes regular flights to drink, including to small pools among rocks. Forages in pairs and in small groups of up to 15 individuals, more rarely solitarily; in recently burnt patches gathers in flocks of c. 100.

Breeding. Season Aug–Dec. Monogamous. Solitary. Displaying male makes rapid whirring flight in front of perched female. Nest built by female alone, often accompanied by male when collecting material, a shallow cup of fine grasses, dry flowers, roots, plant down, wool and animal hair, usually placed in rocky crevice, pothole, or niche on cliff ledge and often concealed under fern or shrub, occasionally in hole in tree, and frequently near water. Clutch 3–5 eggs, pure white; incubation by female alone, regularly fed on nest by male, period 16–17 days; chicks fed and cared for by both parents, nestling period 20 days.
Movements. Sedentary but breeding birds from higher areas move to lower levels in non-breeding season; becomes more numerous in extreme E of range mid-winter and numbers decline in spring suggesting winter influx of altitude migrants.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cape Fynbos EBA. Common to locally common.
Bibliography. Barnes (2000), Claassen (2002), Clement *et al.* (1993), Collar *et al.* (1994), Fraser (1997c), Fry & Keith (2004), Ginn *et al.* (1989), Hockey *et al.* (2005), Mackworth-Praed & Grant (1963), Maclean (1993), Milewski (1978), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960), Tarboton (2001), Ward (2001).

42. Drakensberg Siskin

Pseudochloroptila symonsi

French: Serin de Symons **German**: Basutogirlitz **Spanish**: Canario del Drakensberg
Other common names: Symond's Siskin

Taxonomy. *Spinus symonsi* Roberts, 1916, Sangebetu Valley, Drakensberg Mountains, South Africa.
Genus formerly subsumed within *Serinus*, but differs morphologically, in display behaviour and in breeding ecology. This species forms a superspecies with *P. totta*, and previously considered conspecific. Monotypic.
Distribution. Lesotho and EC South Africa (NE Free State, W KwaZulu-Natal and NE Eastern Cape).



Descriptive notes. 13–14 cm; 11–16·8 g. Small to medium-sized, drab finch. Male has forehead to nape and side of neck dull yellowish-green, finely streaked darker; short, indistinct olive-yellow supercilium to behind eye and thin crescent below eye; lores dark grey, becoming dull olive-green with yellow streaks on cheek and ear-coverts; mantle, scapulars and back dark rust-brown, indistinctly streaked darker, upper rump grey-brown, becoming olive-green on lower rump, uppertail-coverts dark brown, fringed pale greyish-buff in fresh plumage; tail black or blackish, outer feathers with white inner web; upperwing dull brown, median coverts finely fringed dull greenish-yellow, greater coverts and remiges dull dark brown to blackish with ash-grey or pale buffish fringes; chin and throat greenish-yellow, breast olive-green with yellow tinge, washed brown at side, becoming yellower on lower breast, pale brown on flanks and warmer brown on lower flanks; centre of belly to undertail-coverts pale buff or whitish; iris brown; bill dark horn or brownish, paler base of lower mandible; legs pale brown. Differs from *P. totta* mainly in lack of white tips on flight-feathers and tail feathers. Female is similar to male, but head browner, upperparts duller brown, and crown to back more heavily streaked darker brown; chin and throat pale buff or whitish, streaked dark brown or blackish, streaks continuing to upper breast and flanks, breast to undertail-coverts buffish-brown, or paler buff from belly downwards. Juvenile resembles female but duller, more heavily streaked on head to breast and flanks, underparts paler buff, except for dark brown lower flanks. Voice. Song, given for prolonged periods throughout day in breeding season, a lively jumble of buzzing "cheez" notes interspersed with metallic chirps. Calls include "schwee", "jer-chweet" and a 3-note "jer-chweet-chweet", together with calls similar to those of *P. totta*.
Habitat. Lower montane and submontane heathland, scrub and grassy areas on plateau, hillsides and valleys of Drakensberg range, usually above 2600 m; in non-breeding season in open bushes, scrub and edges of cultivation of lower-level ravines, gulleys and valleys, down to 1500 m.
Food and Feeding. Mainly a variety of seeds, buds and small insects. Seeds and buds include those of grasses and proteas, also *Schkuhria pinnata*, *Taraxacum officinale*, *Sonchus oleraceus*, *Galinsoga parviflora*, *Capsella bursapastoris*, *Sisymbrium capensis*, *Stellaria media*, *Chrysocoma tenuifolia*, *Oxalis pescaprae*, *Cyperus esculentus*, *Echinochloa colona*, *Echinochloa crusgalli*, *Panicum schinzii*, *Panicum maximum*, *Rhynchelytrum repens* and *Salvia splendens*, also flowerhead of *Erythrina*; insects taken include termites (Isoptera). Forages on the ground and in low shrubs; generally tame and approachable. In pairs and small flocks; often associates loosely with *Serinus flaviventris* and *Alario alario*.
Breeding. Season Nov–Jan. Probably monogamous, solitary and territorial. Nest a neat, shallow cup of dry grasses, plant fibres, leaves and animal hair, placed in rock crevice, pothole or hole in cliff, rock face or bank, usually concealed by overhanging plant, exceptionally in bush. Clutch 2–4 eggs, white or pale greenish-blue, finely speckled and spotted reddish-brown or slate-grey; incubation by female alone, period 17–19 days. No other information.
Movements. Altitudinal migrant; descends to lower levels and valleys in non-breeding season and during cold or wet summers.
Status and Conservation. Not globally threatened. Restricted-range species: present in Lesotho Highlands EBA. Common to locally common.
Bibliography. Barnes (2000), Brown & Barnes (1984), Clement *et al.* (1993), Collar *et al.* (1994), Fry & Keith (2004), Ginn *et al.* (1989), Hockey *et al.* (2005), Jenkins (1997), Mackworth-Praed & Grant (1963), Maclean (1993), Osborne & Tigar (1990), Sinclair & Ryan (2003), Sinclair *et al.* (2002), Skead (1960), Tarboton (2001), Urquhart (1992).

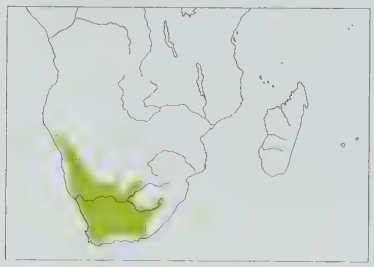
Genus *ALARIO* Bonaparte, 1850

43. Black-headed Canary

Alario alario

French: Serin alario **German**: Alariogirlitz **Spanish**: Serín Alario
Other common names: Mountain Canary; Damara (Blackhead)/Namibia Canary (*leucolaemus*)

Taxonomy. *Emberiza alario* Linnaeus, 1758, Cape of Good Hope, South Africa.
Genus often subsumed within *Serinus*, but differs morphologically and separate status more appropriate. Race *leucolaemus* has previously been treated as a separate species, but intergrades widely with nominate in NW South Africa; further research required. Two subspecies recognized.
Subspecies and Distribution.
A. a. leucolaemus Sharpe, 1903 – S Namibia and NW & WC South Africa (Northern Cape E to W Free State).
A. a. alario (Linnaeus, 1758) – W & C South Africa (C Northern Cape E to S Free State, S to C & S Karoo) and Lesotho.



Descriptive notes. 12–13 cm; 11–14 g. Small to medium-sized canary with chestnut upperparts and tail. Male nominate race has head to side of neck, chin, throat and centre of breast jet-black (may show some white tips in fresh plumage), broad white or whitish-buff collar from lower nape across side of neck to side of breast; upperparts (including median and greater upperwing-coverts, most of secondaries and tertials) rich chestnut-brown, slightly richer on rump and uppertail-coverts, tail also deep chestnut with fine black centres near tips of feathers; rest of wing black or blackish, secondaries partially black towards base, tertials with inner webs largely black; rest of underparts white or buffish-white, flanks and undertail-coverts sometimes tinged buffish-brown, a broad line of blackish spots (fringed rufous in fresh plumage) on lower side of breast (below black area); iris brown; bill dark greyish-horn, usually paler horn on lower mandible; legs pale brown to slate-grey or black. Female has head and face to upper mantle dull grey-brown, indistinct narrow pale supercilium, sometimes small pale subocular crescent, side of neck to side of breast greyer; back and scapulars rich brown, streaked darker brown or blackish, becoming richer brown or pale chestnut on lower back, rump and uppertail-coverts, tail also chestnut with blackish shaft streaks; lesser and median upperwing-coverts warm brown or light chestnut, greater coverts black at base with broad chestnut tips, alula, primary coverts and flight-feathers blackish, inner secondaries and tertials edged rufous or chestnut-brown; mostly pale buff or light greyish below, chin and throat darker grey, side of lower breast and flanks warm buff-brown, paler whitish-buff on centre of belly and vent; bare parts much as for male. Juvenile resembles female, but generally paler brown on head and face, darker feather centres on mantle, back and scapulars, tail darker at tip, paler brown lesser and median coverts and tips of greaters, more heavily streaked below (extending to flanks). Race *leucolaemus* has white side of forehead and broad white supercilium to rear of ear-coverts, also white subocular crescent reaching base of bill, ear-coverts streaked blackish with white central patch, chin and throat white, black crescent across breast (amount of black on head variable, some showing more white than black), female similar to nominate but has narrow buffish-white supercilium and whitish subocular patch, centre of ear-coverts pale buff, chin and throat pale greyish-white, and breast pale cinnamon. Voice. Song, by male only, a rather unmelodious jumble of liquid and twanging notes interspersed with buzzes, trills and twitters, frequently including a buzzing "zhreee" and low chuckling notes. Calls include "chway", "chwooee" and "pee-chee", also abrupt "dit" or "didit", and low "tseet", "tweet" or "sweea".
Habitat. Lowland and lower montane dry rocky outcrops, semi-arid scrub on hills, and open grassland with scattered bushes, edges of cultivation, fallow fields, bushes and scrubby areas along streams, vleis, dune slacks; also suburban areas, including gardens.
Food and Feeding. Mainly seeds of a variety of plants and grasses, also other plant parts, also some insects. Seeds include those of *Panicum maximum*, *Panicum laevifolium*, *Alternanthera pungens*, *Bidens pilosa*, *Lepidium africanum*; also takes buds, leaves and flowers of *Senecio tamoides* and *Flaveria bidentis*, and fruits including *Morus mesozygia*. Insects taken include termites (Isoptera). Forages on ground and in lower levels of shrubs and bushes; makes regular short-distance flights to drink. In pairs and small groups; in non-breeding season gathers in larger flocks of up to 200 individuals, often tame and confiding. Occurs in mixed-species flocks with *Serinus flaviventris*, *Serinus albogularis*, House Sparrow (*Passer domesticus*), Cape Sparrow (*Passer melanurus*), also buntings (Emberizidae) and estrildid finches (including genera *Estrilda*, *Ortygospiza* and *Amadina*).
Breeding. Season Jul–Apr. Monogamous. Loosely colonial. Nest built by female alone, accompanied by male when collecting material, a deep cup of thin, dry grasses, animal hair, plant down, wool and some feathers, placed low down within 1 m of ground in small bush or shrub, often in overhanging rock face or side of ditch and open to view. Clutch 2–5 eggs, white or pale bluish-green, sparsely blotched or spotted with reddish-brown; incubation by female only, fed on nest throughout by male, period 13–14 days; chicks fed and cared for by both parents, nestling period 20–21 days. Maximum recorded longevity 16 years.
Movements. Resident, partially nomadic and irruptive. In non-breeding season (mostly Jan–Aug) nominate race wanders in flocks throughout range in search of foraging areas, also infrequently occurs S to coastal grasslands of E & SW Cape; *leucolaemus* wanders in non-breeding season (mainly May–Jul and Oct–Dec) S to Lambert's Bay and irregularly to coastal areas of Western Cape and E to W Free State. Wintering individuals usually remain in non-breeding area until food supply exhausted, and flocks begin to break up and move back towards breeding area at approach of spring (but has bred in extreme SW). Nominate race recorded as vagrant in Botswana and in NC South Africa (N Free State and former Transvaal).
Status and Conservation. Not globally threatened. Common to locally common or uncommon.
Bibliography. Clement *et al.* (1993), Cole (1992), David & Gosselin (2002a), Dean & Harrison (1997), Fry & Keith (2004), Ginn *et al.* (1989), Hockey *et al.* (1989), Mackworth-Praed & Grant (1963), Maclean (1993), Ryan *et al.* (2004), Sinclair & Ryan (2003), Skead (1960), Tarboton (2001), Urquhart (1992).

Genus *NEOSPIZA* Salvadori, 1903

44. Sao Tome Grosbeak

Neospiza concolor

French: Néospize de Sao Tomé **German**: Einfarbgirlitz **Spanish**: Picogordo de Santo Tomé
Other common names: Sao Tome Grosbeak Weaver, Sao Tome/St Thoma's Canary, Grosbeak Weaver/Bunting, Neospiza

Taxonomy. *Amblyospyza* [sic] *concolor* Bocage, 1888, São João dos Angolares, São Tomé Island. Recent genetic evidence indicates close relationship to *Serinus rufobrunneus*, suggesting that, pending review of entire genus, this species may be better placed in *Serinus*. Monotypic.
Distribution. São Tomé I.
Descriptive notes. 19–20 cm. Large, uniformly coloured finch with massive bill. Plumage is almost entirely dark cinnamon-brown or chocolate-brown, with short blackish streaks (visible at close range) on crown to nape and ear-coverts; lores to eye dark brown, mantle, scapulars and bases of wing and tail slightly darker or blackish-brown; iris dark brown or black; bill dark horn; legs dark brown to blackish. Sexes presumed alike. Juvenile undescribed. VOICE. Song a 2-note whistle, second note higher, frequently repeated, similar in tone to that *of Serinus rufobrunneus*; call a brief series of 4–5 short whistles.
Habitat. Lowland, dense closed-canopy primary forest at 230–400 m.
Food and Feeding. Diet largely unknown; food mostly hard-shelled seeds or fruits, as indicated by bill size. Forages in *Uapaca guineensis* and *Dicranolepis thomensis* trees; forages at middle level and in canopy of forest trees, also on ground. In pairs and singly.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in São Tomé EBA. Very poorly known. Discovered in 1888, but seen infrequently and soon considered extinct, until rediscovery in 1991 near R Xufexufe, in SW São Tomé; subsequently reported on about six further occasions, from the Xufexufe, Ribeira Peixe and São Miguel areas. Small amount of suitable habitat remaining and scarcity of records indicates a tiny global population, currently believed to number fewer than 50 individuals. In the past, large areas of lowland forest were cleared for cocoa plantations. At present time, land privatization has led to increase in number of small farms and consequent tree clearance; although this does not impinge on primary forest, it could become a threat in the future. Vulnerable to further loss of habitat; potential threats also from increasing human access to remote areas owing to road developments. In addition, introduced predators, namely black rat (*Rattus rattus*), mona monkey (*Cercopithecus mona*), African civet (*Civettictis civetta*) and weasel (*Mustela nivalis*), could represent a threat, and this possibility needs to be investigated. Primary forest on São Tomé is protected both in Obo Natural Park and elsewhere, but law enforcement in these areas is non-existent; also, lack of information on this species' ecological requirements severely hampers any attempt to assess the benefits provided by such areas. Conservation initiatives already started include the training of local communities in implementation of site-based conservation and a programme designed to raise public awareness of the species' plight. Research is urgently required to determine its population size, distribution and ecological demands, and to identify major threats so that the necessary conservation action can be taken. Ensure designated protected areas are actively protected.



Bibliography. Anon. (2009i), Atkinson *et al.* (1991), Bannerman (1915, 1949), Bocage (1888, 1891), Borrow & Demey (2001), Butchart & Stattersfield (2004), Christy & Clarke (1998), Clement *et al.* (1993), Collar & Stuart (1985), Dallimer, King & Leitão (2003), Fry & Keith (2004), Jones & Tye (2006), Leventis & Olmos (2009), Melo (2006), de Naurois (1975, 1983), Olmos & Turshak (2007), Salvadori (1903), Sargeant *et al.* (1992), Sinclair & Ryan (2003), Snow (1950), Stattersfield & Capper (2000), Steinheimer (2005).



PLATE 36

inches 3

cm 8

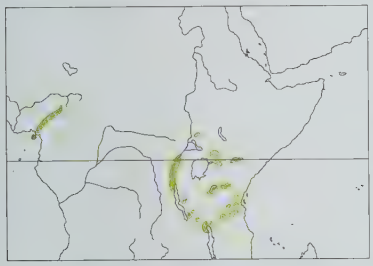
Genus *LINURGUS* Reichenbach, 1850

45. Oriole Finch

Linurgus olivaceus

French: Linurge loriot **German**: Pirolgimpel **Spanish**: Canario Oropéndola

Taxonomy. *Coccothraustes olivaceus* Fraser, 1843, Clarence, Bioko Island.
Genus may have closer affinities with some Palearctic *Carduelis* species than is otherwise apparent. Present arrangement of races possibly comprises more than one species, but a more detailed and comprehensive analysis of all populations is required before determining species limits. Four subspecies recognized.
Subspecies and Distribution.
L. o. olivaceus (Fraser, 1843) – SE Nigeria, W Cameroon and Bioko I (Fernando Póo).
L. o. prigoginei Schouteden, 1950 – E DRCongo, extreme SW Uganda, W Rwanda and W Burundi.
L. o. elgonensis van Someren, 1918 – SE Sudan, E Uganda and W & C Kenya.
L. o. kilimensis (Reichenow & Neumann, 1895) – extreme S Kenya (Mt Ol Doinyo Orok, in Namanga Hills), Tanzania and N Malawi.



Descriptive notes. 12–13 cm; 18–29·5 g. Small to medium-sized, brightly coloured finch with conical bill. Male nominate race has entire head to hindcrown, chin and upper throat jet-black, nape and lower side of neck bright yellow, lower nape to back and scapulars, also lesser and median upperwing-coverts, yellowish-green, becoming yellow across lower back to rump and uppertail-coverts; tail light olive, broadly fringed yellow; greater upperwing-coverts blackish, broadly edged greenish-yellow and tipped bright yellow, flight-feathers black, tips of secondaries and tertials broadly fringed yellow, tips of lower tertial, outer secondaries and primaries creamy white; underparts golden-yellow, tinged orange on upper breast and greenish on flanks; iris black; bill bright orange-yellow; legs orange-brown. Female has forehead to nape, face, chin and throat dull grey to olive-green, upperparts, including lesser and median coverts, and tail dull greenish-olive, or slightly paler on rump and uppertail-coverts; greater coverts blackish, finely edged green and broadly tipped yellow, flight-feathers also blackish, secondaries and tertials broadly edged green or yellowish-green and tipped bright yellow; underparts greenish or yellowish-green, brighter yellow on undertail-coverts; bill more yellowish, less orange, than male's. Juvenile is similar to female, but head more uniform or only slightly greyer than duller green upperparts and streaked finely darker on crown and face, yellow tips of greater coverts and edges of flight-feathers duller, underparts pale yellow or yellowish-buff, streaked finely brownish on breast and flanks, bill brown or blackish-brown. Race *prigoginei* lacks yellow collar below black head, has underparts tinged orange-brown; *elgonensis* has entire upperparts bright golden-yellow, tinged brown or golden-brown on mantle, back and scapulars, broad silvery white on inner webs of secondaries and tertials, creamy white on tips of primaries, bright yellow tail and underparts, female similar to nominate but with outer webs of secondaries bright yellow and underparts dull olive with yellowish wash; *kilimensis* is darker olive above and below, black of head often extends to centre of upper breast, and tail almost entirely dark olive, edged and finely tipped yellow, female has lores dark grey, face dark grey with olive-green flecks, chin olive-green. Voice. Song a series of variably rapid and slow musical trills interspersed with longer drawn-out whistled "seeeeeeee", a chattering "tsaa-tsaa-tsaa" or "tsee-too, tsee-too", also a soft churring concluding with a soft or melodic whistle; song of race *kilimensis* similar, "cheep cheep cheep cheep tsee tsee tsee tsee chureeeeeee swee tsip-tsip-tsip-tsip chereeeep", the long middle and final notes upslurred; song of *elgonensis* more variable, a short and rapid "tsew-tsew-tsew siiiiiiiiii" which may conclude with thin or high-pitched notes, or several high-pitched notes terminating in thin twitter, "seet-seet, seet-seet-seet-sweeet, suweet sieu-sieu, cheew chew-chew-chew tititititiiti". Calls include high-pitched or wheezing "tssip", "twee", "tzit-tzit" and "sip-sip".
Habitat. Inhabits undergrowth, clearings and edges of lower montane and submontane evergreen forest and cloudforest at altitude range of 1700–3000 m; also occurs in damp riverine forests, eucalypt (*Eucalyptus*) plantations, thickets, ravines, gardens, scrub and areas of long grass; can be found in dwarf trees and stunted bamboo above tree-line. Nominate race occurs down to 1000 m on Mt Cameroon.
Food and Feeding. Mostly seeds of trees and large shrubs, including albizias, millet, nettles, figs (*Ficus*), cultivated tobacco plants (*Nicotiana*) and grasses; also algae, taken from sides of pools and slow-moving rivers; also occasionally caterpillars. Forages low down in undergrowth, in scrub or to middle or canopy level of cloudforest and bamboo clumps; takes seeds from tree foliage, saprophytic orchids, lianas and along liana-covered branches, and feeds at flowerheads; shy and restless, most often recorded at forest edge. Forages alone, in pairs and in small loose or scattered groups.
Breeding. Season Nov–Feb. Presumed monogamous and solitary. Nest built by female, a shallow untidy cup of moss, lichens, plant fibres and plant down, placed within 1·5 m of ground in bush. Clutch 2–3 eggs, white, sometimes sparsely speckled or finely lined reddish-brown. No further information.
Movements. Resident and partial migrant; small numbers of high-elevation breeders wander or move erratically to lower levels in non-breeding season.
Status and Conservation. Not globally threatened. Reckoned to be generally uncommon throughout, although locally common in some parts. Described as not uncommon in W portion of range (nominate race).
Bibliography. Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Ferri, Wink & Serrano-Vela (2008), Arnaiz-Villena, Moscoso, Ruiz-del-Valle, Gonzalez, Reguera, Wink & Serrano-Vela (2007), Borrow & Demey (2001), Bösche (2009), Clement *et al.* (1993), Dowsett-Lemaire & Dowsett (2006), Elgood *et al.* (1994), Fry & Keith (2004), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1952, 1963, 1973), Nguembock *et al.* (2009), Short *et al.* (1990), Sinclair & Ryan (2003), Stevenson & Fanshawe (2002), Zimmerman *et al.* (1996).

Genus *RHYNCHOSTRUTHUS*

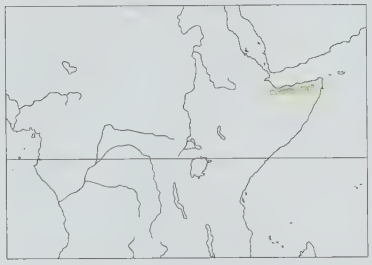
P. L. Sclater & Hartlaub, 1881

46. Somali Grosbeak

Rhynchostruthus louisae

French: Grand-verdier de Somalie **German**: Somaligimpel **Spanish**: Picogordo Somalí
Other common names: Somali Golden-winged Grosbeak

Taxonomy. *Rhynchostruthus louisae* E. L. Phillips, 1897, Golis Mountains, north-west Somalia.
Previously considered conspecific with *R. percivali* and *R. socotranus*, but morphological and plumage differences sufficient to warrant separation as full species. Monotypic.
Distribution. Mountains of N Somalia from near Ethiopian border E to W foothills of Jebel Hantara.



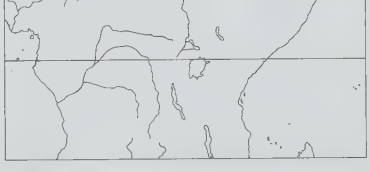
Descriptive notes. 15 cm; 23–26 g. Medium-large, stoutly built finch with large head and fairly short tail. Male has forehead and crown dull dark brown, lores to throat black, ear-coverts grey or greyish with white anterior edge; upperparts grey-brown, rump paler or greyer; tail blackish, all except central feather pair with broad yellow edges, yellow broadest at base; median upperwing-coverts grey-brown, fringed golden-yellow, greater coverts (except inner feathers) golden-yellow, flight-feathers blackish-brown, except for mostly golden-yellow secondaries; breast pale greyish, belly to undertail-coverts white or whitish; iris blackish; bill blackish; legs light flesh-brown. Differs from *R. socotranus* mainly in head pattern, also in slightly smaller bill. Female resembles male, but forehead and crown paler, black on head restricted to face and chin. Juvenile is similar to female, but plumage streaked and facial mask indistinct. Voice. No information; calls probably similar to those of *R. socotranus* and *R. percivali*.
Habitat. Lowland to lower montane thorn-covered and scrub-covered rocky outcrops, slopes and dry wadis with giant euphorbias (*Euphorbia abessinica*); sea-level to at least 1400 m.
Food and Feeding. Diet largely unknown; presumed similar to that of congeners, i.e. variety of seeds, buds and fruit, mostly of euphorbias, and particularly fruits of giant euphorbia. Forages in bushes, trees and on the ground; often perches on tops of thorn bushes or euphorbias; generally shy and elusive. Forages singly, in pairs and in small groups of up to eight individuals.
Breeding. No information.
Movements. No information; presumed to be sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in North Somali Mountains EBA. Very poorly known, and very few definite observations. Considered scarce, with estimated population of fewer than 10,000 individuals; very few recent records, but this perhaps due to almost total lack of observer coverage in the region. Formerly (in 1930s) regarded as quite common, at least in Golis Mts, but believed to have declined as a result of habitat loss and recent poor-rainfall years. Field research required.
Bibliography. Archer & Godman (1961), Ash & Miskell (1983, 1998), Clement *et al.* (1993), Collar & Stuart (1985), Fry & Keith (2004), Kirwan & Grieve (2007), Redman *et al.* (2009), Sinclair & Ryan (2003).

47. Arabian Grosbeak

Rhynchostruthus percivali

French: Grand-verdier de l'Arabie **German**: Arabiengimpel **Spanish**: Picogordo Árabe
Other common names: Arabian Golden-winged Grosbeak

Taxonomy. *Rhynchostruthus percivali* Ogilvie-Grant, 1900, Yeshbun, Hadramaut, eastern Yemen.
Previously considered conspecific with *R. louisae* and *R. socotranus*, but morphological and plumage differences sufficient to warrant separation as full species. Monotypic.
Distribution. SW Saudi Arabia, W & E Yemen and SW Oman.



Descriptive notes. 15 cm; two birds 29·6–33·4 g. Medium-large, stout and fairly short-tailed finch with large head and large bill. Male has warm brown forehead to upper nape, merging over lower nape into grey-brown on mantle and rest of upperparts, rump slightly paler; lores, fore cheek and chin blackish-brown, rear cheek and ear-coverts white or washed greyish; tail blackish, all except central feather pair with yellow edges; median upperwing-coverts grey-brown, fringed with golden-yellow, greater coverts (except innermost) golden-yellow, flight-feathers blackish-brown, secondaries mostly golden-yellow; side of neck and throat warm ginger or chestnut-brown, underparts grey-buff; iris blackish; bill blackish or dark slate-grey; legs pale flesh-brown. Distinguished from very similar *R. socotranus* mainly by lack of extensive blackish-brown on head, less yellow in outer tail. Female is similar to male, but black of face replaced by poorly defined area of blackish-brown, and generally lacks yellow fringes on outer tail. Juvenile resembles adult, but has dark brown forehead and lores, crown to nape finely streaked darker, ear-coverts pale buff (or buffish-white at rear), side of neck and upperparts brown or grey-brown, heavily streaked darker brown, tail as on adult female, underparts pale buff-brown, becoming whiter with broad brownish streaks on belly and flanks, undertail-coverts whitish-buff, bill blackish with paler grey base of lower mandible. Voice. Song a rambling and frequently discordant or musical jangling series of phrases, including repeated liquid or bubbling notes, "sit-

On following pages: 48. Socotra Grosbeak (*Rhynchostruthus socotranus*); 49. European Greenfinch (*Carduelis chloris*); 50. Oriental Greenfinch (*Carduelis sinica*); 51. Yellow-breasted Greenfinch (*Carduelis spinoides*); 52. Vietnamese Greenfinch (*Carduelis monguilloti*); 53. Black-headed Greenfinch (*Carduelis ambigua*).

eeee-did-oo-ee", "zer...chi-cher-chi-wer-chi" or "tler-chichi-chop-wi", interspersed with upslurred "wer-tli" and short twitters and dry chirps; similar to song of *R. socotranus*. Calls include variety of notes like those of *Carduelis carduelis*, e.g. "wip", "wink", "tzee", "tut-tut-tut", "booo-peep", "seed-loo" or "wheep", "did-ee", "did-did-ee", also soft "tlyit" and more rapid "dy-dy-dy" and a harsh dry trilling "drrrt"; also "si-si-si-soo tzee".

Habitat. Lowland and lower montane and submontane scrub-covered rocky outcrops, slopes and dry wadis, juniper (*Juniperus*) forest, *Anogeissus–Commiphora* woods, acacias (*Acacia*), euphorbias (*Euphorbia*), other succulents and scrub, often at edges of cultivated areas in Yemen; in Oman occurs in steep-sided valleys and coastal slopes with rich growth of *Adansonia digitata*, *Commiphora habessinica* and euphorbia trees and shrubs. Mainly between 1060 m and 3100 m in SW Arabia; down to 50 m in Oman.

Food and Feeding. Variety of seeds, buds and fruit, mostly of euphorbias (particularly *Euphorbia schimperi*), *Ziziphus* and *Juniperus procera*. Forages in bushes and trees and on ground. Acrobatically twists, stretches and reaches down, hanging upside-down in manner recalling a parrot (Psittacidae) to reach fruits; sucks liquid parts of fruit of *Euphorbia schimperi* and extracts small seeds; in Oman, plucks berries of *Commiphora habessinica* and squeezes fleshy fruit in bill, discarding outer pulp by shaking head, and eating seed whole. Forages alone, in pairs and in small groups; generally shy and elusive, and often inactive, especially in early afternoon, in leafy bushes; becomes most active before dusk. Roosts communally.

Breeding. Season Dec to at least Apr. Solitary. Male performs circular stiff-winged, slow-motion gliding and parachuting display-flight similar to that of *Carduelis chloris*; displays also on horizontal branch, where it flutters wings and shivers tail for up to a minute; male courtship-feeds begging female. Nest (only two known) built by both sexes, an open cup or platform of fine twigs, grasses, plant fibres and insect cocoons or pupae cases, some material also taken from old nests of Rüppell's Weaver (*Ploceus galbula*), placed in fork near crown of bush or tree. Fledglings fed by both parents. No further information.

Movements. Resident, little known; may wander at random throughout range in non-breeding season. Makes daily journeys from high-altitude roosts to lower-level feeding areas.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon to scarce. Small global population estimated at c. 3000 pairs, or c. 9000 individuals (including juveniles): 500 pairs in Saudi Arabia, c. 2000 pairs in Yemen, and 500 pairs in Oman (the last possibly an overestimate of true numbers). In Yemen formerly extended E to Al Mukalla, but no records between Aden and latter site since 1950. This species' apparent preference in much of its range for *Euphorbia*-dominated habitats makes it vulnerable to grazing pressure and/or clearance for agriculture. In 2008, was designated as national bird of Yemen, which may bring wider recognition of the threats facing it and encourage the development of public-awareness and conservation programmes.

Bibliography. Clement *et al.* (1993), Collar & Stuart (1985), Fry & Keith (2004), Gallagher & Woodcock (1980), Gedeon & Neumann (2004), Hollom *et al.* (1988), Kirwan & Grieve (2007), Martins (1987, 1996), Martins *et al.* (1996), Porter *et al.* (1996), Sinclair & Ryan (2003).

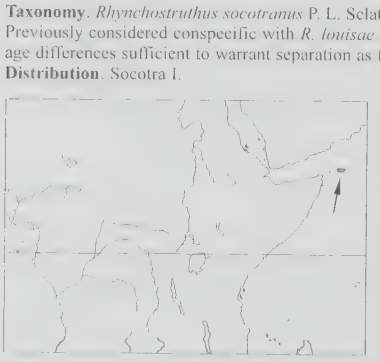
48. **Socotra Grosbeak**

Rhynchostruthus socotranus

French: Grand-verdier de Socotra **German**: Sokotragimpel **Spanish**: Picogordo de Socotora
Other common names: (Socotra) Golden-winged Grosbeak

Taxonomy. *Rhynchostruthus socotranus* P. L. Sclater and Hartlaub, 1881, Goehel Valley, Socotra. Previously considered conspecific with *R. louisae* and *R. percivali*, but morphological and plumage differences sufficient to warrant separation as full species. Monotypic.

Distribution. Socotra I.



Descriptive notes. 14–15 cm; 25–39 g. Medium-large, robust and fairly short-tailed finch with large head and bill. Male has sooty-black head to nape, chin and central upper breast, broken only by white or greyish-white ear-coverts; nape and upperparts to lower back grey-brown, becoming plain grey on rump and uppertail-coverts; tail blackish-brown, broadly edged yellow on all outer feathers (showing as broad panels on closed tail); median upperwing-coverts dark grey, finely tipped yellow, greater coverts bright yellow (except for black or blackish innermost), edged grey distally and tipped pale buff; alula, primary coverts and flight-feathers black, edges of secondaries and lower tertial yellow or golden-yellow (may be tipped white or whitish-buff), rest of tertials edged pale yellow or white; underparts pale greyish or washed light buffish, undertail-coverts white; iris black; bill blackish or deep slate-grey; legs pale flesh-brown. Female is like male, but black of head replaced by dark brown or blackish-brown, ear-coverts more visibly greyish-white, upperparts paler grey, tinged brownish, less yellow on edges of tail, breast brown, becoming pale grey below and white on undertail-coverts. Juvenile has same plumage pattern as adult, but dark brown forehead and lores and browner crown to nape finely streaked darker, ear-coverts pale buff (or buffish-white at rear), side of neck and upperparts brown or grey-brown, heavily streaked darker brown, tail like female's, wings blackish, tips of median-coverts pale buff, tips of greaters and edges of tertials and secondaries yellowish-buff, underparts pale buff-brown, becoming whiter on belly and flanks, all broadly streaked brownish, undertail-coverts whitish-buff, bill blackish, paler base of lower mandible. Voice. Song, usually from late Feb and Mar from concealed perch in centre of tree or in display-flight, often given by several birds in flock, also by apparently immature males, a liquid, discordant, musical jangling series of phrases, including "whit-whee-oo", "whee-wee-ooo whee", "kwink-kwink- kwink", "sit-eeee-did-oo-ee", "sit-chiler-chiloo" and "tler-chichi-chop-wi", interspersed with clear fluty and more typical twitters and chirps (like those of *Carduelis cannabina* or *Carduelis carduelis*); also has short subsong. Calls include variety of *Carduelis chloris*-like notes, e.g. "wip", "wink", and a wheezy "tzeeeu".

Habitat. Lowland to lower montane scrub-covered rocky outcrops, hillside slopes and dry wadis with acacias (*Acacia*) and euphorbias (*Euphorbia*); 150–1400 m, occasionally lower, down to 60 m or below.

Food and Feeding. Variety of seeds, buds and fruit, especially seeds of *Croton* and small red berries of tree resembling a laurel (Lauraceae). Forages mainly in trees and bushes, often in leafless trees still holding fruit, also on ground; stretches to reach fruits and hangs upside-down in manner of a parrot (Psittacidae). Plucks berry from tree and squeezes it in bill, shaking head so that outer pulp drops off, and swallows seed whole. Forages alone, in pairs and in groups of up to about 30 individuals; may occur in loose association with Socotra Sparrow (*Passer insularis*). Generally shy and elusive, tends to fly for some distance when disturbed; spends early part of afternoon inactive in leafy bushes, becoming most active before dusk; also makes regular visits to drink. Roosts communally.

Breeding. Season Dec–Feb. Solitary. Displaying male has stiff-winged, slow-motion display-flight similar to that of *Carduelis chloris*, also fluttering flight; male courtship-feeds female. No other information.

Movements. Little known; makes daily journeys from high-elevation roosts to lower-level feeding areas.

Status and Conservation. Not globally threatened. Restricted-range species: present in Socotra EBA. Locally common to uncommon. Total population estimated at 6500 individuals.

Bibliography. Anon. (2009i), Archer & Godman (1961), Ash & Miskell (1983, 1998), Clement *et al.* (1993), Collar & Stuart (1985), Fry & Keith (2004), Gallagher & Woodcock (1980), Gedeon & Neumann (2004), Hollom *et al.* (1988), Kirwan & Grieve (2007), Martins (1987, 1996), Martins *et al.* (1996), Porter *et al.* (1996), Redman *et al.* (2009), Sinclair & Ryan (2003).

Genus *CARDUELIS* Brisson, 1760

49. **European Greenfinch**

Carduelis chloris

French: Verdier d'Europe **German**: Grünfink **Spanish**: Verderón Común
Other common names: Common/Western Greenfinch

Taxonomy. *Loxia chloris* Linnaeus, 1758, Sweden.

Recent phylogenetic analysis indicates that this species is closest to *C. sinica* and *C. spinoides*, probably forming a superspecies with them and with *C. ambigua* (and presumably including also *C. monguilloti*). All may be only distantly related to present congeners, suggesting that resurrection of genus *Chloris* appropriate; comprehensive review of all taxa in current genus required in order to determine true relationships. Has hybridized with *C. carduelis*. Ten subspecies recognized.

Subspecies and Distribution.

C. c. harrisoni (Clancey, 1940) – Britain (except N Scotland) and Ireland.

C. c. chloris (Linnaeus, 1758) – N Scotland, Norway and N & C France E to C Urals, NW Kazakhstan and W Siberia, S to Hungary and N Ukraine; NE breeders migrate to S Europe.

C. c. aurantiiventris (Cabanis, 1851) – Madeira, Canary Is, S France and Spain (except NW) E to Croatia, W & S Greece, Crete, Dodecanese and Cyprus, also N Tunisia & NW Libya; non-breeding also Morocco E to N Egypt.

C. c. muehlei Parrot, 1905 – Serbia, Macedonia, Romania and Moldova S to C & E Greece; non-breeding also E to W Asia Minor.

C. c. vanmarli Voous, 1951 – NW Spain, Portugal and NW Morocco.

C. c. voousi Roselaar, 1993 – C Morocco E to N Algeria.

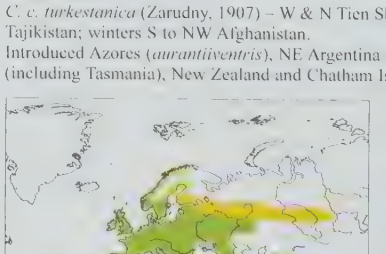
C. c. madaraszi (Tschusi, 1911) – Corsica and Sardinia.

C. c. chlorotica (Bonaparte, 1850) – SC Turkey, Syria, Lebanon, Israel, W Jordan and NE Egypt.

C. c. bilkevitchi (Zarudny, 1911) – S Ukraine (Crimea) E to Caucasus, NE Turkey, N Iran and SW Turkmenistan.

C. c. turkestanica (Zarudny, 1907) – W & N Tien Shan from S Kazakhstan S to Kyrgyzstan and C Tajikistan; winters S to NW Afghanistan.

Introduced Azores (*aurantiiventris*), NE Argentina and Uruguay (race unknown), and S Australia (including Tasmania), New Zealand and Chatham Is (nominate race).



Descriptive notes. 14·5–16 cm; c. 17–34 g (nominate). Medium-sized broad-headed finch with strong conical bill and short forked tail. Male nominate race is olive-green, tinged brownish, on head and upperparts (duller or browner in winter), slightly paler or greenish-yellow on forehead, side of crown and hindneck; lores black, cheek and side of neck yellowish-green to green, ear-coverts to side of neck green with grey tinge; lower back and rump paler or brighter yellowish-green, uppertail-coverts olive-yellow with broad grey feather tips; central pair of tail feathers black, all other rectrices yellow at base and black on distal half; median upperwing-coverts like upperparts, greater coverts ash-grey; alula black, edged bright yellow and tipped grey, primary coverts the same but edged olive-yellow or yellowish-buff, flight-feathers grey-brown to blackish-brown, primaries edged bright yellow at bases, tertials and secondaries broadly edged lead-grey (blackish on inner webs); chin, breast and belly yellowish, otherwise underparts olive-green (duller or slightly darker in winter), flanks tipped greyish, lower belly whitish and undertail-coverts washed yellowish; underwing-coverts yellow; iris dark brown or black; bill flesh-pink or pinkish-horn; legs pale brown to pinkish. Female differs from male in having duller forehead to nape, greyer-tinged mantle, back and wing-coverts, slightly duller green rump and uppertail-coverts, less yellow at side of tail base, alula, fine pale yellow edgings on primary coverts and flight-feathers, and white vent and undertail-coverts; bill greyer than male's. Juvenile is similar to female, but head and upperparts buffish-brown (darker on feather centres of mantle, back and scapulars), sandy-buff tips of greater coverts and fringes of tertials, narrow pale or dull yellow edges on outer primaries and base of tail, pale buff-brown below, streaked darker on breast, upper belly and flanks, bill pale horn, dull or dingy pink base of lower mandible. Race *harrisoni* is like nominate, but forehead yellowish-green, crown tinged grey, upperparts olive-green tinged brownish, pale olive-green rump, more uniformly olive-green below, with belly greenish-yellow, side of breast and flanks tinged grey-brown; *aurantiiventris* is very slightly smaller, brighter green above, slightly brighter on forehead and rump, brighter yellow edges of flight-feathers, and brighter or more yellowish on belly, with side of breast and flanks olive-green; *vanmarli* is similar to previous, but upperparts (including rump) duller and less yellowish, forehead greenish-yellow, underparts yellowish-tinged olive-green, brighter yellow belly, and flanks more heavily olive; *voousi* has larger bill (longer, deeper and wider at base) and is overall paler than *aurantiiventris*, rump slightly paler green, forehead greenish-yellow, pale yellowish-green below, brighter on belly, female has upperparts ash-grey, tinged brownish, underparts pale ash-grey, tinged greenish-yellow on throat and belly; *madaraszi* is slightly darker green, with forehead less yellow-

ish; *chlorotica* is like *aurantiiventris*, bright yellowish-green above, slightly paler on forehead and rump, throat and belly bright yellow, breast and flanks yellowish-green; *bilkevitchi* differs subtly from last (doubtfully distinguishable in the field), slightly brighter yellow in wing, inner secondaries and tertials pale grey (less brown-tinged), below paler or greyer, less yellowish; *muehlei* is doubtfully distinct, closer to nominate, with upperparts plain olive-green, less infused with brown, forehead greenish-yellow, rump yellowish-green, also yellowish-green below or slightly brighter on belly, with side of breast and flanks grey; *turkestanica* is larger and slightly paler, forehead more yellowish-green than green, flight-feathers deeper grey on edges and paler yellow at bases, slightly paler or greyer below than nominate, female more streaked on upperparts than nominate female. Voice. Song, by male between Jan (occasionally late Dec) and mid-Aug, from treetop or prominent perch or during display-flight, a repeated series of phrases including call notes, begins with dry nasal trill and slowly rising, accelerating and rolling "teu-teu-teu-teu", interspersed with sharp, nasal or high-pitched "tsweee" or drawn-out "zeeee" notes, before being repeated; female sings, but much less frequently and less strongly than male. Calls include harsh "chit", "chi", "teu-teu" and longer "twichit" or "twichichichit" contact call; territorial male in summer gives persistent nasal "tsweeeee" or "zweeeee" part of the song; querulous, sharp and rising "swee-it" or "tsooeet" when alarmed or in anxiety; alarm note a sharp, plaintive and rising "diuweee" or "iuweee", also a sharp "sweeet" in presence of predator. Juveniles while being fed emit soft "chi", "chee" or rising "chwii"; young fledglings in autumn utter hard "chit" or "chip", approaching a similar note of *Loxia curvirostra*.

Habitat. Wide range of habitats in boreal, temperate, steppe and Mediterranean zones, including edges of lowland forest, deciduous and mixed forests, woods, plantations, copses and groves, orchards, churchyards, hedgerows, parks, edges of cultivation and gardens, including in suburban and city centres; in C Asia occurs in oases, edges of desert, semi-deserts, foothills and lower montane forests, including juniper (*Juniperus*) scrub. In non-breeding season in similar habitat, but also in open fields, including winter stubbles and weedy areas with low spreading shrubs, also marshes and along shoreline of open coast, particularly where there is growth above tideline. Usually below 1400 m; to at least 1890 m and probably to 2000 m in Alps, and to 2000 m in Kazakhstan.

Food and Feeding. Wide variety of seeds, buds, flowers, berries, fruit; also some arthropods. Seeds, buds and flowers include those of yew (*Taxus*), cypress (*Chamaecyparis*), juniper, redwood (*Sequoia*), larch (*Larix*), spruce (*Picea*), pine (*Pinus*), willow (*Salix*), birch (*Betula*), alder (*Alnus*), hornbeam (*Carpinus*), hop-hornbeam (*Ostrya*), beech (*Fagus*), elm (*Ulmus*), mulberry (*Morus*), sycamore (*Acer*), plane (*Platanus*), lime (*Tilia*), ash (*Fraxinus*), dogwood (*Cornus*), barberry (*Berberis*), lilac (*Syringa*), mistletoe (of genus *Viscum*), grape (*Vitis*), hemp (*Cannabis*), knotgrass (*Polygonum*), sorrel (*Rumex*), buckwheat (*Fagopyrum*), goosefoot (*Chenopodium*), beet (*Beta*), orache (*Atriplex*), glasswort (*Salicornia*), amaranth (*Amaranthus*), chickweed (*Stellaria*), buttercup (*Ranunculus*), mouse-ear (*Cerastium*), corn-spurrey (*Spergula*), wild cabbage (*Brassica*), charlock (*Sinapis*), radish (*Raphanus*), rocket (*Sisymbrium*), sea-kale (*Crambe*), common whitlow-grass (*Erophila*), pennycress (*Thlaspi*), shepherd's-purse (*Capsella*), rose (*Rosa*), bramble (*Rubus*), strawberry (*Fragaria*), burnet (*Sanguisorba*), agrimony (*Agrimonia*), apple (*Malus*), pear (*Pyrus*), cherry (*Prunus*), whitebeam (*Sorbus*), hawthorn (*Crataegus*), *Cotoneaster*, *Pyracantha*, sainfoin (*Onobrychis*), vetch (*Vicia*), clover (*Trifolium*), broom (*Cytisus*), flax (*Linum*), crane's-bill (*Geranium*), dog's-mercury (*Mercurialis*), spurge (*Euphorbia*), sea-buckthorn (*Hippophae*), violet (*Viola*), primrose (*Primula*), evening-primrose (*Oenothera*), thrift (*Armeria*), bedstraw (*Galium*), comfrey (*Symphytum*), hound's-tongue (*Cynoglossum*), borage (*Borago*), viper's-bugloss (*Echium*), hemp-nettle (*Galeopsis*), self-heal (*Prunella*), plantain (*Plantago*), honeysuckle (*Lonicera*), guelder-rose (*Viburnum*), snowberry (*Symphoricarpos*), devil's-bit scabious (*Succisa*), golden-rod (*Solidago*), mugwort (*Artemisia*), sunflower (*Helianthus*), bur-marigold (*Bidens*), corn marigold (*Chrysanthemum*), tansy (*Tanacetum*), colt's-foot (*Tussilago*), groundsel (*Senecio*), burdock (*Arctium*), thistles (*Carduus* and *Cirsium*), knapweed (*Centaurea*), goat's-beard (*Tragopogon*), chicory (*Cichorium*), sow-thistle (*Sonchus*), lettuce (*Lactuca*), dandelion (*Taraxacum*), hawk's-beard (*Crepis*), cat's-ear (*Hypochoeris*), hawkweed (*Hieracium*), rush (*Juncus*), sedge (*Carex*), reed (*Phragmites*); also seeds of grasses (*Poa*) and cereals, and seeds and buds of non-native herbs and shrubs in parks and gardens; in NW Europe has recently taken to eating unripe berries of mezereon (*Daphne mezereum*). Arthropods taken include bugs (Hemiptera), flies (Diptera), moths (Lepidoptera), ants (Formicidae), beetles (Coleoptera) and spiders (Araneae). Regularly (in W & C Europe) attends garden birdfeeders, where it takes variety of foods, including sunflower seeds and peanuts; captives eat up to 6·5 g of peanuts daily. Nestlings fed mostly with insect larvae. Dietary overlap with *Coccothraustes coccothraustes* in size of seeds taken, also in range of species (particularly seeds of beech and hornbeams). Forages on ground, in low vegetation and at all levels in bushes and trees. Versatile, feeds while upside-down on plant or feeder, slides vertically down stem or string and may hold seedhead under foot while extracting seeds; extracts seeds of fruit, particularly bramble and yew berries, by squeezing fruit in bill and ejecting pulp. Forages in pairs and in small flocks; at end of breeding season forms large flocks of up to several thousands; in non-breeding season often in mixed flocks with, especially, *Carduelis cannabina*, Eurasian Tree Sparrow (*Passer montanus*), Yellowhammer (*Emberiza citrinella*), and Reed Bunting (*Emberiza schoeniclus*).

Breeding. Season mid-Mar to mid-Aug, peak mid-May to early Jul; two broods. Monogamous; a few polygamous, including male paired with up to five females. Solitary or loosely colonial, up to 1·5 m between nests; non-territorial. Male sings from prominent perch or during slow-motion, rolling, stiff-winged display-flight for up to 50 m through and over treetops around breeding area; perched male sings with head held high and body upright, wings held slightly out from body and wings and tail vibrated; during courtship (initiated by either sex, mostly male), male, with plumage sleeked, body horizontal, head forward with bill open, and wings and tail slightly raised and/or partly spread, chases female from perch to perch or in flight, during display may also twist body from side to side or present female with nesting material; other parts of display include male hovering over female with legs outstretched and just touching her, male fluffing out body plumage to create large rounded appearance (usually prior to copulation), also mutual flirting by partners with bills touching, and in established pairs may include courtship-feeding by male (which continues through to incubation stage). Nest built entirely by female, accompanied by male during material-collecting, a well-made cup of dry twigs, grasses, moss, lichens, plant fibres and down, animal hair, feathers, occasionally some man-made material, placed 1–20 m from ground in bush, hedge, tree (especially conifer or evergreen), creepers, occasionally in old or disused nests of other species, sometimes in artificial site, e.g. balcony of building in Germany. Clutch 4–6 eggs, buff or greyish-white to bluish-white, blotched pinkish and sparsely spotted reddish to purple or black; incubation by female, fed on nest by male, period 11–15 days; chicks cared for and fed by both parents, nestling period 14–18 days; young of first brood fed for up to 14 days after fledging. Breeding success: of 1589 eggs in 300 clutches in Britain, 68·6% hatched and 52·9% subsequently produced fledglings (giving average of 2·55 young per nest attempt), losses due to human predation, cats, rodents, crows (Corvidae), gulls (Laridae) and poor weather; in E German study of 1199 eggs in 257 clutches, 61·5% hatched and 47·3% fledged young (2·21 young per nest), and in a second study 40% of failures due to loss or predation of eggs, 36% to loss of young, 5% to poor weather and 1% to loss of adult, predation mostly by crows, Eurasian red squirrel (*Sciurus vulgaris*) and yellow-necked mouse (*Apodemus flavicollis*); in Moscow region, 38% of nests successful when density high and 46% when low; in Spanish study, losses increased through breeding season, i.e. 51% of 223 eggs produced fledged young in Mar–Apr, 49% of 171 eggs in May and 3% of 58 eggs in Jul, additional losses caused through cutting of undergrowth layer, thereby reducing food supply, leading to starvation of young. Breeds in first year. Maximum recorded longevity 12 years 7 months.

Movements. Resident and migratory. Within breeding range becomes highly mobile in non-breeding season, flocks roaming in search of foraging areas; evidence from ringing in W Europe shows majority of population sedentary (moving less than 20 km), regular movements from S Norway W to N Scotland, and within British Is pronounced movements to S & SW England. Breeders from N Europe move S & SW between late Sept and mid-Nov to non-breeding grounds within or slightly S of species' range, later movements often triggered by onset of severe weather or food shortage; return to breeding areas (high incidence of site-fidelity to natal area) from end Feb or mid-Mar to end Apr or early May in N Scandinavia. Race *harrisoni* largely sedentary, or dispersive towards lowland and coastal areas; most move up to 70 km, females travelling farther than males and immatures farther than adults, with larger proportion of young in S of range, also small-scale movements to Ireland, N France and Belgium, and longest recorded distance 1100 km (to C Spain). Nominate race a passage migrant and winter visitor in small numbers in British Is (mostly N & SE); largely vacates breeding areas in N Norway and N Sweden and moves S & SW to wintering areas in S Scandinavia and from Poland and Germany S to W & C France, some travelling over 2260 km to S Spain; many now apparently resident in Finland owing to recent milder winter temperatures and increased artificial feeding; birds ringed in Netherlands, Belgium and Germany recovered mostly in SW Europe, occasionally Morocco, resident population in Canary Is greatly augmented in winter months by immigrants possibly also from NC Europe, also recently recorded May–Jun W Mauritania; French population largely sedentary or locally dispersive, but E birds move SW to as far as S Spain and Portugal; birds from Scandinavia, Netherlands and Belgium winter mainly W & C France, and those from Finland, Baltic countries, Germany, Poland, Czech Republic and Switzerland in S & SE France; one of the most numerous finches in winter in Switzerland, where largely resident population joined by birds from C Europe, also passage birds through Switzerland winter mostly N Italy, S France and Spain. Breeders from farther E (Hungary to Ukraine and Russia) either resident (including small numbers in Russia around Moscow and lower Urals) or move to wintering grounds in Europe from Germany and Poland S to Italy and Bulgaria, with sporadic occurrence of small numbers in NW & NE Kazakhstan (lower Urals; W Altai); also small number of recoveries of nominate race from Moscow region in N Israel. E Mediterranean *chlorotica* resident or locally dispersive; passage migrant and winter visitor in Cyprus (where resident birds largely altitudinal migrants, scarce in winter above 800 m) from late Nov to Feb, occasionally very numerous on S coast passage Mar–Apr; passage through Lebanon and N & W Israel mid-Sept to late Oct and during Nov, joining variable numbers of immigrant *muehlei* from Balkans. Race *aurantiiventris* mostly sedentary, but small numbers move short distances to N Africa (Morocco E to N Libya, and N Egypt E to N Red Sea coast). Race *turkestanica* mostly sedentary, or moves short distances altitudinally and to S of breeding range; occurs S to desert oases in C Turkmenistan, NW Afghanistan, W & SW Iran, less frequently Iraq, and uncommon NW Saudi Arabia. Otherwise, species is a very rare passage migrant in W China (W Xinjiang) and W Mongolia, and recorded as a vagrant N to Iceland and Faeroes.

Status and Conservation. Not globally threatened. Common or locally common; in some areas abundant. Estimated European breeding population between 12,000,000 and 14,500,000 pairs, with up to a further 1,000,000 in Russia and 500,000 in Turkey; within Europe, largest populations in Germany and Spain. Densities variable, depending on size of suitable area, average 10–20 pairs/km², with highest densities often in cemeteries, and in E Germany highest density as great as 229 pairs/km²; lowest densities (1–6 pairs/km²) usually on farmland. First bred in Canary Is in late 1960s, on Gran Canaria and Tenerife, and subsequently more widely; rare on Madeira, where first bred 1968. Range has spread N in Scandinavia in 20th century, and expansion still continuing in parts of N Sweden and in Finland; this influenced by provision of feeders in gardens, enabling birds to remain through the winter. In S, range has expanded in Israel and since 1985 in Nile Delta (N Egypt); colonized Cyprus during 1960s, first proven breeding 1963, and common and widespread by mid-1970s. In S Europe, colonization of higher areas (to 2000 m) in Alps has occurred since middle of 20th century, following opening-up of these regions to traffic and the creation of tourism-related structures (e.g. hotels, holiday accommodation, pleasure gardens) and feeding stations.

Bibliography. Arnaiz-Villena, Alvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Beretzk *et al.* (1969), Blümel (1983), Clarke (2006), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Flint, P.R. & Stewart (1983), Flint, V.E. *et al.* (1984), Gibbons *et al.* (1993), Glutz von Blotzheim & Bauer (1997), Goodman & Meininger (1989), Hagemeijer & Blair (1997), Hinde (1954), Hüe & Etchécopar (1970), McCarthy (2006), Monk (1954), Newton (1972), Nguembock *et al.* (2009), Porter *et al.* (1996), Rasmussen & Anderton (2005a, 2005b), Roselaar (1993, 1995), Ruelle (1990), Ryabitsev (2001), Shirihai (1996), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1959), Voous (1951), Wassink & Oreel (2007), Wernham *et al.* (2002), Wolters (1979), Zamora, Lowy *et al.* (2006).

50. Oriental Greenfinch

Carduelis sinica

French: Verdier de Chine **German**: Chinagrünfink **Spanish**: Verderón Chino
Other common names: Chinese/Grey-capped Greenfinch

Taxonomy. *Fringilla sinica* Linnaeus, 1766, Macao, south-east China.

Recent phylogenetic analysis indicates that this species is closest to *C. chloris* and *C. spinoides*, probably forming a superspecies with them and with *C. ambigua* (and presumably including also *C. monguilloti*). All may be only distantly related to present congeners, suggesting that resurrection of genus *Chloris* appropriate; comprehensive review of all taxa in current genus required in order to determine true relationships. Race *chabarovi* sometimes subsumed in *ussuriensis*. In Japan, proposed race *sitchitoensis* (described from Hachijo, in Izu Is) synonymized with *minor*; *tokumii*, from Kanzaki-machi (Kanzaki-gun area, in NE Saga Prefecture), in SW Kyushu, synonymized with *minor*. Six subspecies currently recognized.

Subspecies and Distribution.

C. s. chabarovi (Stegmann, 1929) – Russian Far East (Amurland) and NE China (E Inner Mongolia and N Heilongjiang).

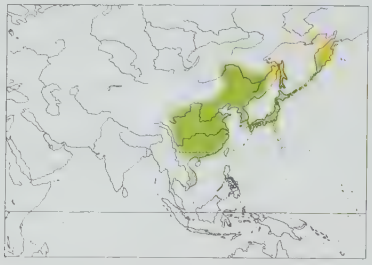
C. s. ussuriensis (E. J. O. Hartert, 1903) – NE China (SE Inner Mongolia E to S Heilongjiang, Liaoning and Hebei), Korea and SE Russia (S Ussuriland).

C. s. kawarahiba (Temminck, 1836) – E Russia (NC Okhotsk coast and Kamchatka), Sakhalin I, Kuril Is, and N Japan (NE Hokkaido); non-breeding also S to SE China.

C. s. minor (Temminck & Schlegel, 1848) – extreme S Korea (Cheju-do I) and Japan (S Hokkaido S to Kyushu, including Tsushima I and Izu Is).

C. s. kittlitzi (Seebohm, 1890) – Ogasawara-shoto (Bonin Is) and Iwo Is.

C. s. sinica (Linnaeus, 1766) – C, E & SE China and NE & C Vietnam (E Tonkin and C & S Annam).



Descriptive notes. 12·5–14 cm; 17–22 g. Medium-sized, strong-billed finch with rather short, slightly forked tail. Male nominate race has forehead and face (on some extending to chin and throat) deep olive-green, crown to nape and rear ear-coverts dark grey or blackish-olive, darker in worn plumage; mantle, back and scapulars rich warm brown, upper mantle often washed olive or grey-green, upper rump paler warm buff-brown, lower rump yellow to yellowish-brown with green feather edges, tips of uppertail-coverts ash-grey; tail black or blackish-brown, all except central feather pair with bright yellow at base of outer edges (forming prominent panels at sides of tail base); upperwing-coverts olive-brown, tinged bright green (when fresh), outermost greater coverts yellow or yellowish with fine buff or grey tips; alula, primary coverts and flight-feathers black, edged bright yellow at bases, more extensively so on primaries (in flight, broad bright yellow wingbar across base of flight-feathers), secondaries broadly edged greyish or buffish-white (forming panel on closed wing) and broadly tipped pale buff, primaries narrowly tipped whitish, tertials broadly fringed buff-brown or greyish-white; chin, throat and side of neck like face or slightly yellow or greenish-yellow, becoming warm brown or rich cinnamon on upper breast, deeper warm brown on lower breast and flanks; belly and undertail-coverts yellow, underwing-coverts pale yellow; iris blackish; bill pale pinkish-horn; legs pale or bright flesh-pink. Female is very similar to male, but duller, with uniformly grey head, indistinct darker feather centres on slightly duller mantle and back, rump paler or yellowish-brown, yellow at side of tail base less extensive, and underparts warm buff-brown, belly to undertail-coverts whiter than on male. Juvenile has pale yellowish head and underparts streaked browner, lores dark grey, cheek and ear-coverts plain buff-brown, mantle, back and scapulars warm buff-brown, streaked darker, median upperwing-coverts dark brown, fringed paler or warmer brown, greater coverts fringed warm buff, secondaries and tertials broadly fringed whitish-buff, tips of primaries the same. Race *kawarahiba* has head deep green, tinged grey, with grey moustachial streak, upperparts chocolate-brown, rump green or lightly washed yellow, underparts rich cinnamon-brown with yellowish wash, undertail-coverts bright yellow, female like nominate but darker or more dingy brown, with head to breast paler buffish-brown, juvenile heavily streaked above and below; *ussuriensis* is paler and greyer on head, more extensively yellow or yellowish-brown below; *chabarovi* is dark brown above, tinged greyer on head, nape and upper mantle, and yellow bases of flight-feathers more extensive; *minor* is similar to nominate, but forehead and lores dark green, crown ash-grey or deep grey, mantle to back greenish-brown, side of neck and underparts deep green, in breeding plumage rump is green with yellow tinge or with yellow centre; *kittlitzi* is similar to last, but smaller, with larger bill, and generally darker olive-green, with yellow below restricted to vent. Voice. Song, from end Mar, from high perch or in slow display-flight, a mixture of chattering and coarse "kirr korr" and "kirikiri-korokoro-been" notes interspersed with or introduced by call notes, very similar in tone and phrases to that of *C. chloris*. Calls include a nasal "dzweee" or "djeeee", and a distinctive twittering "dzi-dzi-i-dzi-i" flight note with ringing or metallic quality; very similar to calls of *C. chloris*.

Habitat. Lowland and lower montane broadleaf and conifer woodlands, including secondary woodlands, trees and bushes in river valleys, riverbanks, hedgerows, edges of cultivation, orchards, parks and gardens, to c. 2400 m; in non-breeding season also descends to plains, coastal fields and edges of villages and urban areas.

Food and Feeding. Mostly variety of seeds, including weed and shrub seeds, sunflower seeds (*Helianthus*), also rice, buckwheat and other grain; occasionally small insects. Forages in shrubs, trees and on the ground; in parts of range comes to feeders and birdtables. In pairs and small groups; in non-breeding season often in large flocks of up to c. 1000 individuals in cultivated fields.

Breeding. Season Mar–Aug; two broods. Displaying male has slow, stiff-winged butterfly-like display-flight, with accompanying song. Nest a deep cup of dry grass, plant fibres and animal hair, placed 3–9 m above ground in bush, in bamboo or at end of branch of tree, usually fruit tree or spruce (*Picea*). Clutch 3–5 eggs, pale green, sparingly speckled and streaked black to reddish-brown. Incubation by female alone, 12-15 days. No further information.

Movements. Resident and migratory. Those in N of range move S in Sept–Oct to winter at lower altitudes, within or short distance to S of range, returning to breeding areas in Apr–May; small numbers of race *kawarahiba* present in Kamchatka throughout year, but majority of population moves S or SE to winter in Japan (S to Okinawa) and SE China. Rare visitor to Commander Is, and vagrant in Taiwan and NW North America (W Aleutians, in Alaska).

Status and Conservation. Not globally threatened. Common to locally common; scarce on Kunashir, in Kuril Is. Status in N Vietnam uncertain; probably scarce resident (E Tonkin). Numbers in S China and Hong Kong have declined drastically since late 1950s.

Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Brazil (2009), Carey *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), King *et al.* (1975), Lee Woo-Shin *et al.* (2000), MacKinnon & Phillipps (2000), McCarthy (2006), Meyer de Schauensee (1984), Nguembock *et al.* (2009), Robson (2000), Stepanyan (2003), Vaurie (1959), Wolters (1979).

51. Yellow-breasted Greenfinch

Carduelis spinoides

French: Verdier de l'Himalaya **German**: Himalayagrünfink **Spanish**: Verderón del Himalaya
Other common names: Himalayan Greenfinch/Goldfinch

Taxonomy. *Carduelis spinoides* Vigors, 1831, Simla, north-western India.

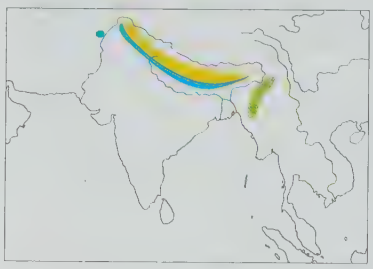
Recent phylogenetic analysis indicates that this species is closest to *C. chloris* and *C. sinica*, probably forming a superspecies with them and with *C. ambigua* (and presumably including also *C. monguilloti*). All may be only distantly related to present congeners, suggesting that resurrection of genus *Chloris* appropriate; comprehensive review of all taxa in current genus required in order to determine true relationships. Has in the past been considered conspecific with *C. monguilloti* and/or *C. ambigua*. Two subspecies recognized.

Subspecies and Distribution.

C. s. spinoides Vigors, 1831 – N Pakistan E in Himalayas to Bhutan and NE India (W Arunachal Pradesh) and SW China (S Xizang).

C. s. heinrichi Stresemann, 1940 – NE India (S Assam hills, Nagaland and Manipur) and W Myanmar (Chin Hills S to Mt Victoria).

Descriptive notes. 12–14 cm; 15–20·8 g. Medium-sized finch with conical bill, bright yellow wingbars and notched tail. Male nominate race has top of head black or blackish-olive, sometimes



finely spotted yellowish on lower forehead, narrow collar of bright yellow across nape to side of neck, sometimes interrupted by blackish-olive band on central nape; lores and supercilium bright yellow, broad yellow subocular crescent, and broad yellow submoustachial stripe contrasting with blackish-olive malar, rest of cheek and ear-coverts as crown or slightly darker; upperparts mostly blackish-olive, lower back dull yellow, becoming bright yellow on rump and uppertail-coverts; tail dark brown or blackish-brown, edged bright yellow at bases (forming short panel at side of tail); lesser and median upperwing-coverts bright yellow, greaters black, broadly tipped bright yellow; alula black, finely edged bright yellow, primary coverts and flight-feathers black, bright yellow bases of primaries and outer secondaries (in flight shows broad wingbar across base of remiges), tertials broadly tipped greyish-white (whiter when worn); below, almost entirely bright yellow, with greenish tinge on side of breast and flanks, underwing-coverts similar or slightly paler; iris blackish; bill brown to brownish-pink, dark tip of upper mandible, paler or pinkish tip of on lower mandible; legs pinkish or pinkish-brown. Female is very similar to male in plumage pattern, but duller, and nape to upper back and scapulars dark olive and indistinctly streaked blackish, yellow areas in wing and tail less extensive, underparts paler yellow, with smudged streaks across breast, and flanks tinged brownish. Juvenile has pale buffish-yellow head to nape and underparts streaked browner, lores dark grey, cheeks and ear-coverts plain buff-brown, mantle, back and scapulars light buff-brown, streaked darker, median upperwing-coverts dark brown, broadly fringed pale yellow, and greater coverts broadly tipped (but less extensively than on adult) yellow; first-winter male more yellow on underparts and extensively on wings than first-winter female. Race *heinrichi* is generally darker than nominate, male with crown and ear-coverts black, lacking yellow subocular crescent, submoustachial stripe and side of neck, but retaining yellow supercilium. Voice. Song, from treetops or during display-flight, a long series of rapid twitters interspersed with short "chip" and "tew" notes, e.g. "trit-it-it-tt" followed by rapid trill before continuing with "trit-it-it-it-er chip-chip-chip" and concluding with long descending "tew-tew-tew be-e-e-e-ze ouu", very similar to song of *C. chloris* but higher-pitched; the various sequences often given in differing combinations and repeated for several minutes. Calls include a light twittering followed by or incorporating a harsh "tsswee", "dzwee", "beez" or more wheezing "zeez", similar to those of *C. chloris* but lighter or more melodic; more distinct is a metallic "sweee-tu-tu", dropping in pitch towards end; contact calls among members of flock mostly a rapid, high-pitched rising and descending "trit-tit-tit-tur"; young in autumn give hard "chit chit" notes similar to those of young *C. chloris*.

Habitat. Submontane and montane open forests of oak (*Quercus*), rhododendron (*Rhododendron*) forest and mixed deciduous and conifer forests, in W Himalayas open forests of Himalayan blue pine (*Pinus wallachiana*) and deodar (*Cedrus deodara*), also grassy slopes and open or terraced hillsides and edges of cultivation, scrub and gardens, often above tree-line; occurs at 1600–4400 m in Himalayas, down to 1200 m in Bhutan, and in Simla possibly breeds down to 1100 m; in non-breeding season in similar habitat at lower levels. In Myanmar found in forest edge and secondary growth, also alder (*Alnus*) stands and cultivation, at 1220–2400 m.

Food and Feeding. Variety of seeds, including pine (*Pinus*) and alder, also downy seedheads of Asteraceae, especially thistles (*Cirsium*, *Carduus*), dandelions (*Taraxacum*), daisies (*Coreopsis*) and *Senecio chrysanthemoides* and other herbs, ripening seedheads of sunflowers (*Helianthus*) and seeds of hemp (*Cannabis*), millet, rice, buckwheat, also some berries; may also take some small insects. Forages in vegetation, clinging to stems and seedheads of tall plants; also perches in bushes and tall trees, including at tops of pines and alders. Gregarious, often in small flocks, also in pairs, and often in company with *C. carduelis*; in non-breeding season commonly in large flocks of more than 200 individuals.

Breeding. Season May–Sept; one brood. Monogamous. Solitary and loosely colonial, up to six nests within radius of 15 m, and often two nests in same tree. Courtship and display include slow-motion, stiff-winged flight over nesting area, similar to that of *C. chloris*. Nest built entirely by female, a neat cup of plant fibres and stems, grass, moss and lichens, placed 2–20 m above ground and concealed in overhanging foliage at end of branch, usually of pine or deodar. Clutch 3–5 eggs, pale greenish-white, finely or minutely spotted with blackish-brown; incubation period 13–14 days; chicks fed and cared for by both parents, nestling period 13–14 days; fledglings dependent on parents for a further week after leaving nest.

Movements. Resident and partial altitudinal migrant. Birds at higher altitudes either resident (to 2700 m in Sikkim) or, in Sept–Oct, descend short distances to foothills, lower valleys and adjacent plains, mostly to 1300–1500 m, some lower, to c. 300 m in hills around cities (e.g. Islamabad, in Pakistan) and sometimes down to 160 m in SC Nepal; in N Pakistan occurs on passage in Murree Hills from late Aug to Nov, before moving down to lower adjacent valleys. Returns to breeding areas late May and Jun. Also nomadic, erratic and unpredictable in occurrence.

Status and Conservation. Not globally threatened. Generally common. Fairly common to very common in N Indian Subcontinent; locally common in SW China; locally common in W Myanmar.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Cheng Tsohsin (1987), Clement *et al.* (1993), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), MacKinnon & Phillipps (2000), McCarthy (2006), Meyer de Schauensee (1984), Nguembock *et al.* (2009), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Robson *et al.* (1998), Ruelle (1986), Spierenburg (2005), Vaurie (1959), Wolters (1979).

52. Vietnamese Greenfinch

Carduelis monguilloti

French: Verdier du Vietnam **German**: Annamgrünfink **Spanish**: Verderón Vietnamita

Taxonomy. *Hypacanthis monguilloti* Delacour, 1926, Dalat, Annam, south Vietnam.

Presumably part of a superspecies formed by *C. chloris*, *C. sinica*, *C. spinoides* and *C. ambigua*, and often treated as conspecific with *C. spinoides*; all may be only distantly related to present congeners, suggesting that resurrection of genus *Chloris* appropriate, but comprehensive review of all taxa in current genus required in order to determine true relationships. Monotypic.

Distribution. S Annam (Da Lat Plateau), in SC Vietnam.

Descriptive notes. 13·5–14 cm; 15–16 g. Medium-sized, black-headed finch with large conical bill, yellow wing-flash and notched tail. Male has forehead to hindcrown, lores, cheek and ear-coverts black, narrow collar bright yellow (often flecked or finely spotted blackish) across nape to side of neck and meeting bright yellow of throat; upperparts blackish-olive, rump and uppertail-



coverts deep olive with variable amount of bright yellow, tips of uppertail-coverts dark olive; tail black, outer feathers edged bright yellow (forming short panel at side of base); lesser and median upperwing-coverts bright yellow with blackish or blackish-olive bases, greaters black, narrowly tipped bright yellow (in fresh plumage), alula black, largest feather edged bright yellow, primary coverts and flight-feathers black, bases of primaries and outer secondaries bright yellow (in flight, broad wingbar across base of remiges), tertials uniformly blackish-olive; underparts bright yellow, with olive or blackish-olive markings on breast and flanks, underwing-coverts bright lemon-yellow; iris blackish; bill brown to brownish-pink, sometimes with dark tip of upper mandible, and paler or pinkish base of lower mandible; legs pinkish or pale pinkish-brown. Female is very similar to male, but duller, nape to upper back and scapulars dark olive and indistinctly streaked blackish, much less yellow in wing, less extensive yellow at side of tail, underparts heavily spotted or streaked with dark olive on breast, belly and flanks, lower belly and undertail-coverts pale yellow; sometimes has narrow pale eyering. Juvenile is similar to female, but forehead to crown and face duller, more brownish-olive, has paler yellow side of neck to side of nape, more heavily streaked upperparts, and paler underparts mottled with dull olive on side of breast. VOICE. Song a series of notes and phrases very similar to those given by *C. chloris*, a slowly rising and drawn-out "seeuuu-seeuuu-seeuuu" or "teoo-teoo-teooo" usually followed by dry nasal (especially by territorial males in summer) "weeeee" or "chweee". Calls include a series of light *Serinus*-like notes run together, "chi-chi-chi", often descending and interspersed with more musical notes and harsher twitters, including dry nasal "zweee".

Habitat. Occurs in open pine woodland, mostly Khasi pine (*Pinus kesiya*), also at forest edges, in secondary growth, at edges of cultivation, and in gardens; usually at 1200–1900 m, exceptionally down to 1050 m.

Food and Feeding. Mostly seeds, principally of Khasi pine; also small numbers of insects. Forages in trees and bushes, rarely on ground; also pursues and catches newly hatched termites (Isoptera) in flight. In pairs and small groups.

Breeding. Little known. Season Dec–May. Nest a neat cup placed on pine branch. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Da Lat Plateau EBA. Locally common within small global range. Numbers may have increased as a result of the planting of Khasi pine plantations. Considered to be at risk in the long term because of rapid forest clearance for agriculture and charcoal-making.

Bibliography. Anon. (2009i), Butchart & Stattersfield (2004), Clement *et al.* (1993), McCarthy (2006), Robson (2000), Robson *et al.* (1993), Ruelle (1986, 1990), Stattersfield & Capper (2000).

53. Black-headed Greenfinch

Carduelis ambigua

French: Verdier d'Oustalet **German**: Schwarzkopf-Grünfink **Spanish**: Verderón Cabecinegro **Other common names**: Tibetan Greenfinch, Yunnan (Black-headed) Greenfinch, Oustalet's Black-headed Greenfinch

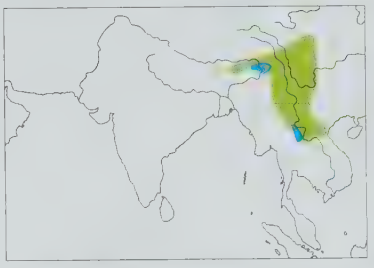
Taxonomy. *Chrysomitris ambigua* Oustalet, 1896, Yun Chou, near Mienning, Yunnan, China.

Recent phylogenetic analysis indicates that this species is closest to *C. chloris*, *C. sinica* and *C. spinoides*, probably forming a superspecies with them (and presumably also *C. monguilloti*); all may be only distantly related to present congeners, suggesting that resurrection of genus *Chloris* appropriate, but comprehensive review of all taxa in current genus required in order to determine true relationships. Has been treated as conspecific with *C. spinoides* and *C. monguilloti*. Two subspecies recognized.

Subspecies and Distribution.

C. a. taylori (Kinnear, 1939) – S China (SE Xizang); non-breeding (possibly resident) also extreme NE India (NE Arunachal Pradesh).

C. a. ambigua (Oustalet, 1896) – S China (W & S Sichuan, W & SE Yunnan, W Guizhou), NE & E Myanmar, N Laos and NW Vietnam (W Tonkin); non-breeding NW Thailand.



Descriptive notes. 12·5–14 cm. Medium-sized, dark-headed finch with pale conical bill, bright yellow wing-flash and notched tail. Male nominate race has forehead to hindcrown, lores, cheek and ear-coverts blackish-olive, sometimes a narrow, indistinct paler supercilium; nape to mantle and scapulars dull olive-green, becoming paler or brighter on lower back; rump olive-green with yellow bases, uppertail-coverts greyer; tail black, outer feathers edged bright yellow (forming short panel at side of base), central feathers narrowly edged pale grey; lesser and median upperwing-coverts as scapulars or paler yellowish-green, greater coverts black or blackish, edged olive-green on outers and broadly tipped pale grey; alula black, finely edged pale yellow, primary coverts and flight-feathers black, bases of primaries and outer secondaries bright yellow (in flight, broad wingbar across base of remiges), outer secondaries and inner primaries finely tipped off-white, tertials black, broadly fringed grey or greyish-white; deep green or olive-green below, obscurely spotted or streaked yellow, uniformly yellow on undertail-coverts; underwing-coverts pale yellow; iris black; bill pale pinkish to brownish-pink, slightly darker tip; legs pinkish or pale brown. Female is very similar to male, but duller, head not so black (nor so well defined), deep olive with darker flecking, dull olive below, flanks pale buffish-brown. Juvenile has pale buffish-yellow forehead to nape, mostly buff-brown face finely streaked darker on cheek and ear-coverts, upperparts pale buff-brown, streaked darker, slightly paler brown on rump and uppertail-coverts, median and greater upperwing-coverts dark brown, tipped pale buffish-brown (more broadly on greater coverts), flight-feathers as for adult, underparts pale buff-yellow, streaked dark brown or blackish, lower belly unstreaked whitish and undertail-coverts pale yellow. Race *taylori* is more sooty black on head and duller olive-green with brown tinge on mantle and back, rump green or pale green with yellowish feather bases, yellow below, becoming pale green on undertail-coverts, female like nominate, but may have pale buff or buffish-grey undertail-coverts. VOICE. Song a long, drawn-out wheezing "wheeeeeeuu, wheeeeeeuu", repeated at regular intervals, and including more metallic notes and higher-pitched trills together with a dry, harsh or sharp "screee" or "treeee-tertrah". Calls include short, thin, high-pitched metallic twitter, "titutu, titu-titu tittrititititit", often interspersed with harsher "chutut" or "chut-ut-ut" notes, frequently given in flight and often repeated; also a softer upslurred "chu-chu" and a rising and wheezy "jieuu", "twzyee" or "tzyeee".

Habitat. Montane and submontane open conifer and deciduous woodlands and forest, also forest edges, clearings, alpine meadows and scrub on open hillsides and edges of cultivation, at 1200–3100 m; in non-breeding season in similar habitat at slightly lower altitude, down to 1300 m in NE India.

Food and Feeding. Mostly a variety of seeds. Forages in bushes, in low vegetation and on ground. In pairs and in small family groups; in non-breeding season often in large flocks of more than 100 individuals, foraging in winter stubble and weedy fields.

Breeding. Little known. Season Jul–Oct. Nest a neat cup placed on tree branch, usually in pine (*Pinus*). Clutch 3–4 eggs, pale greenish-blue, spotted sparingly with black. No further information.

Movements. Resident and partial migrant. Those breeding at high altitudes move to lower levels within range; occasional or scarce winter visitor (in some years in large flocks) to NW Thailand above 1200 m. Vagrant in Hong Kong.

Status and Conservation. Not globally threatened. Locally common in most of range; scarce in N Laos. Status in NE India uncertain; presumed to be a non-breeding visitor from adjacent higher areas of China, but possibly a breeding resident; more fieldwork required.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), King *et al.* (1975), MacKinnon & Phillipps (2000), McCarthy (2006), Meyer de Schauensee (1984), Nguembock *et al.* (2009), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Vaurie (1959), Wolters (1980).

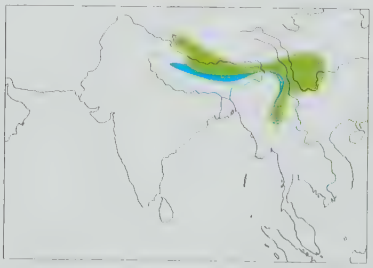


54. Tibetan Siskin

Carduelis thibetana

French: Tarin du Tibet **German**: Himalayazeisig **Spanish**: Jilguero Tibetano
Other common names: Tibetan Serin

Taxonomy. *Chrysomitris thibetana* Hume, 1872, borders of Sikkim and Tibet.
Sometimes placed in genus *Serinus*; further research needed. Monotypic.
Distribution. SW & S China (S & SE Xizang; N Yunnan and W & SW Sichuan), NE India (Arunachal Pradesh) and N Myanmar; non-breeding also N Nepal E to Bhutan and Assam.
Descriptive notes. 10–12 cm; 10–12 g. Small, thin-billed finch with forked tail. Male has bright olive-green crown and upperparts, with rump and uppertail-coverts yellow or pale greenish-yellow, tail black or blackish-brown, edged bright yellow; bases of greater upperwing-coverts blackish-brown, edged and tipped greenish-yellow, tips of medians also greenish-yellow, flight-feathers blackish, edged greenish-yellow (or yellow on tertial edges), and secondaries finely tipped whitish; lores dusky, supercilium to side of nape and neck yellow, cheek and ear-coverts greenish-yellow, and yellow subocular crescent and moustachial area bordered by narrow greenish-yellow malar stripe; throat and underparts deep yellow, tinged greenish on breast, and becoming whiter on lower breast to undertail-coverts; iris dark brown or black; bill bluish-grey above, pale flesh-brown below; legs pinkish-brown. Female is dull olive-green and heavily streaked above, rump and uppertail-coverts pale yellow or tinged green and broadly streaked darker, with dull olive ear-coverts, yellowish cheek and short, broad olive malar stripe; wing and tail as for male, but bases of wing-coverts and flight-feathers more extensively dark olive or blackish, tips of median and greater coverts broadly yellowish-green, and flight-



feathers edged lime-green; chin to breast pale lemon-yellow, whiter on lower breast and belly and pale yellow on undertail-coverts, streaked dark brownish on side of lower breast, flanks and undertail-coverts; bill brown, legs deep brown. Juvenile is similar to female (and not always separable), but generally duller green or tinged buffish above with slight dark streaks, rump and uppertail-coverts dull olive-yellow, wings and tail as on female, but edges of greater coverts and tips of medians and greaters buffish-brown, generally pale light green below, finely streaked darker on breast, belly and flanks; first-year male has contrasting new and old greater upperwing-coverts, narrower and whitish edges of wing-coverts and flight-feathers, and slight streaking on mantle and flanks. VOICE. Song an extended version of the twittering call, mostly a nasal buzzing twitter of 2 or 3 notes, "zeezle-eezle-eeze", and interspersed with additional trills, including "ti-ti tweeoo" phrases. Most frequent call a series of soft twittering notes, used for contact among members of flock, also a wheezing "twang" note; in flight a series of twitters and short trills, also a shorter and abrupt "chut-chut-chut".

Habitat. Breeds in submontane and montane conifer and mixed fir (*Abies*), hemlock (*Tsuga*) and birch (*Betula*) forests with dense understorey of rhododendrons (*Rhododendron*), also in larch (*Larix*), mixed alder (*Alnus*) and birch forest, and scrub at 2800–4000 m; in Myanmar breeds above 1500 m, to c. 2140 m. In non-breeding season found in similar habitat at lower levels, in Himalayas at 1000–3500 m; in Myanmar down to 610 m.

Food and Feeding. Principally seeds, mainly those of alder and birch. Forages either on ground under bushes or in scrub or tops of trees. Active and restless when foraging, often moving some distance between trees. Mostly in pairs and small groups, but in winter also in larger flocks of up to 200 individuals.

Breeding. Season at least May–Jun, when most in pairs. No further information.

Movements. Altitudinal migrant, making post-breeding descent to lower levels. In non-breeding season, arrives in Bhutan early Nov and in Nepal later in month; present until Mar, some to late May, in Bhutan.

Status and Conservation. Not globally threatened. Little known. Generally scarce; rare to uncommon in China and NE India. Locally uncommon and erratic in occurrence in non-breeding range, but fairly regular in Kathmandu Valley, in Nepal. Status in N Myanmar uncertain; breeding suspected, but not yet documented. May occasionally breed in wintering areas in N Indian Subcontinent (E from C Nepal).

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Choudhury (2006), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), Ludlow & Kinnear (1944), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1959).

55. Eurasian Siskin

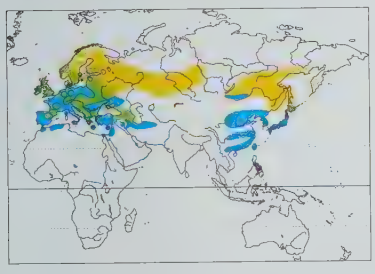
Carduelis spinus

French: Tarin des aulnes **German**: Erlenzeisig **Spanish**: Jilguero Lúgano
Other common names: Common/Spruce Siskin

Taxonomy. *Carduelis Spinus* Linnaeus, 1758, Sweden.

This species and *C. pinus* and *C. atriceps* have been thought to form a superspecies. Recent phylogenetic analysis indicates that first two, at least, are only distantly related to the South American group of siskins, and has recently been suggested that they be separated in genus *Spinus*, but comprehensive review is required of all species currently included within present genus in order to determine true relationships. Monotypic.

Distribution. Breeds discontinuously throughout Europe from N Scandinavia to N & C Spain, Corsica, N & S Italy and Balkans to N Greece, and continuously E from Baltic and E Poland through C parts of W Russia, NC Kazakhstan and W Siberia to upper R Ob (irregularly to R Yenisey), and in S from Ukraine, W Caucasus and NW & N Turkey E to N Iran & N Iraq; also in Russian Far East from L Baikal and Yablonovy Range E to Transbaikalia, Sea of Okhotsk coast, C Kamchatka, Ussuriland, Sakhalin I and NE China (N Inner Mongolia and Heilongjiang), also N Japan (C & E Hokkaido). Winters S to NW Africa, Cyprus, N & C Israel, SW Iran, N Mongolia, Korea, S Japan, E & S China and Taiwan.



Descriptive notes. 11–12 cm; 10·1–18·5 g. Small, greenish-yellow finch with fine bill, bright yellow wingbars and slightly forked tail. Male has black cap from forehead and lores to hindcrown, bright yellow supercilium from above eye to rear of ear-coverts and side of neck, short, fine blackish eyestripe, olive-yellow cheek fading into greyish-olive or olive-green ear-coverts; upper nape green or greenish-yellow (feathers may be tipped grey or blackish); lower nape to back and scapulars olive-green (duller in non-breeding season), streaked broadly blackish on mantle to scapulars, rump bright yellow, becoming unstreaked yellowish-green on uppertail-coverts; tail black, edged rich yellow at sides of base (forming two prominent panels); upperwing-coverts tipped greenish-yellow on medians and broadly bright yellow on greaters; alula, primary coverts and flight-feathers black or blackish, yellow bases of inner primaries and of all secondaries extending along outer edge of feathers for half length (in flight, prominent wingbar across remiges), tertials black, fringed pale yellow or whitish; chin black, throat, breast and flanks yellow, tinged green on side of breast and upper flanks and streaked broadly dark brown or blackish, lower belly to undertail-coverts white; iris black; bill dark-brown to greyish-horn, paler lower mandible; legs dark brown. Female lacks black cap of male, has greenish head (more greyish-green on forehead to crown) and upperparts heavily streaked blackish, rump and uppertail-coverts dark-streaked greenish-yellow, tips of median and greater upperwing-coverts variably pale yellowish-green, cream or whitish, flight-feathers edged very pale or dull yellow, tertials fringed creamy or white or lower tertial edged yellowish; dull yellowish chin to breast and upper flanks, broadly streaked blackish to lower flanks, rest of underparts white; in non-breeding season, head and upperparts greyer and yellow areas in wing and tail duller or tinged greenish. Juvenile is similar to female, but head and upperparts much more buffish-brown with dark brown or blackish streaks, prominent pale buffish supercilium to side of neck, broad warm buff-brown tips on median and greater coverts (forming double wingbar), edges of flight-feathers pale lime-green, off-white or dull greyish-buff below, spotted or streaked blackish; first-winter male like adult, but more heavily streaked above, with less yellow at base of flight-feathers, much paler wing-covert bars. VOICE. Song, usually from treetop or similar high perch or in flight over territory, a rapid jumbled mixture of thin or high-pitched jangling notes, including metallic twitters, trills and wheezy notes, interspersed with slightly harsher notes, often beginning softly and rising in pitch and volume; subsong or softer version often given by migrants in wintering areas prior to spring migration. Call a distinctive, high-pitched, ringing "toolee" or "tsuu-ee" often given for contact in flight, a dry "tet" or "tet-tet" also in flight; at or near territory gives trilling "tirrillili" or variations including "twillit" or a more chattering "tittereee"; alarm or anxiety call a sharp and rising "tsooeet"; foraging flocks in trees give soft chirp or chipping twitter as contact note.

Habitat. Breeds in boreal and temperate lowland, submontane and montane conifer forests, mainly spruce (*Picea*), and in fairly open mixed deciduous and conifer forests, including fir (*Abies*) and pine (*Pinus*); also frequents wide variety of other trees, including larch (*Larix*), alder (*Alnus*) and birch (*Betula*), together with non-native conifers in plantations, parks and gardens. In non-breeding season in similar habitats, also heaths, commons, orchards, weedy thickets, parks and gardens; particularly fond of riverine or lakeside alders, and in many parts of range alder and birch are very important winter foodplants; in E Mediterranean and Middle East occurs in casuarina (*Casuarina*) trees, fruit trees, plantations and edges of cultivation, and in N Africa found in acacias (*Acacia*). On migration regularly occurs in coastal woodlands, scrub and more open areas with scattered trees. In Europe occurs from sea-level to c. 2000 m.

Food and Feeding. Mostly seeds, buds and fruit; some invertebrates. Seeds and buds include those of spruce, pine, juniper (*Juniperus*), cypress (*Chamaecyparis*), redwood (*Sequoia*), alder, birch, larch, hemlock (*Tsuga*), Douglas-fir (*Pseudotsuga*), willow (*Salix*), poplar (*Populus*), beech (*Fagus*), elm (*Ulmus*), maple (*Acer*), plane (*Platanus*), lilac (*Syringa*), olive (*Olea*), hemp (*Cannabis*), hop (*Humulus*), nettle (*Urtica*), dock (*Rumex*), goosefoot (*Chenopodium*), chickweed (*Stellaria*), water-lily (*Nymphaea*), poppy (*Papaver*), charlock (*Sinapis*), shepherd's-purse (*Capsella*), hoary alison (*Berteroa*), wintergreen (*Pyrola*), meadowsweet (*Filipendula*), apricot (*Prunus*), rowan (*Sorbus*), pea (*Pisum*), willowherb (*Epilobium*), evening-primrose (*Oenothera*), bilberry (*Vaccinium*), plantain (*Plantago*), golden-rod (*Solidago*), mugwort (*Artemisia*), groundsel (*Senecio*), burdock (*Arctium*), thistles (*Carduus*, *Cirsium*), knapweed (*Centaurea*), chicory (*Chicorium*), sow-thistle (*Sonchus*), lettuce (*Lactuca*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), cat's-ear (*Hypochoeris*), hawkweed (*Hieracium*) and grasses (Gramineae), possibly also seeds and buds of exotic eucalypts (*Eucalyptus*); also takes peanuts. Small number of insects and larvae taken, including mayflies (Ephemeroptera), damselflies (Odonata), bugs (Hemiptera), moths (Lepidoptera), flies (Diptera), ants (Formicidae), small beetles (Coleoptera); also spiders (Araneae), small earthworms (Lumbricidae) and molluscs (Mollusca). In spring feeds almost exclusively on conifer seeds (when cones open), buds and shoots, turning to alternatives when conifer-seed supply exhausted, usually by late Jul. Nestlings often fed with aphids (Aphidoidea) for first few days, diet then switching to spruce or pine seeds. Forages mostly in trees, including canopy of conifers, larches and alders; not uncommonly on ground during migration, and feeds often on ground in winter. Actively forages from slender branches, clinging acrobatically upside-down in manner of a tit (Paridae), using fine bill to extract seeds from open cones (unable to extract seeds from closed cones); also clings to seedheads of thistles and docks, and pierces flowerheads or strips outer bracts to reach ripening seeds. Sometimes pursues and takes insects in flight. Since early 1960s, has regularly visited garden feeders (both rural and urban) in non-breeding season, particularly late winter, in W Europe to feed on peanuts, sunflower (*Helianthus*) seeds and black niger (*Guizotia abyssinica*) seeds; numbers of individuals visiting feeders also influenced by success of cone crop, with lower numbers in years of plentiful supply and high numbers in poor years. Forages singly, in pairs and in small groups; in non-breeding season usually in larger gatherings, often of hundreds, occasionally thousands of individuals, and often in company with other small finches, including *Serinus serinus*, *C. carduelis*, *C. cabaret*, *C. flammea*, *C. citrinella* and *Loxia curvirostra*.

Breeding. Season late Feb/Mar–Aug, timing dependent on cone crop; two broods, but only one in years with poor cone crop. Monogamous. Solitary, also loosely colonial in groups of up to 20 pairs; territory used only for breeding, only weakly defended for short period during nest-building, majority of feeding done outside territory. Male performs stiff-winged but fairly rapid flight over prospective breeding territory. Pair-forming usually takes place before break-up of winter flocks; displaying male faces female, ruffles black crown and droops quivering wings (showing yellow rump), fluffs out breast and slowly raises and spreads tail, while giving subdued song; other aspects of display include bill-touching or bill-flirting, mate-guarding and courtship-feeding; chases of female by male often to good height or twisting through trees often a prelude to mating. Nest built by female, male may assist in collection of material, a small ball of conifer twigs, bark strips, plant fibres, roots and down, heather, grass, moss, lichens, animal hair, feathers and cobwebs, placed up to 20 m above ground against trunk or in outer branches of tall tree, preferentially spruce, pine or larch, or occasionally (and increasingly) birch. Clutch 3–5 eggs, pale bluish-white to blue, blotched with rust-red or reddish-violet and spotted and scrawled with purple or blackish-brown; incubation by female alone, period 12–13 days; chicks fed and cared for by both parents, nestling period 13–15 days. Breeding success high in years with abundant food supply, in years with poor spruce-seed crop either does not breed or delays until later in season, leading to lower success rate; in Scotland main nest predator is Eurasian red squirrel (*Sciurus vulgaris*); poor weather likely to affect nestling survival, e.g. in S Ireland study several broods drowned in nest during thunderstorm while parents collecting food. Breeds in first year.

Movements. Resident and migratory; periodically irruptive. S populations, mostly those in Europe (S from British Is, S Scandinavia, Baltic countries E to St Petersburg and Moscow regions), largely sedentary or make short-distance movements (longer if weather becomes severe in mid-winter); N breeders move longer distances S & SW to winter mainly within and S of range from S Spain and Mediterranean islands E to Turkey, Lebanon, Israel, NC Iran and S Kazakhstan (where widespread on passage). E Asian populations migrate S mainly to N Mongolia, E & SE China (especially Fujian and Guangdong), Korea and Japan. Scale of movement varies annually, largely dependent on availability of main seed crops within breeding area; in most years only small numbers move S, but in years with poor seed crop considerable numbers irrupt into wintering areas and in such years moves longest distances and reaches farthest S parts of wintering range; ringing evidence indicates that individuals either extremely site-faithful, repeatedly returning to same area, or wander widely in successive years, and recorded at locations up to 3200 km apart in consecutive winters. In S Europe in non-breeding season, a minority of non-breeding visitors (less than 15%) remain at a locality all winter, but most are transients, staying for only 2–3 days at each spot, wandering for short to medium distances (c. 40–45 km) during entire winter period, and some continuing farther. Ringed individuals in Britain, Belgium and Netherlands (including passage migrants) show scattered movement but mostly to S & SW, with most recovered in NC Europe and longest-distance

On following pages: 56. Pine Siskin (*Carduelis pinus*); 57. Black-capped Siskin (*Carduelis atriceps*); 58. Andean Siskin (*Carduelis spinescens*); 59. Yellow-faced Siskin (*Carduelis yarrellii*); 60. Red Siskin (*Carduelis cucullata*).

movements to Italy, Spain and (2450 km from SE England) to Algeria; small numbers also winter N Morocco, where most numerous during irruptions into Europe; other recoveries in N & NE in Scandinavia, E & SE Europe and W Russia, with longest recovery 3140 km from Scotland to Ukraine. Large numbers cross North Sea in autumn, either directly from Scandinavia or via Denmark and Netherlands, and arrive along entire E coast of Britain. Post-breeding dispersal of immatures from mid-Jul, and main migration from N areas begins Aug and reaches peak through late Sept and Oct; arrival in Spain and along W Mediterranean coast in Oct, but most numerous from Nov; occurs Cyprus late Oct to mid-Apr, peak numbers present Dec–Mar (recoveries of birds ringed Russia and Hungary reflect origins); farther E in Europe and in Middle East arrivals continue to late Dec. Most movement in small or medium-sized flocks, in years of large-scale migration up to 9000 birds/day recorded as passing along coast of S Sweden. Pace of migrants apparently depends on feeding areas along routes taken, but some move more rapidly; ringed individuals flying from St Petersburg to Spain and from Latvia to C England covered average of 160 km daily and from Lithuania to Belgium 113 km per day; within Britain, one moved from C England N to Scotland in three days, at average rate of 189 km per day. Return movements from far S of non-breeding range from early Feb, adults ahead of immatures; most return to breeding areas between end Mar and mid-May, largely along routes followed in autumn but in reverse direction; passage through Switzerland end Feb to late Apr, in S England most passage over by late Mar or mid-Apr, in Denmark and S Sweden peak passage Apr, and in St Petersburg area passage E or NE still continuing in mid-May. Prior to departure gains weight rapidly; in S England study individuals gained average 2·5 g over ten days, providing sufficient energy for potential flight of 400–500 km to S Scotland or Netherlands, those with higher fat loads calculated to have potential to reach NE Germany in single flight; other studies in S England and Scotland recorded similar weight gains and estimates of potential flights of 500–1000 km, while birds not showing rapid weight gain presumed to make slower or stepped journey to breeding areas closer to wintering area. Rare or scarce Iceland, Faeroes, Canary Is, Malta, Tunisia, Libya and N Egypt (small numbers occur Sinai in invasion years), Armenia, and throughout Middle East from Lebanon to Kuwait and United Arab Emirates, also Hong Kong (irregularly irruptive) and Taiwan. Vagrant in Azores, Madeira, Saudi Arabia, N Afghanistan, Nepal, N India, N Vietnam (W Tonkin) and Philippines (Calayan and Batan). Records in USA considered to have involved escapes from captivity.

Status and Conservation. Not globally threatened. Common or locally common throughout most of range; uncommon in summer in N Japan. Estimated European breeding population 3,000,000–15,000,000 pairs, 90% of which in Fennoscandia, Baltic countries and W Russia. Breeding densities often high, e.g. in NW Russia 200–300 pairs/km² in riverine forest, in Bulgaria 60 pairs/km² in conifer forest (mostly *Pinus nigra*), in Finland 14–24 pairs/km² in pine and up to 45 pairs in spruce, and in E Poland (Bialowieza Forest) 1–6 pairs/km² in pine and bilberry; densities, however, fluctuate strongly owing to irregular resource availability, e.g. in spruce forests extremely high densities in some years and species virtually absent in others; in Spain enhanced reproduction after strong winter-invasion years, especially in Scots pine (*Pinus sylvestris*) forest. Populations in British Is, Denmark, Netherlands, Romania and Hungary have increased in range and numbers since 1970s; in Britain and Ireland increased from 20,000–40,000 pairs in 1968–1972 to c. 360,000 pairs in 1988–1991, largely as a result of maturing conifer plantations, which provided new breeding areas and feeding habitat. Russian range has also expanded to E & W, narrowing the gap between the two populations. Attempted introductions of this species in USA (in Oregon and Ohio) in early 20th century were unsuccessful.

Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Brazil (1991), Cheng Tsohsin (1987), Clarke (2006), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint, P.R. & Stewart (1983), Flint, V.E. *et al.* (1984), Förschler & del Val (2008), Förschler *et al.* (2006), Fu Tongsheng *et al.* (1998), Gibbons *et al.* (1993), Glutz von Blotzheim & Bauer (1997), Grimmett *et al.* (1998), Hagemeijer & Blair (1997), King *et al.* (1975), MacKinnon & Phillipps (2000), Mariné & Copete (1994), McCarthy (2006), Nguembock *et al.* (2009), Porter *et al.* (1996), Rogacheva (1992), Ryabitsev (2001), Senar & Copete (1992), Senar, Burton & Metcalfe (1992), Senar, Copete & Martin (1998), Senar, Copete & Metcalfe (1990), Shirihai (1996), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1959), Wassink & Oreel (2007), Wernham *et al.* (2002), Wolters (1979), Zamora, Moscoso *et al.* (2006).

56. Pine Siskin

Carduelis pinus

French: Tarin des pins **German**: Fichtenzeisig **Spanish**: Jilguero de los Pinos

Taxonomy. *Fringilla pinus* A. Wilson, 1810, Bush-hill, near Philadelphia, Pennsylvania, USA.

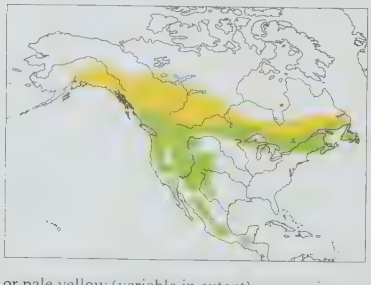
This species and *C. spinus* and *C. atriceps* have been thought to form a superspecies. Recent phylogenetic analysis indicates that first two, at least, are only distantly related to the South American group of siskins, and has recently been suggested that they be separated in genus *Spinus*, but comprehensive review is required of all species currently included within present genus in order to determine true relationships. Race *perplexa* hybridizes with *C. atriceps*, progeny showing intermediate characters (but having bill of present species); the two may be conspecific, but extent of reproductive isolation requires further research. Has also hybridized with *Loxia curvirostra*. Geographical variation largely clinal; review of races probably desirable. Three subspecies recognized.

Subspecies and Distribution.

C. p. pinus (A. Wilson, 1810) – breeds CS & SE Alaska, Canada (S from S Yukon, C Manitoba and C Ontario, E to C & S Quebec and Newfoundland) and W & NE USA; non-breeding S to N & EC Mexico.

C. p. macroptera (Bonaparte, 1850) – N Baja California and NW & C Mexico (E to Veracruz).

C. p. perplexa (van Rossem, 1938) – S Mexico (N & C Chiapas) and W Guatemala.



Descriptive notes. 11–13 cm; 11–18 g. Small to medium-sized, comparatively slender-billed, short-tailed and heavily streaked, drab-coloured finch with slightly forked tail. Male nominate race has head to nape pale buffish-brown, tinged grey and finely streaked dark brown; short, thin and poorly defined supercilium over eye and ear-coverts, underlined by thin dark eyestripe, cheek and ear-coverts finely streaked darker; upperparts like head (or tinged greenish), broadly streaked darker, uppertail-coverts the same or darker brown with yellowish-brown feather tips; tail blackish-brown, bases of all outer feathers yellow or pale yellow (variable in extent); upperwing-coverts dark brown or blackish, tipped light buff or warm buff-brown, tips of greaters broader and yellowish; alula and primary coverts black or blackish-brown, flight-feathers the same and finely edged pale buff, variable small square yellow patch at base of outer primaries (often concealed), tertials edged pale buff or whitish (in flight, shows broad black bases of wing-coverts and broad yellowish wingbar across bases of flight-feathers); pale or whitish-buff below, narrowly streaked darker on chin to breast, broadly or more heavily streaked on belly to undertail-coverts; a number of males (most frequent in SW of range) have upperparts greener, underparts paler and less extensively streaked, and more extensive yellow in wing and tail, considered to be green morph of nominate; iris dark brown; bill light brown to greyish, dark tip; legs dark brown. Female is similar to male, but usually has paler or whiter tips on median and greater upperwing-coverts and smaller area of pale yellow at base of outer primaries. Juvenile (may show loose or fluffed-out plumage) resembles adult, but usually more narrowly streaked on slightly paler buffish-brown upperparts, tips of median and greater coverts whitish, and underparts pale buffish and more thinly streaked dark brown. Races differ mainly in degree of colour saturation and prominence of streaking: *macroptera* is slightly paler than nominate, less prominently streaked above and below, streaks on breast lighter brown and less distinct, male also with more extensively brighter yellow at base of tail; *perplexa* is slightly smaller, paler or grey-brown above, face and underparts light greyish, only lightly or faintly streaked on breast and flanks, juvenile browner than nominate, streaked darker, pale cinnamon tips on median and greater coverts, pale buffish underparts. Voice. Song, usually only from start of breeding season to completion of clutch, a long rambling jumble of soft, nasal, whispering or husky, chattering notes, including downslurred notes, trills and a rising, trilling "zzzhreeeee" and some of the call notes, "che-che-che chew zzzhreeeee to ta chew", sometimes terminating with rolling "brrrrrr". Calls include a husky or buzzing "chee-ee", also a loud "clee-ip" or "chlee-it", a more nasal and rising "sweeeet" or drawn-out "zwee-e-e-e-e-t, zwee-e-eeet, shr-reet, sooeet" and shorter chatter or twitter, "tit" or "ji-ji-ji" or "bid bid", similar to that given by *C. flammea*.

Habitat. Mostly open coniferous forest, especially spruce (*Picea*) forest, also mixed deciduous and conifer forests, mainly pine–oak (*Pinus–Quercus*), and woodlands (including non-native trees), alder (*Alnus*) thickets and shrubs; in winter in similar habitat, also occasionally in meadows, grasslands, weed fields and roadside verges. In N Mexico occurs at 1800–3500 m, and in S Mexico and Guatemala at 2000–3500 m.

Food and Feeding. Mostly seeds of various trees and other plants, also some buds and berries; small amount of insects. Seeds include those of alder, birch (*Betula*), cedars (*Thuja*), larch (*Larix*), hemlock (*Tsuga*), spruce, pine, gums (*Liquidambar*), elm (*Ulmus*), maple (*Acer*), also of wild flowers, mostly of composites (Asteraceae), including dandelion (*Taraxacum*), chickweed (*Stellaria*), ragweed (*Ambrosia*) and grasses (Gramineae); takes buds and catkins of willows (*Salix*), elm and maple, and berries of honeysuckle (*Lonicera*) and red-cedar (*Juniperus virginiana*); also forages on cones of Australian pine (*Casuarina*); at feeders readily takes sunflower (*Helianthus*) and black niger (*Guizotia abyssinica*) seeds. Insects comprise c. 16–17% of diet, and include aphids (Aphidoidea), weevils (Curculionidae), scale insects (Coccoidea), sawfly larvae (Symphyta), eggs and larvae of spruce budworm (both *Choristoneura fumiferana* and *Choristoneura occidentalis*), and larvae of winter moth (*Operophtera brumata*). Nestling diet largely unknown, but adult transports up to 1·5 g of seeds in extended area of oesophagus. Forages at all levels in trees, most frequently in canopy, actively searching and examining slender branches, twigs, buds and cones; also in low vegetation and on ground, and frequently takes salt and grit from roads. In pairs and small groups; in non-breeding season occurs in larger flocks of up to 100 individuals, less frequently more than 1000 together and in mixed-species flocks with *C. tristis* and *Carpodacus purpureus*.

Breeding. Season late Feb to early Sept; one brood, occasionally two, and may rear second brood at site farther N than first nest. Monogamous. Loosely colonial, and territorial; very small area of up to 2 m around nest defended during egg-laying and incubation. Pair-forming takes place in wintering area from Dec onwards, reaching peak in Feb–Mar. Male performs circular, butterfly-like, fluttering song flight, with wings and tail fully spread, above treetops. Male pursues female in short, rapid flights, often as prelude to mating; courtship-feeds female (through to brood stage) and defends her against encroaching males; female also induces mating from crouched position on ground or perch while fluttering wings and tail and giving soft begging calls. Nest built by female, accompanied by male, which gathers some nest material, a flat or shallow, compact cup or saucer of fine twigs, grass, leaves, plant stems, fibres and down, strips of vines or bark, lichens, animal hair or fur, feathers and moss, placed 1–15 m above ground and well hidden on horizontal branch of tree, usually conifer, occasionally deciduous tree or shrub. Clutch 1–6 eggs, usually 3–4, pale greenish-blue, variably speckled or spotted brown or reddish-brown to lavender or black; incubation by female alone, fed on nest by male, period 13 days; nestling period 13–15 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*). Breeding success largely influenced by weather from nest-building to nestling-feeding stages, also substantially influenced by brood parasitism in areas where range overlaps with that of Brown-headed Cowbird; effects of nest predation little studied, but reacts strongly to Blue Jay (*Cyanocitta cristata*), American Crow (*Corvus brachyrhynchos*), American red squirrel (*Tamiasciurus hudsonicus*) and domestic cats (*Felis catus*) when present near nests or young. Breeds in first year. Maximum recorded longevity 9 years 5 months.

Movements. Resident and partial migrant; frequently irruptive. Most movements diurnal, and in irruption years moves in flocks often containing several thousands. S races largely sedentary or altitudinal migrants, moving to lower levels in non-breeding season. N breeders migrate S to wintering grounds throughout S parts of breeding range and through C & SE USA to Gulf coast and S Florida; highly nomadic throughout range in autumn and winter, timing and scale of movements largely influenced by availability of food, resulting in yearly variation in extent of movements. Irruptive movements occur in years of poor cone crops in N of breeding range (on average every two years, but sometimes in consecutive years or at intervals of more than three years) and this species may then occur through S Canada and most of USA. In non-irruption years winters mostly in N conifer forests in varying numbers (from scarce to abundant). Departs from breeding areas between mid-Aug and Nov, peak of movement in Sept–Oct, and returns N from late Feb to May; little evidence of site-fidelity and may nest as soon as suitable habitat located close to wintering area, or passage continues through areas where birds breeding to more N locations; considered likely that some pairs may raise first brood in S and then move N to within N areas of breeding range to raise second brood, but degree to which this happens unclear. Evidence from ringing suggests that most movements erratic or highly variable annually, and a given individual may winter in an area several thousand kilometres distant from that used in previous year; most winter recoveries of birds ringed in E Canada and NE USA show N–S orientation of winter movements, with recoveries S to W Virginia, Pennsylvania and Vermont; farther W, those wintering in C USA also show NE or NW areas of origin. Scarce or irregular visitor on Pribilof Is, Aleutian Is (Unimai) and islands in Bering Sea. Vagrant in S Baja California, in Bermuda and at sea in N Atlantic Ocean (on board E-bound ship c. 3060 km E of New York).

Status and Conservation. Not globally threatened. Common, locally common or erratically common to abundant. Breeding-survey data in parts of USA breeding range indicate some decline of more than 7% during 1968 to 1994 in population breeding between SW British Columbia and NW California, with highest levels of decline in Washington and California; reasons for decline not well understood, but breeding success possibly adversely affected by predation, nest failure, failure of food supply and brood parasitism.

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57. Black-capped Siskin

Carduelis atriceps

French: Tarin sombre **German**: Guatemalazeisig **Spanish**: Jilguero Capirotado

Taxonomy. *Chrysomitris atriceps* Salvin, 1863, near Quetzaltenango, 8000 feet [c. 2440 m], Guatemala.
This species and *C. pinus* and *C. spinus* have been thought to form a superspecies. Possibly only distantly related to the South American group of siskins, and has recently been suggested that the three be separated in genus *Spinus*, but comprehensive review required of all species currently included within present genus in order to determine true relationships. Hybridizes with *C. pinus* of S race *perplexa*, progeny showing intermediate characters; may be conspecific, but extent of reproductive isolation between these two taxa requires further research. Monotypic.
Distribution. SE Mexico and W Guatemala.



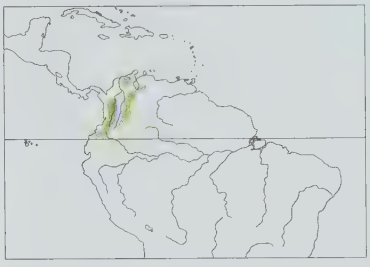
Descriptive notes. 11–13 cm; one male 12·5 g, one female 14·5 g. Small to medium-sized, fine-billed, greenish-yellow finch with slightly forked tail. Male has forehead and upper lores to hindcrown, chin and throat blackish, rest of head dark greenish-olive; nape and upperparts uniformly deep green, becoming paler green on lower back and rump; tail black or blackish, feathers finely edged bright yellowish-green, bases of all outer feathers bright yellow; median upperwing-coverts bright olive-green, greater coverts blackish basally, broadly tipped bright olive-green or slightly yellowish; alula and flight-feathers black, narrowly edged greenish-yellow, narrow bright yellow patch on base of outer secondaries and inner primaries, tertials black, edged olive-green and tipped whitish-buff; underparts mostly dull green, becoming yellowish on belly and undertail-coverts; iris black; bill pale flesh-pink; legs greyish or dark horn-brown. Female is similar to male, but head and upperparts duller, cap sooty black or blackish-brown, mantle to scapulars deep olive-green, streaked broadly darker, rump pale green and uppertail-coverts duller or greenish-olive; underparts duller green than on male, with short faint streaks on throat and breast; belly to undertail-coverts whiter. Juvenile is similar to female, but lacks black cap and is generally more buffish-brown, streaked darker on upperparts, with rump and uppertail-coverts only lightly streaked, median and greater upperwing-coverts tipped yellowish, bright yellow bases on outer secondaries and inner primaries, and underparts mostly pale buffish or yellowish-buff, streaked finely dark brown on side of neck and upper breast. Voice. Song poorly known, a rambling warble of scratchy notes, twitters, buzzes and trills, recalling song of *C. pinus*. Calls include nasal "zwee" or "dzee", a rising buzzing "zree-ee-ee" or "djeeeerrr", and a dry "ch-ch-cht" or "cheh-cheh-cheht".
Habitat. Submontane and montane pine–oak (*Pinus–Quercus*) and oak and alder (*Alnus*) forests, also scattered conifer woods and adjacent fields, pastures and cultivated areas; at 2350–3500 m.
Food and Feeding. Mainly various plant and tree seeds (particularly those of genus *Salvia*). Forages on ground and in upper levels of trees. In pairs and small flocks; in non-breeding season often in flocks of up to 30 individuals.
Breeding. No information.
Movements. Presumed sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in North Central American Highlands EBA. Very little known. Appears to be uncommon or scarce.
Bibliography. Clement *et al.* (1993), Howell & Webb (1995), Land (1970), McCarthy (2006), Ruelle (1995a).

58. Andean Siskin

Carduelis spinescens

French: Chardonneret des Andes **German**: Andenzeisig **Spanish**: Jilguero Andino

Taxonomy. *Chrysomitris spinescens* Bonaparte, 1850, Bogotá, Colombia.
May form a superspecies with *C. yarrellii*. Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species, but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Proposed race *capitanea*, described from San Miguel (Santa Marta Mts), in N Colombia, is treated as a synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
C. s. spinescens (Bonaparte, 1850) – Colombia (Santa Marta Mts, Sierra de Perijá and E Andes) and W & N Venezuela (probably Sierra de Perijá; N Andes in Trujillo, Mérida and Táchira; also NE Aragua).
C. s. nigricauda (Chapman, 1912) – W Colombia (W & C Andes S from N Antioquia) S to N Ecuador (Carchi).
Descriptive notes. 9–11 cm; one bird 11·3 g. Small, dull greenish finch with fine bill, yellow wing-flash and slightly forked tail. Male nominate race has forehead and upper lores to crown black, face uniform dingy green, washed slightly paler or yellowish; nape and upperparts deep green (may be finely spotted darker), becoming bright yellow on rump and dull greenish-yellow on uppertail-coverts; tail black or blackish, bases of all outer feathers bright yellow; median upperwing-coverts black, broadly fringed greenish-yellow, greater coverts the same but tipped brighter yellow; alula and flight-feathers black, bases of primaries and secondaries bright yellow (in flight shows as broad yellow wingbar), edges of lower secondaries also finely edged bright yellow, tertials black, edged white or whitish-yellow; mostly dull greenish-yellow below, sometimes paler yellow on side of breast and flanks, with belly to undertail-coverts pale yellow; iris black; bill brown or brownish-horn, paler base of lower mandible; legs brown or dark brown. Female generally lacks black cap (may show dusky forehead and lores) and is generally duller olive-green on head and upperparts, lower back and rump greenish-yellow or pale yellow, wings and tail as for male but with less extensive greenish-yellow tips on wing-coverts and less yellow at bases of flight-feathers; underparts as on male or paler greenish-grey, except for white or yellowish-tinged belly to undertail-coverts. Juvenile is similar to female, but paler and generally more buffish-brown above and below, rump pale yellow, wings and tail as those of adult, but tips of median and greater upperwing-coverts brown or buffish-yellow, lower underparts yellowish. Race *nigricauda* has upperparts (including rump) duller or darker green than nominate, underparts dull green (lacking any yellow), no greenish-yellow tips on upperwing-coverts (but has bright yellow bases on inner primaries and secondaries), tail all black, female similar to male but slightly duller, with dusky cap and yellowish-olive underparts (several females from W slope of E Andes in Ecuador identical to male). Voice. Song a lively series of sustained but rambling high-pitched metallic notes and rolling trills, reminiscent in tone and quality of song of *C. carduelis*. Call a sharp "tswee" and variations, often given in flight.



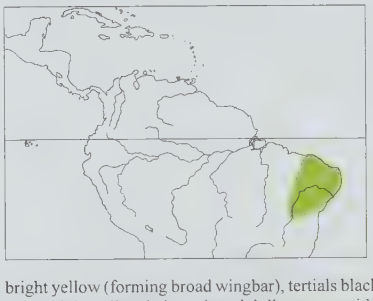
Habitat. Low bushes and scrub along tree-line and edges of open cloudforest or elfin forest; also in *páramo* and open hillsides with scattered trees, thickets and bushes or edges of cultivation. At 1800–4100 m; occasionally down to 1500 m in Colombia.
Food and Feeding. Mainly a variety of plant seeds, particularly *Espeletia* seeds, and flowers. Forages in low vegetation and on ground; also perches high in treetops. In pairs and in small flocks of up to 20 individuals; in non-breeding season occasionally in mixed flocks with other finches, including *C. magellanica*.
Breeding. Birds in breeding condition in Aug; nest-building in Jun and recently fledged young in Mar. No further information.
Movements. Nomadic or erratic in occurrence; wanders widely throughout its range when not breeding.
Status and Conservation. Not globally threatened. Common, locally common or rare. A poorly known species.
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Clement *et al.* (1993), Fjeldså & Krabbe (1990), Hilty (2003), Hilty & Brown (1986), Nguembock *et al.* (2009), Restall *et al.* (2006), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Todd (1926).

59. Yellow-faced Siskin

Carduelis yarrellii

French: Chardonneret de Yarrell **German**: Yarrellzeisig **Spanish**: Jilguero Cariamarillo

Taxonomy. *Carduelis yarrellii* Audubon, 1839, Upper California; error = Bahia, Brazil.
May form a superspecies with *C. spinescens*. Recent phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic ones, but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Monotypic.
Distribution. NE Brazil (Ceará and Paraíba S to NC Bahia).
Introduced to N Venezuela (Carabobo).



Descriptive notes. 10 cm. Very small, bright yellow finch with fine, pointed bill and slightly forked tail. Male has forehead and upper lores to upper nape black, face and side of neck bright yellow, lower nape and hindneck green; upperparts deep green or olive-green (may show dark streaks), becoming bright yellow on lower back, rump and uppertail-coverts (longest coverts dark green, fringed paler); tail blackish, bases of all outer feathers broadly bright yellow; median upperwing-coverts black, fringed olive-yellow, greater coverts blackish basally, broadly tipped bright yellow; alula and flight-feathers black, bases of remiges bright yellow (forming broad wingbar), tertials black, edged pale greenish-yellow and tipped whitish-buff; bright yellow below, tinged dull green on side of breast and flanks; iris black; bill dark brown or dark horn; legs brown or dark horn-brown. Female is similar to male, but lacks black crown; face as on male, but slightly duller, forehead to upperparts dull green or olive-green, rump pale greenish-yellow or brighter pale yellow, median coverts duller olive-green, greater coverts blackish, tipped greenish or pale yellow, flight-feathers as on male but yellow areas slightly duller; bright yellow below, greenish wash on side of throat, breast and flanks. Juvenile is similar to female, but duller, generally pale buffish-brown, narrowly streaked darker above and below. Voice. Poorly known; song a complex and varied, high-pitched, ringing warble.
Habitat. Edges of lowland humid forest, secondary-growth woodland, *caatinga*, edges of cultivation, coffee plantations, also edges of urban areas; to c. 550 m.
Food and Feeding. Poorly known. One specimen found to have eaten small fruits; presumably also takes various seeds. No other information.
Breeding. No published information. Nests said to have been found in exotic pine trees (*Pinus*) in Pernambuco (Saltinho), NE Brazil.
Movements. Presumed sedentary.
Status and Conservation. VULNERABLE. CITES II. Extremely rare; surviving populations concentrated in Alagoas, with recent records from Pedra Talhada, Murici and Usina Laginha. Has been recorded at more than 20 sites in Brazilian Atlantic Forest, including Saltinho, Sierra Grande Caramarigbe, Bitury, Caetes, Caruaru, Ibimirim and Serra Negra (all in Pernambuco), Serra da Capivara (Piauí), and near Jeremoabo (Bahia); not recorded in Ceará since 1958 and no records from Paraíba since 1957. In 1980s, this species was considered locally common in Pernambuco and Alagoas, but rare elsewhere. Subsequently, only two recent records from Pernambuco, one of which may have involved individuals released after confiscation by inspectors combating illegal animal trade, and very few observed at Murici (Alagoas) in 1996–1999, indicating a sharp decline in range and numbers. No recent confirmed sightings in Venezuela, where all records of this species now considered to refer to escaped cagebirds. Although protected in both Venezuela and Brazil,

this siskin has been trapped in large numbers for the cagebird trade, supplying both national and international markets; in 1980s, up to 700 individuals were seen at Fortaleza bird market (Ceará), and 60–100 appeared seasonally at the Caxias market, in Rio de Janeiro. Some evidence that applications of pesticides in foraging areas may also have contributed to the species' decline. Occurs (or has been recorded) in Pedra Talhada, Serra Negra and Saltinho Biological Reserves, Serra da Capivara National Park and Tapacurá Ecological Station. Surveys required, especially in Alagoas and Pernambuco, in order to determine this species' current range, abundance and ecology, and enforcement of laws concerning trapping and trade needed. Possible impact of pesticides on food availability and the birds' health also requires investigation.

Bibliography. Anon. (2009i), Butchart & Stattersfield (2004), Clement *et al.* (1993), Collar *et al.* (1992), Esuperanzi (1993a), Goessen (1996), Gregorutti (1996), Hilty (2003), Kerkhove (2002), Klages (2010), Magnani (2002), Olmos (1993), Restall *et al.* (2006), Ridgely & Tudor (1989), Roda *et al.* (2003), de Roeck (1996), Rodriguez & Rojas-Suárez (2003), Ruelle (1997b), Sick (1993), Stattersfield & Capper (2000), Todd (1926), Wege & Long (1995).

60. **Red Siskin**

Carduelis cucullata

French: Chardonneret rouge **German**: Kapuzenzeisig **Spanish**: Jilguero Rojo

Taxonomy. *Carduelis cucullata* Swainson, 1820, Cumaná, Venezuela.

Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic ones, but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Monotypic.

Distribution. NE Colombia (Norte de Santander), N & W Venezuela and S Guyana. Introduced to Puerto Rico.



Descriptive notes. 10–11 cm. Small, reddish finch with sharply pointed bill and notched tail. Male has head to side of neck, chin and throat jet-black, hindneck and upperparts deep scarlet with grey or blackish feather bases, lower back and rump paler red or pinkish-red; tail black, base of feathers edged pale vermilion at side (not always visible in field); upperwing-coverts black, tipped deep vermilion, alula, primary coverts and flight-feathers black, brighter vermilion patch at base of outer secondaries and primaries, tertials black, edged pale pinkish and whiter at tips; underparts vermilion, belly and vent whitish, tinged pink; iris black; bill dark greyish-horn or blackish; legs brown or dark brown. Female has head and upperparts (to lower back) grey, forehead to crown and nape streaked darker, face to chin and throat and sides of neck pale grey (sometimes finely spotted red on lower throat), mantle to scapulars lightly streaked darker and tinged reddish-pink on lower back; rump and uppertail-coverts vermilion, tips of longest coverts grey, tail black, finely edged reddish at side of base; wing as for male, but median and greater coverts more broadly black at bases and tips paler orange-red, also band at bases of flight-feathers pale orange-red, tertials have white or whitish-buff tips; breast to upper belly and flanks orange-red, rest of underparts whitish. Juvenile resembles female, but paler or greyer, with reduced amounts of orange-red; first-year male similar to adult, but vermilion replaced by brown, tips of wing-coverts yellowish or buff, flight-feathers black with pale or creamy-yellow bases, underparts brownish. Voice. Song a long series of repeated twitters and trills, lasting up to 2–3 minutes, reminiscent of that of *C. carduelis*. Calls include high-pitched twitter, high-pitched ringing bell-like "ta-lee" with second note rising, and a distinctive, sharp "chi-tit" or "chut-chut". For calls apparently used mainly in mate contact, single-note call usually given while perched, double-note call normally in flight.

Habitat. Lowland, dry deciduous woodland and open country, edges of evergreen forest, scrub and grassland with occasional trees; at 300–1200 m, occasionally down to 100 m.

Food and Feeding. Mostly seeds of various grasses, shrubs and trees, also flowerheads, fruit of cacti and figs (*Ficus*) and berries, including, in Venezuela, *Cordia*, *Trixis*, *Eupatorium*, *Wedelia* and *Urera baccifera*, and, in Guyana, flowerbuds and fruit of sandpaper tree (*Curatella americana*) and fruit of the mistletoe *Phoradendron*; also nectar; possibly some small insects. Commonly forages on ground and low down in vegetation and bushes; also higher up in trees. Singly and in pairs; following breeding season, forms large flocks.

Breeding. Season mainly May to early Jul, also Nov–Dec. Solitary; loosely colonial in Guyana, with breeding territories densely packed, apparently owing to superabundance of fruiting *Curatella* and *Phoradendron*. Prominent aspects of breeding behaviour include mate-guarding, male–male and female–female chasing, display-flights, and stealing of nest material. Nest a deep cup of fibrous bark or grass strips, lined with fine cottonlike fibres; placed high (25 m) up in *Tillandsia* bromeliad clump or in branch fork in tall forest tree (Venezuela), or in dense terminal leaf cluster 5–7 m high in crown of *Curatella* tree (Guyana). Eggs 3–5, pale greenish-white. Female alone incubates, fed by male, incubation period 11–13 days; fledging 14–16 days. In captivity: birds pair for single season; female builds nest alone, and feeds chicks with very little help from male; longevity 8–9 years, males remaining fertile up to 8 years, females up to 5 years.

Movements. Partially migratory or semi-nomadic. Moves considerable distances (up to 50 km) daily to and from breeding and roosting areas to feed; in non-breeding season disperses at random away from breeding areas in search of food. On Monos I, off Trinidad, was sporadic but apparently common at times, perhaps indicating seasonal influxes from mainland, but origin of birds on Trinidad has been questioned, possibly introduced.

Status and Conservation. ENDANGERED. CITES I. Extremely rare. In N Venezuela recent observations from only four states; small population probably still extant in N Colombia (Norte de Santander), where sighting in 2000 was the first since 1978; small population discovered in 2000 in SW Guyana, c. 950 km from nearest known locality in Venezuela. In early 20th century considered common and widespread throughout N Venezuela, but has subsequently declined rapidly and severely. Last seen on Trinidad, where possibly introduced, in 1960. Population in the wild, in Venezuela, estimated in 1981 at c. 600–800 individuals, with c. 350–500 in W and c. 250–300 in C, reportedly extirpated in E; newly discovered population in Guyana thought to be in low hundreds to low thousands of individuals; present global population of this species estimated at between high hundreds and low thousands, although paucity of recent records in both Colombia and Venezuela suggest that true figure is probably closer to lower end of that range. Introduced (through escaped cagebirds) to Puerto Rico in 1920s or 1930s; small numbers persisted, but species was always very rare and, after rapid decline, last seen in 1982; also introduced to Cuba but apparently never became established. Has suffered from a long history of enormous commercial exploitation owing to its popularity as a cagebird, as it hybridizes with domesticated canaries to produce "red-factor" variants or mules; although legally protected since 1940, trapping continued until 1990s. In 1975 at least 3000 birds were recorded in trade, dropping to just over 1000 in 1982. Although bird-trappers are active in area of Guyanese population, they claim that there is no active market for the species. Amount of suitable habitat has been greatly reduced through intensive agriculture, which continues to compound effects of long-term intensive trapping. Furthermore, captive-breeding programmes are hampered by problems of disease and hybrid stock; captive-breeding project exists in USA and Canada, but planned (re)introduction project on Trinidad was suspended because of disease in the birds. Legally protected in Venezuela, where said to have occurred in Guatopo and Terepaima National Parks, but there have been no records for many years from these localities. Recently declared legally protected in Guyana, where the South Rupununi Conservation Society (SRCS), in partnership with local communities, is conducting research on the species; a large part of its known Guyanese range is on a cattle ranch, where managers are well disposed towards conservation. Proposed conservation measures include surveys to ascertain the species' present range and status, international co-ordination of captive-breeding efforts with a long-term view to reintroductions in Venezuela, genetic research, and development of a management plan to ensure the protection of the recently discovered Guyanese population.

Bibliography. Anon. (2009i), Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Butchart & Stattersfield (2004), Clement *et al.* (1993), Coats & Phelps (1985), Collar *et al.* (1992), Esuperanzi (1992b, 2005), Hilty (2003), Hilty & Brown (1986), López-Lanús (2000), Magnani (2007), Nguembock *et al.* (2009), Nitschky-Germann (2000), Perez (2002), Raffaele *et al.* (1998), Restall *et al.* (2006), Ridgely & Tudor (1989), Robbins *et al.* (2003), Rodríguez & Rojas-Suárez (2003), Stattersfield & Capper (2000), Todd (1926), Wege & Long (1995).

PLATE 38 ➤



PLATE 38

inches 2

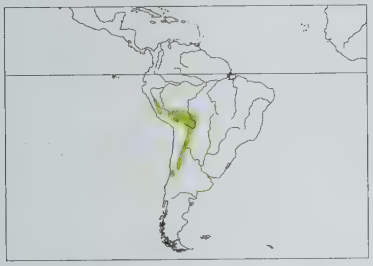
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61. Thick-billed Siskin

Carduelis crassirostris

French: Chardonneret à bec épais **German**: Dickschnabelzeisig **Spanish**: Jilguero Piquigrueso

Taxonomy. *Chrysomitris crassirostris* Landbeck, 1877, near passes of Uspallata and Portillo, Mendoza, Argentina.
It has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be appropriate, as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species (*C. spinus* and *C. pinus*); comprehensive review required of all species currently included within present genus in order to determine true relationships. Races possibly intergrade; birds from WC Peru perhaps intermediates, similar to nominate, but with smaller base of lower mandible and breast tinged olive as in race *amadoni*. Two subspecies currently recognized.
Subspecies and Distribution.
C. c. amadoni (George, 1964) – Andes of C to SE Peru.
C. c. crassirostris (Landbeck, 1877) – S Bolivia, NW Argentina and C Chile.



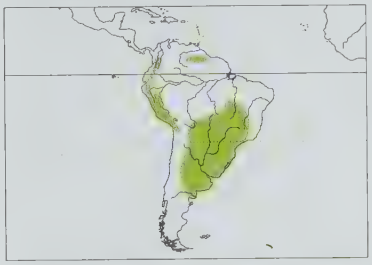
Descriptive notes. 12·5–14 cm; 19 g. Medium-sized, greenish-yellow finch with large bill, bright yellow wing-flashes and notched tail. Male nominate race has head to upper nape, chin and throat (occasionally to centre of upper breast) black, bordered by bright yellow side of neck; lower nape to back and scapulars olive-yellow, indistinctly streaked darker, rump greenish-yellow, yellower on uppertail-coverts; tail black, broad deep yellow edges at bases of all outer feathers (forming prominent side panels); median and greater upperwing-coverts blackish-brown, tipped dull yellow or yellowish-green (pale tips of greater coverts absent in worn plumage); alula, primary coverts and flight-feathers black, basal half of primaries and bases of secondaries bright yellow (forming band across wing), distal edges of secondaries edged light buff, tertials fringed and tipped pale or whitish-buff; lower throat to breast and flanks bright yellow, often tinged greenish on side of upper breast and flanks, belly to undertail-coverts bright yellow or yellowish-buff; iris brown; bill black above, brownish-horn below; legs dark grey or blackish. Female is similar to male, but much duller, head to nape dark grey, greyish-olive on chin and throat, upperparts duller green or grey-tinged greenish-olive and flecked with buff, except for olive-yellow wash on rump; wings and tail as for male, but yellow panels on tail smaller, yellow at bases of flight-feathers less extensive; underparts dull or dingy yellow, sometimes with slight streaking on flanks, with belly to undertail-coverts off-white; bill horn-brown or greyish, paler base of lower mandible. Juvenile resembles female, but buffish-brown above and below, except for pale yellow undertail-coverts. Race *amadoni* differs from nominate in slightly smaller bill, duller olive upperparts, black head of male usually lacks glossy tones, yellow underparts much duller, tinged olive on breast, lower belly and vent whitish or pale yellow, less yellow at bases of flight-feathers (restricted to bases of inner primaries and secondaries), rump olive and uppertail-coverts tipped greyish, little or no yellow at base of tail, female like nominate but more uniform upperparts (lacking contrast on rump and uppertail-coverts), greyish-white below with dusky streaks on lower flanks and undertail-coverts. Voice. Song a series of twitters typical of siskins, but lower-pitched and with more rapid delivery; groups of males often sing in concert. Call a dry and drawn-out "heeep" and a coarse "chler-ee".
Habitat. Montane Andean steppes, in *Polylepis* shrubs and scattered woodland, usually in short or stunted trees, also brush-covered hillsides; in C Chile occurs in shrubs on dry slopes adjacent to rivers. At 3000–4800 m.
Food and Feeding. Almost entirely *Polylepis* seeds, buds and shoots in breeding season; less well known in non-breeding season (when apparently occurs outside *Polylepis* range). Forages actively and acrobatically in trees, often hanging upside-down on slender branches. Forages in pairs, in small groups and in larger flocks of up to 30 individuals, often in mixed flocks with *C. atrata* and *C. magellanica*.
Breeding. Birds in breeding condition and nest-building in Mar and eggs in late Feb. No further information.
Movements. Resident, nomadic and partial migrant. Most movements not well known; some of nominate race move N to winter at lower altitude within N breeding range; also wanders at random in non-breeding season.
Status and Conservation. Not globally threatened. A poorly known species. Locally common to rare; infrequently recorded.
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Clement *et al.* (1993), Fjeldså & Krabbe (1990), George (1964), Jaramillo *et al.* (2003), Nguembock *et al.* (2009), Ridgely & Tudor (1989), Todd (1926).

62. Hooded Siskin

Carduelis magellanica

French: Chardonneret de Magellan **German**: Magellanzeisig **Spanish**: Jilguero Encapuchado
Other common names: Southern Siskin; Santa Cruz Siskin (*sanctaecrucis*)

Taxonomy. *Fringilla magellanica* Vieillot, 1805, southern America and vicinity of Straits of Magellan; error = Buenos Aires, Argentina.
Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species (*C. spinus* and *C. pinus*), but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Has been considered conspecific with *C. olivacea*, from which it differs mainly in habitat preference, but the two hybridize in NW Peru; further research required. Hybridizes with *C. uropygialis* in S Peru. Race *boliviana* possibly of hybrid origin. Twelve subspecies currently recognized.
Subspecies and Distribution.
C. m. longirostris (Sharpe, 1888) – SW & SE Venezuela, W Guyana and adjacent N Brazil.
C. m. capitalis (Cabanis, 1866) – C Andes from WC & S Colombia and C Ecuador S to NW Peru (La Libertad).
C. m. paula (Todd, 1926) – S Ecuador (Milagros) S in W Andes to SW Peru (Arequipa).
C. m. peruana (Berlepsch & Stolzmann, 1896) – C Peru.
C. m. urubambensis (Todd, 1926) – S Peru and N Chile.
C. m. santaecrucis (Todd, 1926) – C Bolivia.
C. m. boliviana (Sharpe, 1888) – S Bolivia.
C. m. hoyi C. König, 1981 – C Andes of NW Argentina (Jujuy Province).
C. m. tucumana (Todd, 1926) – W Andes and foothills of N Argentina (Jujuy S to E Mendoza).
C. m. alleni (Ridgway, 1899) – SE Bolivia, Paraguay and NE Argentina.
C. m. icterica (M. H. C. Lichtenstein, 1823) – E & SE Brazil and E & S Paraguay.
C. m. magellanica (Vieillot, 1805) – E Argentina and Uruguay.



Descriptive notes. 10–12 cm; 11–15·5 g. Small, bright greenish-yellow finch with sharply pointed bill and slightly forked tail. Male nominate race has head to nape, throat and centre of upper breast black, bordered by bright yellow collar on side of neck and across nape; lower nape to back and scapulars olive-green faintly streaked darker (more heavily streaked in worn plumage), rump bright yellow and uppertail-coverts olive-green; tail black, broad deep yellow edges at bases of all outer feathers (forming prominent side panels); upperwing-coverts blackish-brown, greaters tipped pale olive-green or bright yellow; alula, primary coverts and flight-feathers black, basal half of primaries and bases of secondaries bright yellow (forming band across wing), tertials edged yellowish at base, becoming white at tips; underparts bright yellow, often tinged orange on side of breast and greenish on flanks and belly; underwing-coverts bright yellow; iris black; bill black; legs dark grey or blackish. Differs from *C. siemiradzkii* in dark feather centres on upperparts and less pure yellow underparts. Female is similar to male, but much duller, head and upperparts dull olive or olive-green, tinged grey, except for yellow or yellowish-green rump and green uppertail-coverts; wings and tail as for male, but tips of upperwing-coverts duller yellow or buffish and yellow bases of flight-feathers less extensive, secondaries also distally edged finely yellow (paler or whiter when worn); chin and throat pale greyish or greyish-olive, underparts greenish or tinged olive, except for whiter belly to undertail-coverts. Juvenile resembles female, but head and upperparts buffish-olive, finely streaked darker, rump and uppertail-coverts pale olive-green, tips of longest coverts greyish, tips of median upperwing-coverts dull yellow, tips of greaters buffish to bright yellow, outer webs of tertials whitish at tips, underparts as on female or washed greyer, undertail-coverts tinged pale yellow. Race *capitalis* has upperparts darker olive, rump the same, flight-feathers tipped and tertials broadly fringed white or greyish-white, yellow at base of all tail feathers, underparts more golden-yellow, female more yellow on upperparts and pale grey below, washed light olive or yellowish on throat and breast; *paula* is similar to previous, but mantle and back less prominently streaked, rump bright yellow, more extensive yellow in wing and at sides of tail base, underparts greenish-yellow, female upperparts greyer than nominate except for yellowish rump, and underparts as on male; *peruana* is similar to previous, but more green on upperparts and rump dull yellow, female more heavily olive on upperparts; *urubambensis* is like last but larger, female more variable and can resemble nominate, with chin to belly variably pale grey or greenish (tinged with pale yellow) and vent to undertail-coverts whitish; *boliviana* male has upperparts prominently streaked blackish, uppertail-coverts blackish, broad yellow sides of tail base, black of throat usually extending to breast; *santaecrucis* is like previous but smaller, upperparts light olive-green, mottled darker, rump yellowish, uppertail-coverts like back, wing-coverts tipped bright yellow, tertials broadly fringed yellow and tipped whitish, base of tail has broad yellow edges; *hoyi* has black of throat well demarcated from breast, less yellow in tail, lacks white on flanks; *tucumana* has black extending only to throat and upper nape, underparts pale yellow except for whitish flanks; *longirostris* has black hood extending to centre of throat, rump and uppertail-coverts pale green, extensively yellow bases of outer tail feathers, whitish lower belly and vent, female rump and uppertail-coverts as on male and vent to undertail-coverts pale grey; *alleni* is like *capitalis* but smaller, male has lower rump bright yellow, edges of tertials olive-yellow, underparts yellow; *icterica* differs from last in slightly larger size, broader wingbars, more extensive yellow at base of tail, and less yellow underparts. Voice. Song, usually from prominent perch or in flight, and often for long periods, a varied series of rapid short twittering "tseet-tseet", "tseet-weet" or "tseet-weet-a-weeta" interspersed with repeated phrases; several males often sing in concert. Call a light or lilting "djey, djey", "tseeu" and a long trilling "trrrrrr".
Habitat. Lowland to lower montane woodlands, secondary woodland, savanna with scattered trees and small woods, poplar (*Populus*) groves, cocoa and palm plantations, swamp-woodland, also open scrubby or bushy areas and edges of cultivation, parks, and large gardens on edge of towns and cities. Sea-level to c. 5000 m; 1000–3500 m, exceptionally down to 650 m, in Ecuador.
Food and Feeding. Mainly seeds, buds and leaves of a variety of plants, including thistles and lettuces (*Lactuca*); also occasionally small insects. Forages at all levels, from ground to treetops; actions quick and restless. Singly, in pairs and in small flocks, usually fairly tame and approachable; in non-breeding season gathers in larger numbers in mixed flocks, often with other members of genus, including *C. crassirostris*.
Breeding. Nest-building seen in Oct–Jan, eggs in Mar and Jun, and fledglings in Feb and Jul; possibly breeds throughout year. Nest placed in top of tall tree. No other information.
Movements. Resident and nomadic. Wanders at random throughout range in non-breeding season, when erratic in occurrence in some areas; race *tucumana* moves E and occurs around Buenos Aires (E Argentina) when not breeding.
Status and Conservation. Not globally threatened. Common to locally common in much of range; rare to locally common in N Andes of Colombia; status in Guyana uncertain. Possibly only a vagrant in SW Venezuela (R Meta).
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Clement *et al.* (1993), Fjeldså & Krabbe (1990), Hilty (2003), Hilty & Brown (1986), Jaramillo *et al.* (2003), Nguembock *et al.* (2009), Restall *et al.* (2006), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Sick (1993), Todd (1926).

On following pages: 63. Antillean Siskin (*Carduelis dominicensis*); 64. Saffron Siskin (*Carduelis siemiradzkii*); 65. Olivaceous Siskin (*Carduelis olivacea*); 66. Black-headed Siskin (*Carduelis notata*); 67. Yellow-bellied Siskin (*Carduelis xanthogastra*); 68. Black Siskin (*Carduelis atrata*); 69. Yellow-rumped Siskin (*Carduelis uropygialis*); 70. Black-chinned Siskin (*Carduelis barbata*).

63. Antillean Siskin

Carduelis dominicensis

French: Chardonneret des Antilles **German**: Haitizeisig **Spanish**: Jilguero Antillano
Other common names: Hispaniola Siskin/Goldfinch

Taxonomy. *Chrysomitris dominicensis* H. Bryant, 1867, Port au Prince, Haiti.
Monotypic.
Distribution. Hispaniola.



Descriptive notes. 11–12 cm; c. 9 g. Small, greenish-yellow finch with conical bill and notched tail. Male has head to nape, side of neck and throat black, bordered by bright yellow collar on side of neck; lower nape to back and scapulars light olive-green, tinged yellow, rump and uppertail-coverts brighter olive-yellow; tail black, broad deep yellow edges at bases of all outer feathers (forming prominent side panels); upperwing-coverts blackish-brown, tipped yellowish-olive, greaters more broadly edged yellowish-olive and tipped bright yellow; alula, primary coverts and flight-feathers black, remiges finely edged olive-yellow, tertials fringed and tipped bright yellow; underparts bright yellow, washed olive on flanks and belly; underwing-coverts pale yellow; iris black; bill whitish or pale straw-yellow; legs brown to dark brown. Female is olive-green on forehead to crown and upperparts, except for brownish tinge on mantle and scapulars, and more yellow or yellowish-green rump and uppertail-coverts; wings and tail as for male, but tips of upperwing-coverts paler or duller yellow or buffish, secondaries also distally edged finely light green or olive-yellow (whiter when worn) and tertials more broadly so; face pale olive or yellowish-olive, becoming buffish-yellow with grey tinge on chin and throat, and pale yellowish with fine dark brown streaks on breast, paler but more prominently streaked on belly and flanks, with lower belly to undertail-coverts white or off-white. Juvenile is like female, but duller, head and upperparts buffish olive-green, broadly streaked darker, rump and uppertail-coverts pale olive-green, tips of median upperwing-coverts pale yellow (may be whiter on greater coverts), underparts yellowish-olive, broadly streaked dark brown; first-year male has more yellow on underparts than first-year female. Voice. Song a low trill or jumble of notes closely resembling song of *C. tristis*. Calls include "seee-ip" or "e-see-ip", "chit chit chee-ee-o", high-pitched "swee-ee" and soft or low "chut-chut".
Habitat. Edges of montane moist broadleaf forest and lower montane pine (*Pinus*) forest, also open grassy clearings and weedy patches, usually at 1000–2500 m; in non-breeding season may occur at lower levels along edges of cultivation and dry scrub-forest, and down to 500 m in severe cold weather.
Food and Feeding. Mostly seeds from a variety of plants, including docks (*Rumex*). Forages on ground in low-growing vegetation, also in shrubs and trees. Generally in small flocks or loosely associating groups of up to 25 individuals, including throughout breeding season.
Breeding. Season at least May–Jun. Nest a small cup of moss, usually placed in bush or low pine. Clutch 2–3 eggs, pale greenish-white, finely spotted with brown. No further information.
Movements. Poorly known. Apparently nomadic in non-breeding season, when those from higher parts of range may descend to lower altitudes; irregular in NW Haiti and in Sierra de Neiba (Dominican Republic).
Status and Conservation. Not globally threatened. Restricted-range species: present in Hispaniola EBA. Locally common in W Dominican Republic; uncommon in Haiti. Little known. No figures on global population; appears to be declining as a result of habitat destruction. Possibly a candidate for listing as Near-threatened.
Bibliography. Bond (1979), Clement *et al.* (1993), Keith *et al.* (2003), Latta *et al.* (2006), Ottaviani (1986), Raffaele *et al.* (1998), Ruelle (1996a), Woods & Ottenwalder (1986).

64. Saffron Siskin

Carduelis siemiradzkii

French: Chardonneret safran **German**: Safranzeisig **Spanish**: Jilguero Azafranado

Taxonomy. *Chrysomitris siemiradzkii* Berlepsch and Taczanowski, 1884, Guayaquil, Ecuador.
Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species (*C. spinus* and *C. pinus*), but comprehensive review of all species currently included within present genus is required in order to determine true relationships.
Monotypic.
Distribution. SW Ecuador (SW Manabí, Guayas and SW Loja) and extreme NW Peru (Tumbes).



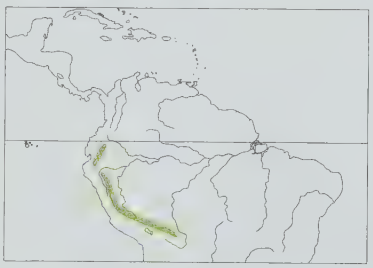
Descriptive notes. 10–11 cm. Small, bright greenish-yellow finch with fine bill, yellow wingbars and notched tail. Male has head to upper nape, side of neck and throat glossy black, bordered by bright yellow collar on side of neck; lower nape to back and scapulars bright golden-olive or greenish-yellow, rump and uppertail-coverts bright yellow; tail black, broad deep yellow edges at bases of all outer feathers (forming prominent side panels); lesser and median upperwing-coverts fringed greenish-yellow, greater coverts black, broadly tipped bright yellow; alula, primary coverts and flight-feathers black, small square of bright yellow at base of primaries, tertials edged pale or whitish-yellow; underparts rich yellow or saffron-yellow, tinged greenish on flanks and slightly paler on vent to undertail-coverts; iris black; bill dark brown or horn-brown; legs brown or dark brown. Distinguished from *C. magellanica* mainly by deeper yellow underparts and lack of dark feather centres on mantle and back. Female has forehead pale yellow, crown and upperparts olive-green with faint streaks on crown and nape, green-tinged yellow rump and uppertail-coverts; face pale olive-green, poorly defined paler yellow supercilium and cheek patch; wings and tail as for male, but tips of wing-coverts duller, tertials narrowly fringed whitish; chin to upper breast greenish-yellow, centre of breast, belly and flanks saffron-yellow (brighter yellow than female *C. magellanica*), vent whitish and undertail-coverts pale yellow. Juvenile is like female, but duller. Voice. Calls include high-pitched twitter in flight; song apparently very similar to that of *C. magellanica*.
Habitat. Edges of lowland dry deciduous forest and second-growth woods, including tall grasses, weedy patches and flowering plants on forest edge and along roadsides, edges of cultivation, also brush and dry scrub; recorded in suburban parks and urban areas of Guayaquil, in Ecuador. Near sea-level to c. 800 m; seasonally to 1300 m in S Loja (Ecuador).
Food and Feeding. Mostly various seeds, also buds, leaves and some insects. Forages low down in tall grasses and other seed-bearing plants, and on ground. In pairs and in small groups, occasionally in flocks of up to 30 individuals; in non-breeding season often in company with other seed-eaters.
Breeding. Season Jan–May. No further information.
Movements. Resident. May wander erratically in non-breeding season, and at times of El Niño events, but extent of such movements little known.
Status and Conservation. VULNERABLE. Restricted-range species: present in Tumbesian Region EBA. Uncommon or rare; locally fairly common (at two sites). Estimated global population possibly only a few thousand individuals, but not well known. Potentially seriously threatened by fragmentation of its range through rapid deforestation for agriculture and intense grazing; in 30 years between 1958 and 1988, rate of clearance of lowland forest (below 900 m) in W Ecuador was 57% per decade, leaving a mere 8%; continuing loss of forest patches will further reduce local populations. On the other hand, this species appears reasonably tolerant of heavily disturbed habitats, and in Ecuador has been recorded several times in centre of Guayaquil, the largest city in that country; possibly dependent on deciduous forest during part of its life-cycle. Most localities at which this species has been found appear to be close to the interface zone between forest and arid scrub; exceptions are records on coast of Tumbes, in Peru, and on Puná I (S Guayas) and at a site in SW Manabí, in Ecuador. Even if it is not dependent on deciduous forest throughout entire year, loss of forest patches still likely to cause decline in overall habitat suitability; also, changes in agricultural practice, especially pesticide use, could have an impact on this siskin in semi-agricultural habitats. Occurs in Machalilla National Park (Manabí) and three other protected forests in Ecuador, and in Northwest Biosphere Reserve, in Peru.
Bibliography. Anon. (2009i), Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Butchart & Stattersfield (2004), Clement *et al.* (1993), Collar *et al.* (1992), Dodson & Gentry (1991), Nguembock *et al.* (2009),Ople *et al.* (1997), Restall *et al.* (2006), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Ridgely *et al.* (1988), Stattersfield & Capper (2000), Todd (1926), Wege & Long (1995).

65. Olivaceous Siskin

Carduelis olivacea

French: Chardonneret olivâtre **German**: Olivzeisig **Spanish**: Jilguero Oliváceo

Taxonomy. *Spinus olivaceus* Berlepsch and Stolzmann, 1894, Vitoc, Junín, Peru.
Has been considered conspecific with *C. magellanica*, differing mainly in habitat preference, but hybridizes in area of range overlap in NW Peru; further research required. Monotypic.
Distribution. E slope of Andes from E & SE Ecuador S to Peru and WC Bolivia.



Descriptive notes. 10–11 cm. Small, greenish-yellow finch with fine, pointed bill, yellow wingbars and notched tail. Male has head to nape, throat and centre of upper breast black, bordered by bright yellow collar on side of neck; lower nape to back and scapulars olive-green, streaked blackish, rump and uppertail-coverts bright yellow; tail blackish-brown, broad deep yellow edges at bases of all outer feathers (forming prominent side panels); upperwing-coverts blackish-brown, edged and tipped greenish-olive on medians and broadly bright yellow on greater coverts; alula, primary coverts and flight-feathers black, basal half of primaries and bases of secondaries bright yellow (forming band across wing), tertials black, fringed and tipped bright yellow (buffish when worn); below, olive-yellow on side of breast and flanks, generally duller on lower breast and belly, with undertail-coverts bright saffron-yellow; iris black; bill greyish or greyish-horn; legs brown or flesh-brown. Differs from *C. magellanica* in smaller size, blackish streaks on mantle and back, less well-defined collar on side of neck and duller underparts. Female lacks black on head, has head and upperparts dull greenish or olive-yellow, tinged green, except for yellow rump and greenish tips of uppertail-coverts; wings and tail as for male, but tips of upperwing-coverts and bases of flight-feathers slightly duller yellow; chin and throat washed olive-yellow, becoming bright yellow on underparts. Juvenile is like female, but head and upperparts duller or darker olive, streaked darker, rump and uppertail-coverts dull yellow or olive-green, tips of upperwing-coverts dull yellow or greenish-yellow, outer webs of tertials dull yellowish at tips, underparts as on female or washed with olive, broadly streaked brown on side of breast and flanks. Voice. Undescribed; apparently very similar vocally to *C. magellanica*.
Habitat. Montane, subtropical forest canopy, edges and clearings (especially on upper slopes), between 1200 m and 3000 m; 900–1700 m, exceptionally down to 750 m, in Ecuador.
Food and Feeding. Mainly seeds, mostly of low-growing plants, together with bush and tree seeds. Forages in low plants and in shrubs, bushes and trees, often at canopy level, rarely away from forest or on ground. In pairs and small groups; in non-breeding season gathers in larger flocks. Active; flocks noisy and restless and continually on the move.
Breeding. No information.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common to uncommon.
Bibliography. Clement *et al.* (1993), Restall *et al.* (2006), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Ruelle (1997a), Saccarola (2001), Todd (1926).

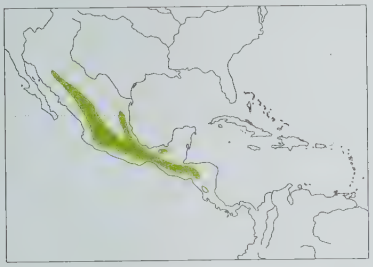
66. Black-headed Siskin

Carduelis notata

French: Chardonneret à tête noire **German**: Schwarzbrustzeisig **Spanish**: Jilguero Cabecinegro
Other common names: Neotropic(al) Black-headed Siskin

Taxonomy. *Carduelis notata* du Bus de Gisignies, 1847, Jalapa, Veracruz, Mexico.
Three subspecies recognized.

Subspecies and Distribution.
C. n. forreri (Salvin & Godman, 1886) – W Mexico.
C. n. notata du Bus de Gisignies, 1847 – E & C Mexico and N Guatemala.
C. n. oleacea (Griscom, 1932) – S Belize to N Nicaragua.

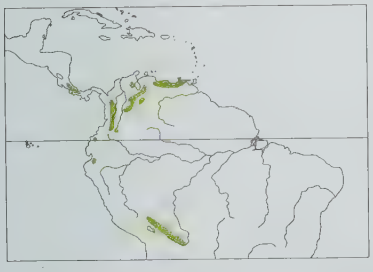


Descriptive notes. 10–12 cm; 10–12·2 g (Belize). Small, greenish-yellow finch with black head, bright yellow wing-flashes, sharply pointed bill and notched tail. Male nominate race has head to lower nape, side of neck and centre of upper breast (occasionally to centre of lower breast) black, bordered by bright yellow collar on side of neck; lower nape to back and scapulars olive-green, tinged yellow, streaked blackish, rump bright yellow, uppertail-coverts and tail blackish-brown, broad deep yellow edges at bases of all outer rectrices (forming prominent side panels on tail); upperwing-coverts and flight-feathers black, greater coverts with broad bright yellow tips, bases of outer secondaries and primaries broadly bright yellow (forming band across wing), tertials finely fringed bright yellow (quickly worn away); underparts bright yellow or golden-yellow, tinged greenish-yellow on flanks; underwing-coverts pale yellow; iris black; bill bluish-grey; legs brown or brownish-horn. Female is similar to male, but head to lower throat blackish-brown (may also show yellow tips on lower throat); lower nape and upperparts dull olive-green, rump yellow or dull yellow, uppertail-coverts olive; wings and tail as for male, but less extensive yellow panels on tail and less yellow at bases of flight-feathers; underparts bright lemon-yellow. Juvenile has head and upperparts duller, olive-brown, streaked darker, rump and uppertail-coverts dull olive-yellow, tips of upperwing-coverts dull yellow or pale buffish-white, yellow at bases of flight-feathers less extensive and paler/duller, tips of tertials off-white, lower face (below eye) yellowish or olive-yellow, becoming yellower or light olive-green on underparts, faintly streaked brown on side of breast and flanks. Races differ mainly in intensity of green or olive on upperparts and underparts: *oleacea* is darker above and below than nominate, sexes almost identical, female slightly darker or greener in fresh plumage and black on head does not extend to lower throat and upper breast; *forreri* male has brighter green upperparts, more yellow underparts, female duller green upperparts and green underparts. Voice. Song a varied and rapid series of jangling or twittering notes, interspersed with nasal or metallic notes, and phrases often repeated. Calls include a nasal "teu" or "ti-chie", a drawn-out "tseeeu" or "djeein", and a dry "jeh-jeht".
Habitat. Lower montane and submontane conifer forest and pine–oak (*Pinus–Quercus*) forest, also lower cloudforest edge and some secondary forest, at 600–3000 m; in E Guatemala occurs down to sea-level in open pine forests and savannas with scattered pines.
Food and Feeding. Mostly seeds of various plants and pine seeds. Forages in trees, on the ground and by clinging to flowerheads or seedheads in manner of *C. carduelis*. In pairs and small groups; in non-breeding season occurs in larger flocks of up to 200 individuals.
Breeding. Season May–Jul. Nest apparently similar to that of *C. pinus*; clutch 2 eggs. No further information available.
Movements. Resident and altitudinal migrant. Those at higher areas of range descend to adjacent lower levels and coastal areas in non-breeding season.
Status and Conservation. Not globally threatened. Common to locally common.
Bibliography. Alberti (2002), Castellanza (2004), Chabert (1992), Clement *et al.* (1993), Costantino (2007), Esuperanzi (1992a, 1992c, 1998), Haffner (2001), Howell & Webb (1995), Jones (2003), Land (1970), Märzhäuser (1980), Prignacca (1995), Ruelle (1996b), Russell & Monson (1998), Saccarola (1992), Todd (1926), Wacknitz (1993).

67. Yellow-bellied Siskin
Carduelis xanthogastra

French: Chardonneret à ventre jaune **Spanish**: Jilguero Ventriamarillo
German: Gelbbauchzeisig

Taxonomy. *Chrysomitris xanthogastra* du Bus de Gisignies, 1855, Ocaña, Colombia.
Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species (*C. spinus* and *C. pinus*), but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Two subspecies recognized.
Subspecies and Distribution.
C. x. xanthogastra (du Bus de Gisignies, 1855) – mountains of Costa Rica and W Panama (W Chiriqui), Colombia, NW & N Venezuela and NW & SW Ecuador.
C. x. stejnegeri (Sharpe, 1888) – extreme SE Peru (E Puno) and W Bolivia.

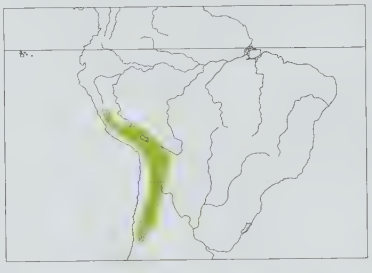


Descriptive notes. 10–11·5 cm; 10·8–13·8 g (Panama). Small finch with fine bill and notched tail. Male nominate race has head, upperparts and chin to centre of breast glossy black; upperwing and tail also black, except for broad bright yellow bases of secondaries and primaries (except outermost) and yellow sides of tail base (forming short panels); lower breast to undertail-coverts bright yellow, tinged olive on flanks; iris black; bill dark brown or blackish; legs dark brown. Female has forehead to crown and upperparts dull olive-green, finely streaked darker, except for paler green rump and uppertail-coverts; fairly well-defined supercilium pale olive-green, slightly dusky eyestripe and rear edge of ear-coverts; tail blackish-brown, broadly edged olive or yellowish at base of all outer feathers (forming side panels), upperwing-coverts blackish with pale or dull yellow or olive-yellow tips, flight-feathers as for male and distally edged light olive-green; throat and underparts olive-yellow, paler or more yellowish on belly to undertail-coverts. Juvenile is like female on upperparts, but lacks broad yellow bases of flight-feathers and side of tail base, has tips of median and greater upperwing-coverts pale buff, secondaries also edged pale buff and tertials fringed off-white, underparts pale buffish-yellow with olive tinge, belly palest and yellower. Race *stejnegeri* is slightly larger and longer-billed than nominate, male has larger yellow patch at base of flight-feathers, greater coverts broadly tipped yellow, tertials also lightly fringed white or whitish-buff, black on side of breast slightly more extensive, rest of underparts paler or brighter yellow, female slightly duller olive than nominate, greater coverts broadly tipped yellow, throat and upper breast dull olive or greenish-yellow, rest of underparts yellow. Voice. Song a rapid and varied jumbled series of bubbling notes, melodious twitters and buzzing trills, often repeating note or phrase several times and alternating high-pitched and low nasal notes in seemingly random fashion. Calls include thin or high-pitched "pee" or "pyee" and harsher "bziee".
Habitat. Edges of humid forest and woods, clearings with scattered trees and bushes, coffee plantations and high pastures in subtropical and upper tropical zones at 800–3700 m; most numerous at 1400–2000 m.
Food and Feeding. Mostly plant seeds. Forages at all levels in trees, usually from middle to upper canopy level, less frequently on the ground and in low vegetation; also clings to thistles and flowerheads in manner of *C. carduelis*. Singly, in pairs and in small groups; in non-breeding season often in larger flocks of up to 30 individuals, occasionally in mixed-species flocks with *C. atrata*.
Breeding. Season at least Mar–May and Sept–Nov. Nest built by female, a thick-walled cup of bush and plant fibres, roots, fungal strips, lichens and moss, placed up to 4 m above ground in dense foliage of bush or tree. Clutch 2–3 eggs, white or lightly tinged greenish, and unmarked or finely speckled. No further information.
Movements. Resident or partially nomadic; erratic in appearance in some areas of range in non-breeding season.
Status and Conservation. Not globally threatened. Uncommon to scarce or rare; perhaps locally common in remote parts of range. Uncommon to rare in Costa Rica (Cordillera Central and Cordillera de Talamanca). Erratic in Colombia; local and erratic in Venezuela, but more regular in S Táchira; scarce in Ecuador. Males are highly sought after as cagebirds for cross-breeding with domestic canaries; heavily trapped in some areas for trade.
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Clement *et al.* (1993), Fjeldså & Krabbe (1990), Hilty (2003), Hilty & Brown (1986), Klages (2008), Nguembock *et al.* (2009), Restall *et al.* (2006), Ridgely (1976), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Skutch (1972), Stiles & Skutch (1989), Todd (1926).

68. Black Siskin
Carduelis atrata

French: Chardonneret noir **German**: Schwarzzeisig **Spanish**: Jilguero Negro

Taxonomy. *Carduelis atratus* d'Orbigny and Lafresnaye, 1837, La Paz, Bolivia.
Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species (*C. spinus* and *C. pinus*), but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Monotypic.
Distribution. CS Peru S in Andes to N Chile and NW Argentina.



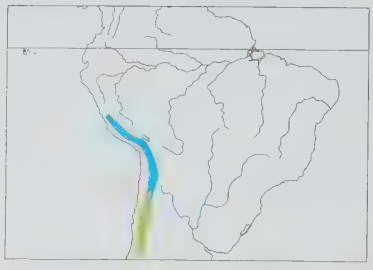
Descriptive notes. 12–13 cm; 15–16·8 g (Argentina). Rather small, black or blackish finch with yellow wing-flash, conical bill and notched tail. Male is almost entirely jet-black or glossy black; bright yellow on vent to undertail-coverts (belly may be brown-tinged with few yellowish feather tips), yellow on tips of greater coverts, broadly across bases of all flight-feathers (decreasing inwardly on secondaries) and on sides of tail base, and white fringe at tip of lowest tertial; iris black; bill horn-coloured, usually darker above with dusky culmen, paler below; legs dark brown or blackish-brown. Female is very like male, but upperparts slightly browner, tips of median upperwing-coverts sometimes pale yellow or buff, tips of greater coverts paler yellow, bases of flight-feathers also paler yellow; underparts also variable, yellowish more extensive, sometimes reaching throat, when breast and flanks show yellow and brown or blackish mottling. Juvenile is like female, but generally duller brown or brownish-black, with pale yellow bases of flight-feathers and tail feathers. Voice. Song and calls poorly known; apparently similar to those of *C. uropygialis*, but song faster, and can include mimicry. Song, usually from prominent perch at top of tree or bush, accompanied by rapid wing-flapping or with wings drooped; also during display-flight. Call "chup" and rising "tweee".
Habitat. Puna zone and Altiplano. Rocky and stony slopes, crags, gulleys and hillsides with light or scattered vegetation, including currants (*Ribes*) and *Polylepis* bushes, also edges of woodland and bushes, occasionally on edges of cultivation, and around farms and villages of Andean steppes and *puna* grasslands. At 1800–4800 m; mostly at higher parts of range in Peru.
Food and Feeding. Mostly seeds of low-growing plants and bushes, also occasionally insects. Forages on the ground and in low vegetation. In pairs and small flocks; in non-breeding season occasionally in larger gatherings and in mixed-species flocks with *C. crassirostris* and *C. xanthogastra*.
Breeding. Eggs recorded in Nov–Dec and juveniles in Apr–Jun. No further information.
Movements. Resident and altitudinal migrant; some from higher areas descend to lower altitude in non-breeding season.
Status and Conservation. Not globally threatened. Uncommon or locally common.
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Clement *et al.* (1993), Fjeldså & Krabbe (1990), Jaramillo *et al.* (2003), Nguembock *et al.* (2009), Ridgely & Tudor (1989), Todd (1926).

69. Yellow-rumped Siskin
Carduelis uropygialis

French: Chardonneret à croupion jaune **Spanish**: Jilguero Cordillerano
German: Kordillerenzeisig

Taxonomy. *Chrysomitris uropygialis* P. L. Sclater, 1862, Chile.
Has recently been proposed that this species be placed in genus *Spinus* or *Sporagra*, and revision may be justifiable as phylogenetic analysis indicates that South American siskins are only distantly related to the two Holarctic species (*C. spinus* and *C. pinus*), but comprehensive review of all species currently included within present genus is required in order to determine true relationships. Hybridizes with *C. magellanica* in S Peru. Monotypic.

Distribution. Breeds C Chile and adjacent NW Argentina; some migrate N to S & C Peru and W Bolivia.



Descriptive notes. 12–13 cm; 14 g (1 bird from Peru). Rather small, blackish-and-yellow finch with fine conical bill and notched tail. Male has head and upperparts to centre of breast sooty black (in fresh plumage, yellow fringes on hindneck to back and scapulars), rump bright yellow, uppertail-coverts blackish, broadly fringed yellowish; tail black, outer feathers broadly edged yellow at base (forming short panels); upperwing black, median coverts finely tipped yellow (soon worn away), greater coverts broadly tipped yellow, flight-feathers broadly bright yellow across bases of primaries and narrowly so across bases of secondaries, tertials narrowly fringed pale yellowish or whitish, underparts below breast bright yellow, tinged greenish on flanks; iris black; bill brown or dark brown; legs dark brown or black. Female is very similar to male, but head to breast and upperparts dull blackish-brown, broad olive-green fringes on mantle, back and scapulars, slightly paler yellow on rump and underparts. Juvenile is like female, but browner to buffish-grey with golden-buff wash on face, dark streaks on upperparts and on breast to flanks and belly. Voice. Song poorly known, a rich and melodious series of warbling phrases interspersed with twitters and trills, delivery somewhat slower than that of congeners. Call a nasal "pheew".

Habitat. Mountain slopes, cliffs, heaths and lightly wooded plains, including *Polylepis* woodlands, bushy ravines, desert scrub and edges of cultivation. Tropical and temperate zones of Andes at 2500–3500 m, occasionally as high as 4000 m; in non-breeding season down to 500 m, more rarely to sea-level.

Food and Feeding. Mostly plant seeds; occasionally some insects. Forages on the ground, in low vegetation and in bushes. In pairs and small groups; in non-breeding season occurs in larger gatherings, and in mixed-species flocks with other siskins.

Breeding. Nest with young in late Feb and juveniles seen in Apr–May. No further information.

Movements. Partial and altitudinal migrant. Wanders widely and erratically in search of feeding areas, some moving N to C Peru and W Bolivia during Apr–Oct; in non-breeding season many descend to lower levels.

Status and Conservation. Not globally threatened. Common to locally common in breeding areas in Chile and Argentina. Generally uncommon, erratic or rare on non-breeding grounds in Peru, Bolivia and N Chile.

Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1999), Arnaiz-Villena, Moscoso *et al.* (2008), Clement *et al.* (1993), Fjeldså & Krabbe (1990), Jaramillo *et al.* (2003), McCarthy (2006), Nguembock *et al.* (2009), Ridgely & Tudor (1989), Todd (1926).

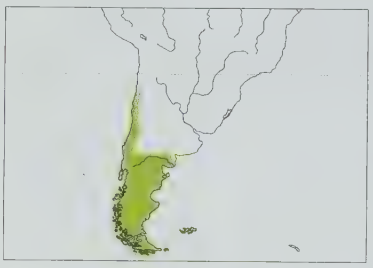
70. **Black-chinned Siskin**

Carduelis barbata

French: Chardonneret à menton noir **German**: Bartzeisig **Spanish**: Jilguero Golinegro

Taxonomy. *Fringilla barbata* Molina, 1782, Valparaíso, Chile.
Monotypic.

Distribution. C & S Chile, S Argentina and Falkland Is.



Descriptive notes. 12–13 cm; 13–19·8 g (Argentina). Rather small, greenish-yellow finch with small bill, yellowish wingbars and notched tail. Male has forehead to crown and upper nape, lores, chin and centre of throat black, supercilium from behind eye to side of neck bright yellowish, tinged green, face olive or green, washed paler or yellowish; lower nape and upperparts olive-green, finely streaked darker, becoming yellow or yellowish-green on rump and uppertail-coverts (tips of some tail-coverts greyish); tail black or blackish, bases of all outer feathers bright yellow; median upperwing-coverts black, fringed pale olive-green and tipped dull yellow, greater coverts similar but tipped bright yellow; alula and flight-feathers black, bases of primaries bright yellow (forming narrow patch), tertials black, edged pale greenish-yellow or pale buff; underparts bright yellow, washed green on flanks, belly whitish and undertail-coverts pale yellow with dark tips; iris black; bill dark brown or blackish, paler flesh-brown base of lower mandible; legs brown or pale flesh-brown. Female lacks black on crown and chin and, apart from bright yellow forehead, is slightly duller green above than male, streaked darker green, with fairly broad pale or bright yellow supercilium and side of neck, dull greenish-yellow or olive-yellow face, less extensive yellow on greater coverts and side of tail base, and underparts as on male or pale yellowish-grey, except for whitish belly to undertail-coverts; occurs also in a grey morph, greyer above and below, with supercilium much duller yellowish. Juvenile is similar to female, but paler, and generally more prominently but narrowly streaked darker green, rump pale greenish-yellow, tips of median and greater upperwing-coverts pale buff or buffish-yellow, lacks bright yellow on face and side of neck, has underparts mostly pale yellow, tinged greyer or olive on breast and flanks. Voice. Song, given usually between May–Jul and Sept–Dec (on Falkland Is) from prominent perch or during display-flight, a loud series of musical phrases and trills, including many of the call notes and other typical siskin-like notes. Calls include rising "tsooeet", abrupt "chit" or "chit-tip" like that of a sparrow (*Passer*), and a more subdued "tsi-tsi-tsi", together with a more prolonged twittering note; also a short "chup" in flight.

Habitat. High forest, mostly coniferous but also broadleaf, also thickets, brush and open country with scattered *Nothofagus* shrubs and low vegetation, and in some parts of range found in suburban gardens and along roadsides; to 1500 m. In Falkland Is, occurs in areas of introduced trees and shrubs and in tall tussac grass (*Poa flabellata*).

Food and Feeding. Mostly small seeds, including those of tussac, wild celery (*Apium australe*) and dandelion (*Taraxacum*), and insects and their larvae; possibly also *Empetrum rubrum* berries. Forages mostly in weedy patches and at all levels, including canopy of trees; agile and active; perches on tall stems of grass and tussac to extract seeds. In pairs and small groups; in non-breeding season often in larger flocks of up to 100 individuals, and in mixed-species groups often including *C. magellanica*.

Breeding. Season Jul/Aug–Feb; up to three broods in Falklands. Nest a neat cup of fine grasses, roots and plant fibres and animal hair (including sheep wool), placed up to 2 m above ground in fork of bush. Clutch 3–5 eggs, pinkish-white, spotted or speckled with reddish-brown. No further information.

Movements. Partial altitudinal migrant; non-breeding visitor to lower plains and valleys within range.

Status and Conservation. Not globally threatened. Widespread and common throughout most of range.

Bibliography. Clement *et al.* (1993), Esuperanzi (1993b), Fjeldså & Krabbe (1990), Jaramillo *et al.* (2003), Neels (1993, 2009), Nitschky (1990), Porco (1993), Ridgely & Tudor (1989), Ruelle (1995b), Todd (1926), Woods (1988).

PLATE 39 ➤

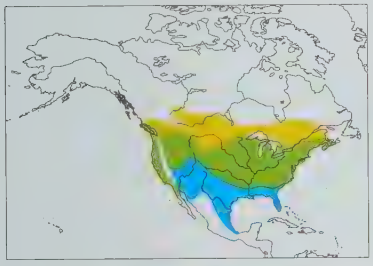

inches 2
cm 5
PLATE 39
71
72
ssp witti
ssp psaltria
ssp hesperophila
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ssp carduelis
ssp subulata
75
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ssp flavirostris
ssp brevirostris
ssp montanella

71. American Goldfinch

Carduelis tristis

French: Chardonneret jaune **German**: Goldzeisig **Spanish**: Jilguero Yanqui

Taxonomy. *Fringilla tristis* Linnaeus, 1758, South Carolina, USA.
Geographical variation slight and clinal; some races perhaps untenable. Four subspecies currently recognized.
Subspecies and Distribution.
C. t. pallida (Mearns, 1890) – S Canada (SC British Columbia E to W Ontario) and C & WC USA (E from to E Oregon, S to NW Colorado); winters also from N California S to NC Mexico.
C. t. jewetti (van Rossem, 1943) – extreme SW Canada (SW British Columbia) S in W USA to C California.
C. t. salicamans (Grinnell, 1897) – SW USA (W Sierra Nevada, in California); winters E to Mohave and Colorado Deserts and S to NW Mexico (N Baja California).
C. t. tristis (Linnaeus, 1758) – SE Canada (E from Ontario) and C & E USA (E from SE Minnesota, S to NE Texas and N South Carolina); winters S & SE USA S to C Mexico.



Descriptive notes. 11·5–13 cm; 10–13 g (summer), 13–20 g (winter). Medium-sized finch with conical bill and forked tail. Male nominate race breeding has forehead, upper lores and crown black, rest of head, upperparts and underparts to lower breast bright straw-yellow, paler on belly, vent to undertail-coverts white; lesser and outer median upperwing-coverts straw-yellow (more extensively blackish when worn), rest of wing black, except for white tips of greater coverts and primaries and white fringes of tertials and distal part of secondaries (all abrading through summer, absent when plumage worn); uppertail-coverts white, tail black with white inner webs of feathers; iris dusky brown; bill orange, dark tip; legs pinkish-brown, buff-brown or dark grey-brown. Male non-breeding has forehead to crown and side of nape greyish olive-green (forehead sometimes black or spotted blackish), face pale yellow, cheek and ear-coverts tinged brownish-buff; nape and upperparts earth-brown, tinged yellowish, rump and uppertail-coverts yellowish-white, tips of longest coverts greyish; tail and wing as in breeding plumage, but rectrices with broad whitish or pale buff edges, greater coverts with broad white tips and secondaries and tertials broadly edged white; chin and throat to side of neck yellow, becoming variably dull grey or buffish-brown on breast and flanks, with belly to undertail-coverts washed yellow; bill dark grey-brown. Female breeding is much duller than male, has olive-green lores, crown, nape, back and flanks; median upperwing-coverts whitish-buff, greater coverts blackish with pale buff-brown to whitish tips, flight-feathers and tail feathers blackish-brown, edged pale buffish; chin to breast olive-yellow, lower belly to undertail-coverts white; bill pinkish. Non-breeding female is similar to non-breeding male, but duller, with head and upperparts paler or greyer brown, rump and uppertail-coverts dull whitish or buffish, wingbars and edges of secondaries and tertials broadly buffish or off-white, underparts more extensively dull grey on breast to undertail-coverts. Juvenile has forehead to crown and back buff, rump olive-brown, becoming white or deep yellow on uppertail-coverts, tail dusky brown, fringed paler brown, lesser upperwing-coverts olive-yellow, median and greater coverts dark or dusky brown with broad warm brown tips, bill brown; first-winter male dark brown above, tinged olive-yellow (mainly on head), uppertail-coverts grey, fringed browner, throat yellowish, breast brownish-olive, side of breast and flanks deeper brown, belly and undertail-coverts white; first-winter female like first-winter male, except throat duller yellow and upperparts less olive-tinged; first-summer plumage similar to adult, but retains juvenile flight-feathers and tail and some wing-coverts (tips of median and greater coverts often abraded). Races differ mainly in plumage tone and pattern: *pallida* is slightly larger than nominate, also paler, with white areas slightly larger, breeding male has more extensive black cap, other plumages have underparts paler or whiter; *salicamans* is intermediate between previous and nominate, both sexes browner in winter, female browner throughout year, male paler and with small black cap; *jewetti* is smallest and darkest race. Voice. Song, by male from top of tree, roadside wires and in display-flight, during late spring and throughout breeding season, a long, rambling jumble of sweet and melodious "wee" and "swee" notes interspersed with thin twittering and trills. Contact calls include a short series of light twittering notes "tsee-tsi-tsi-tsit" or "ti-dee-did-di", "chih tih-tih-tih" and "per-chic-o-ree", often given in flight; alarm a thin high-pitched "ch-ween" or "swee-eet".

Habitat. Open deciduous woodlands with low shrubs and weedy patches, forest edges, orchards, edges of cultivation, thickets, parks, gardens and roadside verges. Lowlands and low hills.

Food and Feeding. Mostly seeds of wide variety, also some shoots and buds of trees and flowering plants, also tree sap; some insects. Strong preference for ripe and unripe seeds of Asteraceae, including thistles, teasel, burdock, dandelions, also grasses (Gramineae), also seeds of alder (*Alnus*), birch (*Betula*), cedar (*Cedrus*) and elm (*Ulmus*); buds of fruit trees, birch and elm, and also strips bark from twigs; sips maple (*Acer*) sap. Insects, including aphids (Aphidoidea), and green algae (Spirogyra) possibly incidental to main food source. In winter often at feeders, when it takes various seeds, including those of sunflowers (*Helianthus*). Nestling diet milky pulp of seeds regurgitated by adults. Feeds on the ground and when perched on or hanging from seedheads of tall plants and shrubs; holds fruit or seedhead with foot. Fine bill enables seeds to be taken from thistle heads and cones, and pollen from catkins. Forages in pairs and in small to large flocks; in non-breeding season forms flocks of more than 200 individuals, often in association with *C. flammea*, *C. pinus* and *Carpodacus purpureus*. Flocks feed actively; those at one end of flock often "roll" over the rest in leap-frog fashion to new area adjacent to other end of flock.

Breeding. Season late Apr or May to Sept; two broods in S of range. Monogamous; also polygamous. Solitary or loosely colonial. Pair formation takes place before break-up of winter flocks and in nesting area before start of breeding; pair-bond endures for single season, and may switch partner between broods. Sexual displays, mostly rapid chasing of female by male, apparent in late winter, leading to prolonged singing in nesting area, stiff-winged butterfly-like song flight and courtship feeding by male, also mate-guarding through to nestling stage. Nest-site selected by both partners, nest built solely by female, a compact cup of plant fibres and down, leaves, grasses, roots and cobwebs on platform of twigs, placed up to c. 5 m above ground in leaf cluster in deciduous shrub or tall vegetation. Clutch 2–7 eggs, mostly 4–5, pale bluish-white, unspotted or with faint light brown speckles; incubation by female, fed on nest by male, period 12–14 days; chicks fed and cared for by both partners, nestling period 12–17 days; young dependent on parents for up to 3 weeks after leaving nest. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*). Breeding success variable, influenced by extent of cowbird parasitism and of predation of eggs and chicks: early nests most often parasitized, resulting in loss of eggs and chicks (also, cowbird chicks rarely survive beyond 3 days, owing to insufficient protein in predominantly seed diet of host); nest contents preyed on by Blue Jay (*Cyanocitta cristata*), American Kestrel (*Falco sparverius*), Great Grey (*Lanius excubitor*) and Loggerhead Shrikes (*Lanius ludovicianus*), also domestic cats (*Felis catus*), American red squirrel (*Tamiasciurus hudsonicus*), short-tailed weasel (*Mustela erminea*), common garter snake (*Thamnophis sirtalis*) and eastern racer (*Coluber constrictor*). Breeds in first year. Maximum longevity c. 11 years, frequently more than 5 years; males live longer than do females.

Movements. Resident, migratory and partially migratory. S populations largely resident or make short-distance movements to non-breeding areas. N population predominantly migratory, females moving farther S than males, and first-winter males either largely sedentary or wintering farther N than adults. N limit of wintering range closely follows Jan minimum 0°F (c. –17·8°C) isobar, when deep snow in areas farther N prevents feeding, and long periods of below-freezing temperatures. Nominate race and *pallida* move S & SW in small to large flocks from late Oct to mid-Dec, to non-breeding grounds within and S of breeding range S to C Mexico. Extent and timing of movements variable among localities and individuals, and little evidence for site-fidelity in subsequent years; breeding birds from C Canada and NC USA move between SW and SE to converge on Mississippi drainage; populations breeding in or close to E seaboard head S along coast, and W populations similarly move S along coast and through main valleys. Nomadic in wintering area, and movements of up to 50 km not infrequent; return to breeding area from late Mar to early Jun, with peak middle to late Apr. Nominate race irregular N to N Ontario, N Quebec and S Labrador (E Canada). Vagrant in Bermuda, Bahamas and Cuba.

Status and Conservation. Not globally threatened. Common to fairly common. Recorded breeding density ranges 0·78–14 pairs/ha, but difficult to determine as nests often clumped or nesting colonial. Some evidence from breeding-bird surveys of decline in E North America but stable in W during 1985–1991; causes of decline largely unknown. Since 1992, however, slight and gradual increase in estimated total population size in USA, from 200,000 individuals in early 1990s to 230,000 in 2010.

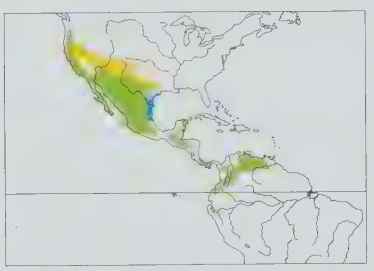
Bibliography. Arnaiz-Villena, Álvarez-Tejado *et al.* (1998), Arnaiz-Villena, Moscoso *et al.* (2007), Berger (1968), Carey *et al.* (1978), Clement *et al.* (1993), Coutlee (1964), Dawson & Marsh (1986), Dorsey (1963), Droege & Sauer (1989), Dwight (1902), Godfrey (1986), Holcomb (1969a, 1969b), Howell & Webb (1995), Kaufman (1993), Mariani *et al.* (1994), Middleton (1974, 1977a, 1977b, 1977c, 1978, 1986, 1988), Nguembock *et al.* (2009), Nickell (1951), Prescott & Middleton (1990), Pyle *et al.* (1987), Sibley (2000), Small (1994), Stokes (1950), Tyler (1968), Watt & Dimberio (1990), Yunick (1983c), Zamora, Lowy *et al.* (2006).

72. Lesser Goldfinch

Carduelis psaltria

French: Chardonneret mineur **German**: Mexikozeisig **Spanish**: Jilguero Menor
Other common names: Dark-backed/Arkansas/Green-backed Goldfinch

Taxonomy. *Fringilla psaltria* Say, 1823, Arkansas River near mountains [= near Colorado Springs], Colorado, USA.
Five subspecies recognized.
Subspecies and Distribution.
C. p. hesperophila (Oberholser, 1903) – W USA (S from Washington, E to N Utah and C Arizona) S to NW Mexico (Baja California and S to S Sonora).
C. p. witti (P. R. Grant, 1964) – Tres Marias Is, off W Mexico.
C. p. psaltria (Say, 1823) – WC USA (Colorado and W Oklahoma) S to S Mexico (C Veracruz and Oaxaca).
C. p. jouyi (Ridgway, 1898) – SE Mexico (N Yucatán Peninsula and Mujeres I) and NW Belize.
C. p. colombiana Lafresnaye, 1843 – S Mexico (Chiapas) S, discontinuously, to N & W Colombia, N Venezuela, N & S Ecuador and NW Peru.



Descriptive notes. 9–11 cm; 8–11·5 g (*hesperophila*), 6–9 g (*witti*). Small, stocky and short-tailed finch with stout bill, rounded wings and notched tail. Male nominate race has upper face, crown and upperparts to tail black or glossy black, variable (in USA some have face and upperparts olive-green except for blackish ear-coverts, proportion of green-backed birds declining clinally to S & E, to none in Mexico); inner webs of outer tail feathers white (variable in extent, and visible usually only in flight); upperwing black, broad white tips on greater coverts (in fresh plumage), white bases of primaries (forming narrow patch on closed wing) and broad white on edges and tips of tertials; cheek to chin and throat to belly bright yellow, paler on vent to undertail-coverts; iris black; bill pale brown or pinkish-brown with grey tip, greenish-yellow base of lower mandible; legs dark brown. Female has forehead to crown and upperparts dull greenish-yellow, finely streaked darker, slightly paler or greener on rump and uppertail-coverts; face yellowish, tinged green on ear-coverts (yellow may extend to lower forehead); tail as on male, wings brownish-black, fringes of greater coverts pale greenish-olive, secondaries edged buff and tipped broadly white, primaries finely edged yellowish, white patch at base of primaries (smaller than on male), tertials edged and tipped white or whitish-buff; underparts and side of neck pale yellow, tinged green on breast and olive to buff-brown on flanks. Juvenile is very similar to female, but upperparts dull brownish, broadly streaked dark brown or blackish, tips of median and greater upperwing-coverts pale buffish-brown, edges and tips of tertials also buffish to off-white, underparts paler yellowish or buffish; first-year male transitional between juvenile and adult plumages, upperparts with blackish bases showing through (from early age) and broadly but irregularly tipped greenish-olive (a few individuals olive-green to almost entirely black with green mottling above), flight-feathers similar to adult, but some juvenile feathers (mostly outer secondaries and inner primaries) retained. Races differ markedly in male plumage,

On following pages: 73. Lawrence's Goldfinch (*Carduelis lawrencei*); 74. European Goldfinch (*Carduelis carduelis*); 75. Citril Finch (*Carduelis citrinella*); 76. Corsican Finch (*Carduelis corsicana*); 77. Lesser Redpoll (*Carduelis cabaret*); 78. Common Redpoll (*Carduelis flammea*); 79. Arctic Redpoll (*Carduelis hornemanni*); 80. Twite (*Carduelis flavirostris*).

females of all like nominate: *hesperophila* has black on head confined to lores, forehead and crown, with ear-coverts to nape and upperparts deep green or olive-green (sometimes black scapulars and black streaks on back), rump and uppertail-coverts paler, black tail finely edged pale green and with white inner webs on outer feathers, greater coverts tipped pale yellow (buffish in worn plumage), bases of flight-feathers white, underparts duller yellow than nominate; *witti* is similar to black-backed nominate, but smaller bill, entire face to cheek black, tips of inner secondaries white; *jouyi* also is like nominate, but smaller overall, underparts brighter yellow; *colombiana* is like black-backed nominate, but lacks white on outer edge of flight-feathers except for white bases of primaries and broad white fringes of tertials (usually lacking when plumage worn), especially in S of range (S from Costa Rica), and has brighter yellow underparts with blackish streaks on flanks. Voice. Song, from top of tree, from late winter through to end of breeding season, similar to that of *C. lawrencei*, a disjointed and often prolonged rising, rambling musical series of grating notes in paired phrases, warbles and higher-pitched trills and (nominate and *hesperophila*, possibly also other races) includes mimicry of calls and songs of up to 40 other species; range of mimicry varies regionally, includes voices of species heard in wintering area and repeated in breeding area, most frequently imitated songs are those of *C. pinus*, *Carpodacus mexicanus*, Bewick's Wren (*Thryomanes bewickii*), phoebes (*Sayornis*) and American Robin (*Turdus migratorius*). Calls include "dit-dit-dit" for contact, similar to that of *C. lawrencei* but harsher and lower-pitched; male courtship note a descending "tee-yer"; other notes include querulous, rising "pee-yee", "cleeu", "cheeo" or "choo-ii" and a more plaintive "jee" and "ee-ee"; female has distinctive "chi-ru-lee" and male a lower-pitched descending "tsweee"; harsh "ch-ch-ch-ch" alarm or anxiety call in flight, and "bee-ee" or "dee-ree, bay-bee" at approach of predator.

Habitat. Lowland and lower montane subtropical and temperate woodlands, including oak (*Quercus*), cottonwoods (*Populus*), willow (*Salix*), elder (*Sambucus*), sycamore (*Platanus*), walnut (*Juglans*), pines (*Pinus*), cedars (*Cedrus*, *Calocedrus*), bald-cypress (*Taxodium*) and mixed oak and conifers, pinyon–juniper (*Pinus–Juniperus*) woods, riverine woods, open country with occasional thickets and trees, scrub, chaparral, mesquite (*Prosopis*) patches, edges of desert and oases, weedy patches in fields, meadows, clearings and edges of roadsides and cultivation, also plantations, orchards; also rural and suburban parks and gardens, where often in ornamental shrubs and trees. From sea-level to 3100 m; mostly above 900 m in Guatemala and Belize.

Food and Feeding. Principally seeds, buds and fruits of wide variety of composite plants and trees; also small quantity of insects. Seeds taken from more than 50 species, including groundsel (*Senecio*), pigweed (*Amaranthus*), tarweed (*Madia*), turkey mullein (*Eremocarpus*), mayweed (*Anthemis*), vinegarweed (*Trichostema*), alfilaria (*Erodium*), sunflower (*Helianthus*) and thistles (*Centaurea*); fruits include coffeeberry and redberry (*Rhamnus*), elderberry, mistletoe (*Phoradendron*) and madrone tree (*Arbutus*); fruits and flowers of honeysuckle (*Lonicera*), buds of cottonwood, alder (*Alnus*), sycamore, willows, oaks; leaves of ceanothus (*Ceanothus*); nuts of fiddleneck (*Amsinckia*) and black sage (*Salvia mellifera*); achenes of cream bush (*Holodiscus*) and chamise (*Adenostoma*). Insects include plant lice (Aphidoidea), possibly taken incidentally with seeds or buds. Forages on the ground under vegetation and while perched or clinging to seedhead; also hangs upside-down to reach seeds or buds. Removes seeds by bill action, and shakes head to get rid of husk; eats into berries with small bites of pulp, and nibbles at edges of leaves and buds. In small flocks; following breeding season family groups form larger flocks of up to 50 individuals, exceptionally 300–400, and often in mixed foraging flocks with other seed-eaters, including *C. lawrencei* and Dickcissels (*Spiza americana*).

Breeding. Season Apr–Oct; one brood. Monogamous. Loosely colonial, and territorial. Pair formation little known, apparently occurs either before break-up of winter flock or immediately prior to start of breeding. Displaying male performs slow, fluttering, circular song flight over perched female, also calls and sings persistently; female attracted to singing male and he follows or chases her when she flies, this developing into rapid pursuit of female through dense foliage; perched pair-members also face each other and touch bills, then open and close bills rapidly, leading to courtship feeding, which endures until chick-brooding stage. Nest built mostly by female, accompanied by male, an open compact cup of plant fibres, dried grass, bark strips, leaves, catkins, animal hair and feathers, placed 1·5–13·5 m above ground in dense foliage or leaf cluster, along main branch or in fork in tree, frequently in cottonwood or willow, occasionally in fruit tree. Clutch 2–5 eggs, pale bluish-white or bluish-green, mostly unspotted or only finely spotted brownish; incubation by female, fed on nest by male, period 12–13 days; no information on nestling period; young apparently dependent on adults for several weeks after leaving nest. One recorded instance of parasitism by Brown-headed Cowbird (*Molothrus ater*). No information on breeding success; main nest predators are Western Scrub-jay (*Aphelocoma californica*), Brewer's Blackbird (*Euphagus cyanocephalus*) and western grey squirrel (*Sciurus griseus*). Maximum recorded longevity 5 years 8 months.

Movements. Resident, partial migrant and nomadic. Those breeding in N and in colder areas of WC USA move S between Aug and Oct (earlier movements may be short-distance post-breeding dispersal); wintering areas largely unknown, possibly nomadic within S part of breeding range. Those from higher areas descend at same time to lower levels, valleys and deserts within S parts of breeding range S to NW Mexico. In N South America wanders seemingly at random in non-breeding season, and may occur in any suitable habitat. Return to breeding areas from Mar, but mostly in Apr and May. Uncommon on passage San Clemente I (off SW California); scarce or irregular N to British Columbia and South Dakota, and E to Kentucky. Vagrant in coastal E USA (Maine and North Carolina).

Status and Conservation. Not globally threatened. Common to locally common in most of range; uncommon in C Guatemala, and local and rare in Ecuador. First recorded in Belize in 1998, and small population now resident in N highlands. US population stable, but some significant regional decreases and increases within California (where highest densities in S); significant increases in San Benito Mt area, in C California, between 1936 and 1985 may have been due to greater amount of suitable habitat, brought about by changes in climate (cooler and wetter) and increases in logging and incidence of fires. Few data on densities of breeding populations: in study of riparian habitats in Sacramento Valley (NC California), 35 territorial males/km² of woodland in 1972 increased to 43 in following year; in riparian habitat in New Mexico, average of 22 breeding pairs/40 ha in May and 50 birds/40 ha in Jun in mid-1980s. Riverine habitat important for this species, especially in arid parts of its range, and loss of such habitat could cause major problems for it. In some parts of range, small numbers are trapped and traded as songbirds, with no apparent adverse effect on total population; on the other hand, capture for cagebird trade believed responsible for recorded decreases in this species' numbers in Central America.

Bibliography. Andrews & Righter (1992), Arnaiz-Villena, Álvarez-Tejado *et al.* (1998), Arnaiz-Villena, Moscoso *et al.* (2007), Baltosser (1986), Binford (1989), Chambers (1915), Clement *et al.* (1993), Coutlee (1966, 1968a, 1968b), Fjeldså & Krabbe (1990), Gilligan *et al.* (1994), Goldwasser (1987), Grant (1964a), Gross (1968), Hilty (2003), Hilty & Brown (1986), Howell, S.N.G. & Webb (1995), Howell, T.R. *et al.* (1968), Hubbard (1978), Johnson & Cicero (1985), Jones (2003), Land (1970), Linsdale (1957, 1968), Marten & Johnson (1986), Mayr & Short (1970), Middleton (1993), Monson & Phillips (1981), Nguembock *et al.* (2009), Oberholser (1903), Price *et al.* (1995), Pyle *et al.* (1997), Remsen *et al.* (1982), Restall *et al.* (2006), Ridgely & Greenfield (2001a), Ridgely & Tudor (1989), Root (1988), Sibley (2000), Skutch (1972), Small (1994), Watt & Willoughby (1999), Zamora, Lowy *et al.* (2006).

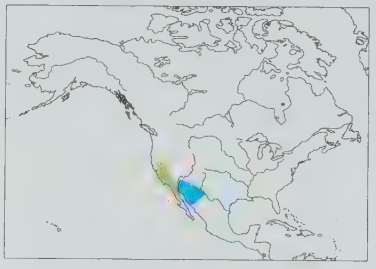
73. Lawrence's Goldfinch

Carduelis lawrencei

French: Chardonneret gris **German**: Maskenzeisig **Spanish**: Jilguero de Lawrence

Taxonomy. *Carduelis Lawrencei* Cassin, 1850, Sonoma, California, USA.
Monotypic.

Distribution. Breeds SW USA (California) and extreme NW Mexico (N Baja California); non-breeding E & S to S Arizona and NW Mexico (N Sonora).



Descriptive notes. 10–11·5 cm; 8·8–14·3 g. Small, short-billed finch, grey and yellowish, with slightly forked tail. Male breeding has black from forehead to hindcrown, lores, fore cheek, chin and centre of throat, rest of head to nape pale ash-grey, paler or pearly grey on cheek and ear-coverts; mantle and centre of upper back light olive-green, scapulars and lower back pale grey (as on nape); rump bright yellow, becoming grey on uppertail-coverts; tail black, finely edged grey, broadly white on inner webs of all outer feathers; lesser and median upperwing-coverts bright yellow (black bases not visible in field), greater coverts black, broadly tipped bright yellow (tips of inner greaters paler or whitish); alula, primary coverts and flight-feathers black, distally edged yellowish, tertials broadly fringed pale grey and tipped whitish; centre of breast and upper belly bright yellow, rest of underparts pale grey, white belly to undertail-coverts; iris black, narrow pale eyering; bill bright pink or pinkish-flesh; legs pale brown to pinkish-brown. Non-breeding male has olive-green of mantle extending onto back and scapulars, paler yellow tips of wing-coverts, more extensive yellow on edges of flight-feathers (which finely tipped white), inner webs of outer rectrices also more extensively white; side of breast to belly and flanks paler, whiter or whitish-buff or tinged browner. Female is similar to male throughout year, but duller and browner, black of head replaced by uniform grey or grey-brown, forehead to nape dusky, nape to back pale brown, wingbars paler or duller (inner greater coverts whitish), underparts paler yellow on breast, light grey on side to belly and undertail-coverts; in non-breeding plumage, head to mantle, back and scapulars buffish-brown, underparts paler, and may have more prominent pale eyering. Juvenile is similar to non-breeding female, but top of head and upperparts (to back) duller brown, finely streaked darker, rump paler and unstreaked, wingbars and edges of secondaries broadly olive-yellow or yellowish-buff, secondaries also tipped whitish or pale buff, tertials broadly fringed dull whitish, underparts pale buffish or tinged brown, belly to undertail off-white, juvenile male with fine pale brown streaks on side of throat and breast. Voice. Song a prolonged series of musical tinkling twitters consisting mostly of notes in paired phrases, and including (or consisting solely of) a range of mimicry of other birds' songs; at least 40 calls and songs known to be regularly imitated, including those of American Kestrel (*Falco sparverius*), Western Wood-pewee (*Contopus sordidulus*), American Rock Wren (*Salpinctes obsoletus*), Western Bluebird (*Sialia mexicana*), American Robin (*Turdus migratorius*) and *C. psaltria*, together with calls of Pacific tree-frog (*Pseudacris regilla*). Calls include thin or high-pitched "dee", a nasal "wheeh" or "whieh", a dry "dri-i-iit", and a distinctive "tink-oo", "tinkl" or "tink-il" often given in flight, also a sharp "kee-yerr" or "rrehr".

Habitat. Lowland and lower montane dry, open woodlands, principally oaks (*Quercus*) and pine–oak (*Pinus–Quercus*), dry grassy slopes and chaparral, brush and tall weedy fields; less frequently in conifer and broadleaf woods, open mesquite (*Prosopis*) woods with scattered shrubs, pinyon–juniper (*Pinus–Juniperus*) woodlands, cypress (*Chamaecyparis*), cedar (*Cedrus*) or juniper plantations, ranches and edges of cultivation usually with access to water; also pastures, desert edges and oases, overgrown roadside verges, riverine and coastal scrub; also parks and gardens, including in cities and suburban areas. Sea-level to 1400 m in Sierra Nevada, to 2900 m in S California and to 2500 m in NW Baja California.

Food and Feeding. Almost entirely seeds of trees and plants, occasionally berries, leaves and some insects. Seeds (variable seasonally and regionally) include those of willows (*Salix*), gums (*Eucalyptus*), fiddlenecks (*Amsinckia*), pigweed (*Amaranthus*), peppergrass (*Lepidium*), shepherd's-purse (*Capsella*), cryptantha (*Cryptantha*), chamise (*Adenostoma*), tarweed (*Madia*), thistles (*Centaurea*, *Cirsium*), Russian thistle (*Salsola*), red maids (*Calandrina*), rabbitleaf (*Lagophylla*), chard (*Beta*), inkweed (*Suaeda*), vinegarweed (*Trichostema*), horehound (*Marrubium*), oak mistletoe (*Phoradendron*), coffeeberry (*Rhamnus*), buckbrush (*Eonothus*), jackass clover (*Wislizenia*), chickweed (*Stellaria*), knotweed (*Polygonum*), clarkia (*Clarkia*); sometimes visits feeders, where it takes variety of small seeds. Insects include oak gall wasps (Hymenoptera). Nestling diet mostly seed pulp fed by regurgitation, occasionally caterpillars (Lepidoptera). Forages principally in early morning and late afternoon, mostly on the ground, also in vegetation; perches on stalks and flowerheads, and hangs upside-down (including from neighbouring plants and fence wires). Either swallows seeds whole or de-husks them in bill and discards outer husk; nibbles or bites into berries of coffeeberry and mistletoe (these not taken whole). In pairs and small groups; in non-breeding season often in larger flocks, and in mixed-species foraging flocks with *C. tristis*, *C. psaltria*, *Carpodacus mexicanus* and Dark-eyed Junco (*Junco hyemalis*).

Breeding. Season Apr to mid-Sept; one brood, perhaps occasionally two. Monogamous. Colonial. Pair formation usually takes place before break-up of wintering flock or shortly after arrival in nesting area (small flocks in spring often comprise established pairs); pair-bond strong, partners associate together while in flock. Displaying male makes long circular flight before returning to female; both may then fly around in excited chases near nesting tree, male leading female. Nest built entirely by female, a loosely woven cup of grasses, leaves, flowerheads, plant fibre and down, lichens, animal hair and feathers (sometimes almost entirely of lichen), placed 3–13 m above ground in fork in outer branch of tree, usually lichen-covered oak, occasionally in lichen or mistletoe clump. Clutch 3–6 eggs, pure white or pale bluish-white; incubation by female, fed on nest by male, period 12–13 days; chicks fed and cared for by both parents, nestling period 13–14 days; young remain within vicinity of nest for a further week, before moving off with parents to form post-breeding flocks. Nests parasitized rarely by Brown-headed Cowbird (*Molothrus ater*). Breeding success little known: eggs and young often taken by Western Scrub-jay (*Aphelocoma californica*) and western grey squirrel (*Sciurus griseus*). Breeds in first year.

Movements. Resident and partial migrant. Extent and duration of movement variable annually, also little evidence of fidelity to breeding or wintering areas. N parts of breeding range (NC California) largely deserted between early Sept and Nov, and occurs more widely in S areas in foothills and interior valleys of SE California and slightly farther S in N Baja California; disperses through Mojave and Colorado Deserts and to higher-lying areas of Sierra Nevada Mts, wanders E to C & S Arizona, extreme SW New Mexico and irregularly S into NW Mexico. Returns to breeding areas between

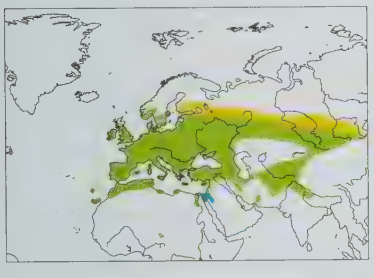
early Mar and early Apr. Also becomes more numerous in parts of the range following brush and chaparral fires in C California. Rare visitor to SW Nevada, C & NW New Mexico and W Texas, and in Mexico S to C Sonora and NW Chihuahua; vagrant in S Oregon and S Baja California.
Status and Conservation. Not globally threatened. Restricted-range species: present in California EBA. Common to locally, erratically or seasonally common. From estimated breeding population in Monterey County (W California) of 2000–5000 pairs, global population judged to be in excess of 200,000 individuals. No clear trends discernible; local increases and decreases reflect annual variability of numbers at breeding and wintering sites.
Bibliography. Anon. (1995a), Arnaiz-Villena, Álvarez-Tejado *et al.* (1998), Arnaiz-Villena, Moscoso *et al.* (2007), Clement *et al.* (1993), Coutlee (1968a, 1968b), Davis (1999), Garrett & Dunn (1981), Gilligan *et al.* (1994), Howell & Webb (1995), Hubbard (1978), Johnson & Cicero (1985), Kaufman (1993), Linsdale (1950, 1957, 1968), Marten & Johnson (1986), Nguembock *et al.* (2009), Pyle & Henderson (1991), Pyle *et al.* (1997), Remsen *et al.* (1982), Sibley (2000), Small (1994), Watt & Willoughby (1999), Wilbur (1987), Zamora, Lowy *et al.* (2006).

74. **European Goldfinch**

Carduelis carduelis

French: Chardonneret élégant **German**: Stieglitz **Spanish**: Jilguero Europeo
Other common names: Eurasian Goldfinch; Grey-crowned/Eastern Goldfinch ("*caniceps* group")

Taxonomy. *Fringilla carduelis* Linnaeus, 1758, Sweden.
Has hybridized with *C. chloris*. Races form two groups, W black-crowned "*carduelis* group" (also with *britannica*, *volgensis*, *frigoris*, *parva*, *tschusii*, *balcanica*, *colchica*, *niediecki* and *loudoni*) and E grey-headed "*caniceps* group" (also with *paropanisi*, *subulata* and *ultima*); groups sometimes treated as two distinct species, but they hybridize in N Iran and probably in SC Russia. Race *brevirostris*, described from Baki (E Azerbaijan), is poorly differentiated, also name invalid, as preoccupied, and synonymized with *loudoni*; likewise, *major* (described from Turkestan) preoccupied, and replaced by new name *frigoris*. Fourteen subspecies recognized.
Subspecies and Distribution.
C. c. britannica (E. J. O. Hartert, 1903) – British Is and NW France E to W Netherlands; non-breeding also SW Europe and Morocco.
C. c. carduelis (Linnaeus, 1758) – S Scandinavia and SE Finland E to C Urals, S to C France, Italy, Slovenia, NW Romania, Moldova, N Ukraine and middle R Volga; non-breeding C & S Europe E to W Kazakhstan.
C. c. volgensis Buturlin, 1906 – S Ukraine, SE European Russia and NW Kazakhstan; non-breeding S to NE Romania.
C. c. frigoris Wolters, 1953 – SW & SC Siberia from E Urals E to R Yenisey, S to W Altai and N & NE Kazakhstan; non-breeding SW Russia and S Urals S to S Kazakhstan.
C. c. parva Tschusi, 1901 – Madeira and Canary Is, S France, Iberia, Balearic Is, and Morocco E to N Libya.
C. c. tschusii Arrigoni, 1902 – Corsica, Sardinia and Sicily.
C. c. balcanica Sachtleben, 1919 – Balkans S to Greece, Crete and NW Turkey.
C. c. colchica Koudashev, 1915 – Crimea and N Caucasus.
C. c. niediecki Reichenow, 1907 – Rhodes, and W, SC & NE Turkey E to S Caucasus, also Cyprus, Lebanon, Israel, SW Iran, N Egypt (Nile Delta and Nile Valley) and N Iraq.
C. c. loudoni Zarudny, 1906 – E Turkey, Azerbaijan and N Iran; winters S to S Iran.
C. c. paropanisi Kollibay, 1910 – W Turkmenistan and E Iran E to N, C & E Afghanistan, W Pamirs, Tien Shan, SE Kazakhstan and NW China (NW Xinjiang); non-breeding SW Asia.
C. c. subulata (Gloger, 1833) – NE Kazakhstan, SC Russia (E to L Baikal) and NW Mongolia; non-breeding SW & C Asia.
C. c. ultima Koelz, 1949 – S Iran (SE Fars and Kerman).
C. c. caniceps Vigors, 1831 – W & N Pakistan (Baluchistan and North-West Frontier Province), Kashmir and NW Himalayas E to C Nepal and SW China (SW Xizang).
Introduced (nominate race) in Bermuda, Azores, Cape Verde Is, SE Australia, Tasmania, New Zealand, Uruguay, and various parts of USA (established only on Long I, New York).



Descriptive notes. 10·5–13·5 cm; 9·5–24 g (various races), 22–30 g (*frigoris*). Small to medium-sized, brightly coloured finch with fine pointed bill and notched tail. Male nominate race has forehead and forecrown (to just behind eye), cheek and chin to upper throat deep red, lores black; side of crown down to side of neck and throat broadly white, bordered by band of black on crown, upper nape and side of nape; centre of nape whitish or pale buff, becoming light sandy to cinnamon-brown on upperparts, rump paler buff-brown and uppertail-coverts white; tail black, feathers broadly tipped white (amount of white largest on central feathers, decreasing outwards), outermost two feathers broadly white on inner webs, large white spot on next inner feather; upperwing black, greater coverts (except for black outermost feather) broadly tipped golden-yellow, central feathers largely yellow; flight-feathers tipped white, broadly on secondaries (but white can be lost through wear in summer), basal half of secondaries and primaries golden-yellow, tertials broadly tipped cream or white; lower throat and side of breast to flanks (extent variable) warm sandy or buffish cinnamon-brown, rest of underparts white, tinged sandy-brown on undertail-coverts; iris dark brown or black; bill whitish-horn to pale pinkish, tipped darker in non-breeding plumage; legs pale brown to pinkish-brown. Female is like male, but red on face less extensive, reaching back to anterior cheek and chin, red of chin more rounded patch (less square than on male) and feathers often tipped black, black of crown mottled greyish-buff, side of head washed buffish and less extensively white; less white in outer two tail feathers, lesser and inner median coverts fringed grey-brown, and buff-brown usually forming complete band across breast. Juvenile has head pale buffish-brown, finely streaked darker or blackish on crown, ear-coverts faintly streaked darker, slightly warmer buff-brown upperparts also dark-streaked, more continuously so on mantle and scapulars, upperwing and tail as on adult, tips of median coverts, flight-feathers and tertials yellowish to buffish-brown (broadly on tertials), yellow on greater coverts and bases of flight-feathers paler than on adult, underparts like face or browner, with fine dark streaks on breast and flanks; red on face acquired through moult into first-winter plumage in Aug–Sept; first-winter and first-summer like adult, but slightly duller, with blackish-brown wings (some juvenile feathers often retained) and tail with buffish tips. Races differ mainly in head pattern, in intensity of plumage tone of upperparts and underparts, and in size, E races most distinctive, having black on head replaced by grey, which extends to side of neck and upperparts: *britannica* is slightly smaller than nominate and darker, generally less cinnamon, on mantle, back and side of breast, ear-coverts browner and underparts duller white; *volgensis* is slightly larger and longer-billed than nominate, also bill broader-based, upperparts slightly paler (bases of back feathers white) and side of nape paler; *frigoris* resembles previous, but larger, larger-billed, and upperparts and side of breast and belly paler; *parva* has shorter bill, wing and tail than nominate, paler or greyer and usually less warm brown upperparts; *tschusii* is similar to previous in size, but bill slightly shorter, upperparts dull earth-brown, ear-coverts browner, and side of breast and belly also olive-brown; *niediecki* is like nominate in size, but paler drab brown on mantle and back (greyer in worn plumage), and paler buff (less cinnamon) or yellowish on side of breast and belly; *balcanica* and *colchica* are poorly differentiated, very similar to nominate in size and to preceding race in plumage, except upperparts and side of breast (sometimes extending as narrow breastband) dull cinnamon-brown; *loudoni* has slightly darker brown upperparts and more extensive patch on side of breast; *subulata* is largest and palest, black areas of head replaced by grey, upperparts pale buffish-grey (or tinged cinnamon in NW), sides of breast and belly paler ash-grey; *paropanisi* is similar to previous, but slightly smaller, longer-billed, somewhat heavier grey, breast almost entirely grey and grey more extensive on side of belly; *caniceps* resembles last, but slightly smaller, and a little darker grey above and below; *ultima* is like *paropanisi* in size and colour, but longer-billed. Voice. Song, usually from open and prominent perch, from end Feb to mid-Jul and late Sept to Dec, a rapid rising and falling series of liquid, twittering and tinkling "tsswit-witt-witt" notes, repeated, and including harsher buzzing "zee-zee" or slightly harsher "ziar-ziar" notes and higher-pitched trills, overall a fast and flowing *Serinus*-like song given continuously for some time or broken by short pauses; song of *subulata* less clearly ringing, softer and more melodic; song of female like male's, but less vigorous or sustained. Subsong a series of soft or subdued chirps and chattering notes with several high-pitched or squeaky phrases reminiscent of "chink" note of *Fringilla coelebs*. Call a variably shrill or ringing "tu-weep", "tee-tuu", "pee-yuu", "tit-tee" or "tsee-yu" or "tuu-wee-oo", and "tickle-lit" or "duu-did-ee-dit", usually followed by a light, high-pitched "zizizi" twitter; alarm or anxiety note a harsh scolding "eeez", "zeez", "geez" and "weeju" given repeatedly.
Habitat. Open or sparse deciduous woodland and mixed deciduous and conifer woods, forest edges, thickets, heaths, hedgerows, stream, riverine and marshy areas with bushes and trees, roadside verges, steppe grasslands with scattered trees to edges of semi-desert areas, scrub, orchards, edges of cultivation, including fallow, rough and overgrown fields with tall vegetation, and parks and gardens. Lowland to lower or submontane levels: in Europe breeds widely below 1000 m, and to almost 2000 m in Alps; to c. 1850 m in Lebanon, c. 2000 m in Caucasus, c. 2600 m in Tien Shan, at 1800–4200 m in Himalayas, to 900 m in N Altai (*frigoris*) and to 1700 m in inner Altai (*subulata*). In non-breeding season, descends from higher parts of range to lower-level foothills and plains.
Food and Feeding. Mostly seeds (ripe and unripe), buds, flowers and fruit of plants; also some arthropods. Plants exploited include cypress (*Chamaecyparis*), fir (*Abies*), larch (*Larix*), hemlock (*Tsuga*), spruce (*Picea*), pine (*Pinus*), poplar (*Populus*), birch (*Betula*) including catkins, alder (*Alnus*), elm (*Ulmus*), plane (*Platanus*), olive (*Olea*), nettle (*Urtica*), hemp (*Cannabis*), knotgrass (*Polygonum*), dock (*Rumex*), goosefoot (*Chenopodium*), orache (*Atriplex*), sea-blite (*Suaeda*), chickweed (*Stellaria*), buttercup (*Ranunculus*), mouse-ear (*Cerastium*), poppy (*Papaver*), meadowsweet (*Filipendula*), burnet (*Sanguisorba*), apple (*Malus*), pear (*Pyrus*), cherry (*Prunus*), rowan (*Sorbus*), clover (*Trifolium*), broom (*Cytisus*), willowherb (*Epilobium*), evening-primrose (*Oenothera*), viper's-bugloss (*Echium*), alkanet (*Anchusa*), forget-me-not (*Myosotis*), self-heal (*Prunella*), snapdragon (*Antirrhinum*), plantain (*Plantago*), honeysuckle (*Lonicera*), field scabious (*Knautia*), small scabious (*Scabiosa*), devil's-bit scabious (*Succisa*), teasel (*Dipsacus*), golden-rod (*Solidago*), cocklebur (*Xanthium*), sea-aster (*Aster*), sunflower (*Helianthus*), butterbur (*Petasites*), yarrow (*Achillea*), mugwort (*Artemisia*), bur-marigold (*Bidens*), corn marigold (*Chrysanthemum*), colt's-foot (*Tussilago*), groundsel and ragwort (*Senecio*), burdock (*Arctium*), thistles (*Carlina*, *Carduus*, *Cnicus*, *Onopordum* and *Cirsium*), knapweed (*Centaurea*), goat's-beard (*Tragopogon*), viper's-grass (*Scorzonera*), chicory (*Cichorium*), sow-thistle (*Sonchus*), lettuce (*Lactuca*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), hawk's-beard (*Crepis*), cat's-ear (*Hypochoeris*), hawkweed (*Hieracium*), oxtongue (*Picris*), and various grasses including *Poa*, *Dactylis*, *Agrostis* and *Phleum*. Insects taken include bugs (Hemiptera), moths and their larvae (Lepidoptera), flies (Diptera), beetles (Coleoptera), also spiders (Araneae). Nestlings fed with insect larvae. Diet varies according to seasonal availability, but insects taken in early spring before most seeds available; also heavily dependent on thistles, particularly *Cirsium oleraceum* in autumn, and in C Siberia *Arctium lappa* apparently important for sustenance during mid-winter. Actively forages on ground, but mostly in or on plants, bushes and tall vegetation; often perches acrobatically on seedheads, particularly thistles, and hangs upside-down on teasels and sunflowers. Uses long, thin tweezer-like bill to picks seeds from exposed and hidden flowerheads (including those from between spines), also pierces closed heads to remove ripening seeds. Regularly attends birdtables and feeders, taking various small seeds, particularly black niger (*Guizotia abyssinica*). Forages in pairs and in small flocks of up to 30 individuals; in non-breeding season often in larger flocks (predominantly of males), occasionally hundreds or thousands at plentiful seed supply, usually in single-species flock (dictated by specialized food requirements), only occasionally in mixed flocks with *C. chloris*, *C. spinus* and *C. cannabina*.
Breeding. Season Apr to early Aug; two broods (race *caniceps* moves to higher altitude for second brood). Monogamous. Solitary or loosely colonial, up to five nests in same tree. Territorial, area of up to 250 m² used for mating and nesting, and forages up to 800 m beyond territory boundary. Pair formation takes place during late winter within flock, partners perch c. 15 cm apart, either upright or crouching horizontally, showing red face and swinging body from side to side, wings slightly lowered and tail semi-spread, the two pivoting at different speeds, also repeated bill-touching by both and courtship-feeding of female by male (which continues through incubation and brooding stages), also short, vigorous chases initiated by either sex, chasing usually followed by perched pivoting display, singing and copulation (usually near nest-site); between chases either sex may adopt soliciting posture while perched horizontally, with wings drooped and shivered fairly vigorously and tail raised; male also performs fairly brief slow-motion, stiff-winged display-flight with short glides, most often during nest-building. Nest built by female, male may assist in collection of material, a compact small cup of grasses, moss, plant fibres and down, cobwebs, animal hair and feathers, a few aromatic flowers on outside (material often includes that taken from nearby nests, including those of *Fringilla coelebs*), placed up to 10 m (mostly below 6 m) from ground, concealed beneath foliage in outer twigs or slender branches of bush or tree, frequently fruit tree; material sometimes reused for second nest. Clutch 4–6 eggs, pale bluish-white, blotched greyish-violet and sparsely spotted or scrolled reddish to purple-brown; incubation by female, period 9–12 days; chicks fed and cared for by both parents, nestling period 13–18 days; young fed by parents for at least 10 days after fledging. Breeding success variable, depends partly on wind strength and predation during critical nestling stage: of 77 nests in Moscow study, 38% successful when density high and 59% when low, most losses to Carrion Crow (*Corvus corone*); in German study of 204 nests, 47 (23%) successfully fledged 187 young, 57% lost eggs and 21% lost nestlings, most taken by Common Magpie (*Pica pica*) and Common Kestrel (*Falco tinnunculus*). Breeds in first year.
Movements. Resident, migratory, partially migratory and nomadic. Moves diurnally, and singly (rare) or in flocks of up to c. 100 individuals. Within Europe and W Russia part of population

sedentary (remains throughout winter in S Scandinavia, Baltic countries and Poland), some move altitudinally, and many breeders in N of range move S & SW between end Jul and Nov to winter mostly within S areas of breeding range or slightly farther S, into N Africa and Middle East; peak arrival in Spain mid-Oct to early Nov, return movement N in Mar to early May, also some movement N across Strait of Gibraltar in Jan. Evidence from ringing shows that more females than males involved in passage movements, and juveniles also move considerable distances to wintering grounds. British breeders (race *britannica*) either remain throughout winter or move to Belgium, S France, Spain and, less frequently, Morocco, some individuals moving in some years but not in others; nominate race winters within S areas of range or heads SW to S France and Spain, higher proportion of females in S indicating that these travel farther, regularly reaching N Africa and S Israel; small passage through Britain (possibly also winters, but undetected owing to similarity to *britannica*), and main passage through Belgium (where c. 33% of breeding population resident) mostly of birds from N & E, including small numbers from SW Russia; German breeders partially migratory, wintering from Belgium S to S France and SE Spain, and those in Switzerland apparently entirely migratory, flying short distances to S France and Spain; local breeders in Spain either resident or move short distance SE towards N Africa, or may cross Strait of Gibraltar. Farther E in Europe, birds from SW Russia and Balkans (females also outnumbering males) winter in Italy, along Dalmatian coast and S to Bulgaria, Cyprus and Tunisia, small numbers continuing W to S Spain. In Morocco prominent autumn and spring passage migrant, and wintering birds include small numbers from W Europe and elsewhere; numbers also increase in mid-winter in periods of severe weather farther N. Winter visitor to Cyprus (where most breeders move to lower altitudes, but small numbers also S to N Egypt), throughout Turkey to NW Iran and along Black Sea coast N to Crimea, arriving from mid-Aug to end Oct, with most passage late Oct; winter visitors arrive Lebanon late Nov to mid-Feb, and in Israel mostly along coastal plain between Oct and mid-Dec; race *niediecki* regularly winters N Egypt, Jordan and NW Saudi Arabia (where may have bred); *balcanica* and *loudoni* probably annual in Cyprus, the latter also in S Iraq. Movements of E populations less well known, but pattern apparently similar to that in W: in N Caucasus either sedentary or short-distance migrant, numbers increasing with arrivals from E between mid-Nov and early Mar; in N Iran small numbers of *paropanisi* occur around Tehran; in Kazakhstan nominate race a common winter visitor in W; breeding races move altitudinally or short distances between early Sept and Nov and from Mar to late Apr/early May in SE; in Tajikistan largely an altitudinal migrant, descending to lower valleys end Aug/early Sept to Feb; *frigoris* on passage through Kazakhstan mid-Sept and Oct to wintering grounds in S between Aral Sea and N Tien Shan foothills, and small numbers of presumed *frigoris* occasionally reach Turkmenistan, Uzbekistan, Tajikistan and NE Afghanistan in winter. In N Pakistan local breeding birds together with immigrants from farther N winter widely in lower hills and adjacent plains S to Baluchistan; in Ladakh summer visitor mainly Jun–Oct, and occasional in winter. Vagrants recorded N to Iceland, S to United Arab Emirates and Oman; both nominate race and individuals apparently of race *caniceps* have occurred in Japan, but nominate considered to be of captive origin.

Status and Conservation. Not globally threatened. Common to very common and widely distributed in W, local in E; race *subulata* rare in SC Siberia. Estimated European breeding population 7,177,000–9,775,000 pairs, with possibly half that number in Turkey and up to a further 1,000,000 pairs in European Russia. Densities highly variable, depending greatly on food supply: 5–10 pairs/km² in rural farmland in Britain; in Germany, 10–60 pairs/km² in parks and cemeteries, 21–77 in woods and fields and 1·2–25 in roadside hedgerows; in Bulgaria, 0·1–0·2 pairs/km² in agricultural shelter-belts to 40 pairs/km² in tree-lined streets and 60 pairs/km² in lime (*Tilia*)-dominated habitats; 30·8 pairs/km² in Moroccan maquis. Most numerous in S of range, where foodplants most abundant and seeds available throughout year; e.g. the most abundant wintering passerine in Spain. Breeding range has expanded N in Scotland and Fennoscandia since early 1960s; in S, breeding population local and widely scattered in Israel prior to mid-20th century, since when has increased and spread to N & C areas and into rural and agricultural settlements in Arava and Negev desert regions; at same time has spread S in Egypt along R Nile to c. 23° N, largely as a result of increased irrigation and human settlements.

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75. Citril Finch

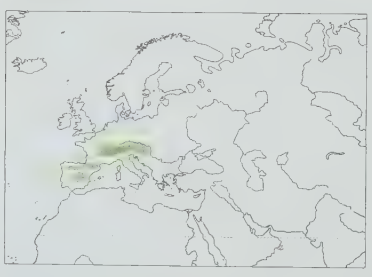
Carduelis citrinella

French: Venturon montagnard **German**: Zitronenzeisig **Spanish**: Verderón Serrano

Taxonomy. *Fringilla citrinella* Pallas, 1764, "Holland".

Previously placed in genus *Serinus*. Until recently considered conspecific with *C. corsicana*, but differs in mitochondrial DNA, morphology, habitat selection and voice. Monotypic.

Distribution. N & C Spain E, discontinuously, to S France, N Italy, S Germany, E Austria and Slovenia.



Descriptive notes. 11·5–12 cm; 12–14 g. Rather small, greenish finch with short pointed bill and fairly long, slightly forked tail. Male has forecrown to around eye and foreface yellowish-green, hindcrown to side of neck and ear-coverts ash-grey or light bluish-grey, tinged olive on ear-coverts; mantle to scapulars olive-green, tinged greyish, finely streaked darker, lower back to uppertail-coverts unstreaked dull yellowish-green, longest tail-coverts with dusky centres; tail blackish, edged yellow on outer webs at base, becoming whitish at tips; lesser and median upperwing-coverts bright yellowish-green, greater coverts black, broadly tipped bright yellowish; alula, primary coverts and flight-feathers black, finely edged (flight-feathers also tipped) yellow or yellowish-green, tertials more broadly fringed yellowish; chin and throat yellowish-green, side of breast (from side of neck) to upper flanks pale grey, centre of breast and belly greenish-yellow, vent to undertail-coverts yellow or whitish-yellow; iris dark brown; bill dark brown, paler or pinkish-grey base of lower mandible; legs pale brown. Female is similar to male, but duller or darker, head to side of neck, breast and upper flanks greyer (or nape and side of neck tinged brown), yellow on face greener and restricted to area from forehead to around eye and down to upper throat; mantle to scapulars dark grey-tinged olive and more heavily streaked darker, rump, uppertail-coverts and edges of outer tail feathers dull greenish-yellow; wing as for male, but tips of coverts narrower and fringes of tertials paler; chin and upper throat green, becoming ash-grey on throat, upper breast and side of breast to flanks, rest of underparts duller or greener, tinged yellow. Juvenile has lower forehead to around eye pale grey-brown, sometimes a pale or yellowish subocular crescent, forecrown to nape and side of neck buffish-brown, finely streaked darker, upperparts slightly warmer brown, broadly streaked darker, rump and uppertail-coverts paler buff or tawny-brown with dark streaks at side, tail with dull yellow or buffish edges on outer feathers, wings dark brown, median and greater coverts broadly tipped rusty-buff to pale creamy, flight-feathers finely edged and tipped buffish-brown, tertials more broadly fringed buff-brown, chin and throat brownish-grey, becoming dark-streaked buffish-brown on breast to centre of upper belly, rest of underparts light buff with yellow tinge, flanks streaked finely brownish, vent and undertail-coverts unstreaked whitish-buff, bill dark horn; first-year like adult, but retains juvenile outer greater coverts, primary coverts, flight-feathers and tertials, male browner and more heavily streaked on mantle and back, tips of wing-coverts and edges of remiges and tail feathers buff with pointed tips (rounded on adult), chin and upper throat green to greyish, underparts greenish-yellow, mottled whitish on belly, female mantle and back brownish-olive, underparts paler yellow, and sides of throat to breast and upper flanks ash-grey to brownish-grey. Voice. Song, throughout year (mostly in winter and during breeding season, rarely in autumn), from treetop or during display-flight, a continuous *Serinus*-like series of rapid, musical, liquid notes, including high-pitched phrases, repeated and interspersed with harsher twitters, rattles, buzzes, trills and call notes; may also introduce song with several individual notes before commencing continuous song. Calls include several notes similar to those given by both *Serinus serinus* and *C. spinus*, a metallic "di", "dit", "tiyie" or "tsiew" or variations, including "hui", "hwee" and lower-pitched "zui" and a slightly harsher "check" or "chwick", "tweek", "twick" or "chit" note, also longer "dididididid", or "chitt-tit-itt" or "check-eck-eck" recalling that of *C. cannabina*, also a ringing "pirriti".

Habitat. Montane and submontane woods of spruce (*Picea*), larch (*Larix*) and pine (*Pinus*), usually along edges and in clearings, also scattered clumps of conifers in otherwise open areas, also alpine meadows, ski-runs, roadside edges, and around alpine huts and gardens in towns, where it perches on roofs and wires; to 1450 m in Black Forest (Germany), mostly at 1400–2000 m in Spain and 1800–2100 m in French Pyrenees, from c. 1350 m to tree-line in Alps, above 1200 m in Swiss Jura, and at 2500–3000 m in N Italy (W Alps). Sometimes breeds opportunistically at lower levels, down to 500 m, in years with good crop of pine seeds. Immediately following breeding often disperses to higher areas, up to 3300 m, before descending to lower-lying wintering areas. In non-breeding season found in similar habitat in sheltered valleys at lower levels, usually above 800–1000 m (lower in severe winters), including in birch (*Betula*) woods, also in alders (*Alnus*).

Food and Feeding. Mostly seeds and buds of trees and other plants; some arthropods. Seeds and buds include those of spruce, pine, willow (*Salix*), birch, alder, dock (*Rumex*), orache (*Atriplex*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), cat's-ear (*Hypochoeris*), hawkweed (*Hieracium*), chickweed (*Stellaria*), meadowsweet (*Filipendula*), rowan (*Sorbus*), thistles (*Cirsium*), knotgrass (*Polygonum*), mayweed (*Matricaria*), gentian (*Gentiana*), *Chrysanthemum*, arnica (*Arnica*), sherpherd's-purse (*Capsella*), mouse-ear (*Cerastium*), goosefoot (*Chenopodium*), amaranth (*Amaranthus*), buttercup (*Ranunculus*), whitlowgrass (*Erophila*), tormentil (*Potentilla*), lady's-mantle (*Alchemilla*), mountain avens (*Dryas*), burnet (*Sanguisorba*), clover (*Trifolium*), melilot (*Melilotus*), forget-me-not (*Myosotis*), wood sage (*Teucrium*), lavender (*Lavandula*), thyme (*Thymus*), nightshade (*Solanum*), plantain (*Plantago*), scabious (*Knautia*), rushes (*Juncus*), sedges (*Carex*) and various grasses (Gramineae). Insects taken include aphids (Aphidoidea), psyllids (Psyllidae), ants (Formicidae) and coleophorid moth larvae (Lepidoptera). Nestling diet either seeds or invertebrates regurgitated by adults; in Alps first broods may be reared entirely on spruce seeds, and in Black Forest entirely on mountain pine (*Pinus mugo*) seeds. Forages usually on ground or in trees. Majority of food taken on ground, and extracts grass seeds while holding seedhead under foot. Perches in bushes, in trees and on roadside wires; probes into cones and catkins, but generally less able to cling to or hang upside-down from pine cones or thistleheads in manner of *C. flammea* or *C. spinus*. In pairs or small groups; on passage and in non-breeding season usually very social, forming flocks of several hundreds of individuals.

Breeding. Season end Mar or mid-Apr to Aug; two broods (yearlings only one). Monogamous. Solitary nester or loosely social in neighbourhood groups. Pair formation takes place in winter flocks or shortly after arrival in breeding areas; pair-bonding and courtship display include chasing of female by male, prolonged singing from song perches, and courtship feeding; also female emits begging call with bill open, head and neck feathers ruffled, and wings slightly open and quivering; male also performs slow butterfly-like display-flight. Nest built by female, a cup of dry grass, plant fibres, lichens, animal hair, feathers and occasionally wool or paper, placed up to 30 m (mostly to 9 m) above ground against trunk of tall tree, usually conifer, or at tip of strong horizontal branches, rarely in deciduous tree. Clutch 3–5 eggs, pale blue, sparsely spotted rust-brown and violet; incubation by female, period 13–14 days; chicks fed and cared for by both sexes until close to fledging, nestling period 15–21 days; young fed by parents for up to 3 weeks after leaving nest. Breeding success: of 55 eggs in study in N Italy, 45% successfully fledged young, average 2·8 young/successful nest; c. 48% fledgling/egg success both at 11 nests in Black Forest and at 50 nests in Catalonian pre-Pyrenees; severe weather during breeding season has strong effect on clutch size and nestling mortality. Breeds in first year. Recorded longevity 5 years 8 months.

Movements. Partial short-distance migrant and altitudinal migrant. Birds from N Alps descend to lower levels from end Sept/early Oct and winter in sheltered and treeless valleys, especially in S & W of Alps; in milder winters remains at higher elevations, especially in S France and N Italy, until severe weather forces downward movement. Autumn passage through W Switzerland of up to 3000 individuals reaches peak in mid-Oct and completed by mid-Nov; also fairly nomadic in winter and may move around at lower levels of breeding range in search of foraging areas. In Switzerland winters regularly only in SW, most breeders from Swiss and S German Alps moving short distance to Mt Ventoux area of SC France (on SW edge of Alps), a journey of up to 600 km for some German breeders; individuals ringed in Switzerland recovered in N & C Italy and NE Spain, suggesting that many individuals regularly move similar short distances. Those breeding in Pyrenees and other parts of NE Spain descend to lower levels, occasionally reaching coastal areas (and even Balearic Is), but in NW Spain (Asturias) largely sedentary. In years with mass spruce seed production, some may remain during winter in Black Forest. Return movements in spring variable, from mid-Feb to mid-Apr, and largely influenced by late-winter snowfalls, some remaining in plains and low-altitude valleys to mid-May; during severe weather in spring, regular altitudinal movements to lower levels. Exceptionally, recorded in plains of C & N France; vagrant to many areas including Finland, N Germany, Belgium, Netherlands, Poland, Czech Republic, and N Africa (Morocco E to Algeria).

Status and Conservation. Not globally threatened. Common or locally common; uncommon in Slovenia. Estimated global breeding population c. 250,000 pairs, majority of which (c. 230,000 pairs) in Spain. Breeding densities in French Alps 13 pairs/km² in pine, 21 pairs/km² in dry spruce and 18–30 pairs/km² in larch; locally high densities, e.g. 7–10 pairs/10 ha in Catalonian pre-Pyrenees. Identity of birds said formerly to have bred on Mallorca (Balearic Is) uncertain, possibly *C.*

corsicana. Has recently declined significantly at N edge of range (Black Forest, N Alps), but otherwise not thought to be at risk.

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76. Corsican Finch

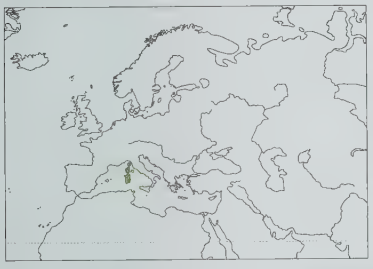
Carduelis corsicana

French: Venturon corse **German**: Korsenzeisig **Spanish**: Verderón Corso

Taxonomy. *Citrinella corsicana* A. F. Koenig, 1899, Corsica.

Previously placed in genus *Serinus*. Until recently considered conspecific with *C. citrinella*, but differs in mitochondrial DNA, morphology, habitat selection and voice. Has hybridized with *C. chloris*. Monotypic.

Distribution. Corsica, Sardinia, and smaller islands of Gorgona, Capri and Elba.



Descriptive notes. 11 cm; 11–12 g. Small, yellowish and brown finch with fairly long, forked tail. Male has forecrown to around eye and foreface bright yellow, lores blackish, hindcrown to side of neck and ear-coverts ash-grey or light bluish-grey, tinged olive on ear-coverts; mantle to scapulars and lower back warm brown or cinnamon-brown, heavily streaked dark grey, rump and uppertail-coverts unstreaked dull yellowish, longest tail-coverts pale grey with dusky centres; tail blackish, finely edged whitish; lesser and median upperwing-coverts bright yellowish-green, greater coverts black, broadly tipped bright yellowish; alula, primary coverts and flight-feathers black, finely edged (flight-feathers also tipped) yellow or yellowish-green, tertials more broadly fringed yellowish; chin and throat yellowish-green, side of breast (from side of neck) to upper flanks pale grey, centre of breast and belly yellowish, tinged green, vent to undertail-coverts white or tinged yellow; iris dark brown; bill dark brown, paler base of lower mandible; legs pale brown. Differs from *C. citrinella* in shorter and more rounded wing and shorter tail, smaller bill, shorter legs, brighter yellow on face restricted to lower forehead, blackish lores, cinnamon-brown upperparts, duller yellow rump, and more yellow in underparts. Female is similar to male, but duller or darker, head to sides of neck, breast and upper flanks brownish-grey, yellow on face restricted to upper lores, around eye and chin; mantle to scapulars more heavily streaked darker, rump, uppertail-coverts and edges of outer tail feathers dull greenish-yellow; wings as for male, but fringes of tertials paler; upper throat tinged green, becoming pale grey at side and on upper side of breast, flanks duller or greener, tinged yellow. Juvenile has lower forehead to around eye pale grey-brown, sometimes a pale subocular line, forecrown to nape and side of neck buffish-brown, finely streaked darker, upperparts slightly warmer brown, broadly streaked darker, rump and uppertail-coverts paler buff or tawny-brown, streaked darker at sides, tail with dull yellow or buffish edges of outer feathers, wing dark brown, median and greater coverts broadly tipped rusty-buff to pale creamy, flight-feathers finely edged and tipped buffish-brown, tertials more broadly fringed buff-brown, chin and throat brownish-grey, becoming dark-streaked buffish-brown on breast to centre of upper belly, rest of underparts light buff, tinged yellow, flanks streaked finely brownish, vent and undertail-coverts unstreaked pale or whitish-buff, bill dark horn; first-year like adult, but retains juvenile outer greater coverts, primary coverts, flight-feathers and tertials, male with browner and more heavily streaked mantle and back, tips of wing-coverts and edges of flight-feathers and tail feathers buff with pointed tips (rounded on adult), chin and upper throat green to greyish, underparts greenish-yellow, belly mottled whitish, female mantle and back brownish-olive, underparts paler yellow, side of throat to breast and upper flanks ash-grey to brownish-grey. Voice. Song, from late Feb and throughout breeding season, a loud series of segmented phrases given in fairly rapid succession (but considerably slower pace than that of *C. citrinella*), interspersed with occasional descending buzzing trills and rattles; sometimes introduced with high-pitched rising notes or rattling note, before continuing with lower-pitched and modulated notes interspersed with trills and call notes. Calls include several notes similar to those of *C. citrinella*, but in general longer, lower and less frequency-modulated, e.g. a series of "de" or "yu" notes; also a long, metallic twitter similar to that given by *C. spinus*.

Habitat. Lowland maquis to montane dry scrub and open to semi-open conifer forests, mainly of European black pine (*Pinus nigra*) and maritime pine (*Pinus pinaster*), and heathland with tree-heath (*Erica*) and bushes, mainly *Genista* and bramble (*Rubus*), also alder (*Alnus*) groves and areas of lightly scattered conifers; in subalpine zone in low juniper (*Juniperus*); in Corsica most breed at 800–1400 m, and in Sardinia breeds nearly exclusively above 800 m. In non-breeding season moves to maquis and scrub vegetation in lower-level valleys, plains and coastal areas.

Food and Feeding. Seeds of European black pine, grasses (*Poa*, *Briza*) and herbs, including dandelion (*Taraxacum*); on Corsica mainly shepherd's-purse (*Capsella*), chickweed (*Stellaria*), mouse-ear (*Cerastium*), daisy (*Bellis*), dock (*Rumex*), black medick (*Medicago lupulina*), trefoil (*Trifolium*), thistle (*Carlina*), heaths (*Erica*), hyoseris (*Hyoseris*), knotgrass (*Polygonum*), rosemary (*Rosmarinus*) and whitlowgrass (*Erophila*); on Sardinia also larval and pupal ermine moths (Parahyponomeutidae). In pairs and small parties in trees, shrubs and on ground; forages up to 2 km from nest-site when feeding nestlings. In non-breeding season occurs in flocks of up to 200, and often associates with *S. serinus*.

Breeding. Season mid-Mar to at least Jun; two broods. Nest a loose and shallow cup of fine grasses, plant fibres and down, moss, animal hair and feathers, placed up to 3 m above ground in low tree-heath, *Genista*, bramble, evergreen oak (*Quercus ilex*) or juniper, generally much lower than that of *C. citrinella*; some nests higher up in large pine. Clutch 2–5 eggs (average clutch size lower than that of *C. citrinella*), pale blue, sparsely spotted blackish or rust-brown; no information on incubation and nestling periods. Breeding success 40·9% for 19 nests in Corsica, Sardinia and Capri.

Movements. Altitudinal migrant. Post-breeding descent to lower-level valleys, plains and coastal areas; large flocks often present in coastal areas into May.

Status and Conservation. Not globally threatened. Common to locally common. Corsican population estimated at c. 10,000 pairs. Breeding densities of 3·6–53 pairs/km² in various habitats in Corsica, highest 5·3 pairs/10 ha in low maquis and scrub. Identity of birds said formerly to have been present on Mallorca (Balearic Is) uncertain; may have been of present species, but possibly *C. citrinella*.

Bibliography. Armitage (1937), Arnaiz-Villena *et al.* (1998), Clement *et al.* (1993), Cramp & Perrins (1994), van den Elzen (1999), Förschler (2006a), Förschler & Kalko (2006a, 2006b, 2007), Förschler & Siebenrock (2007), Förschler, Senar *et al.* (2009), Förschler, Siebenrock & Coppack (2008), Hagemeijer & Blair (1997), Pasquet & Thibault (1997), Sangster (2000), Sangster *et al.* (2002), Snow & Perrins (1998), Thibault & Bonaccorsi (1999).

77. Lesser Redpoll

Carduelis cabaret

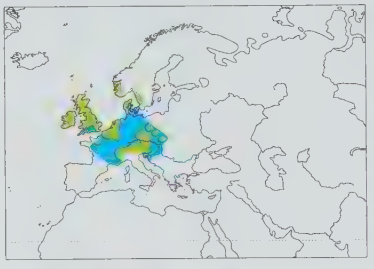
French: Sizerin cabaret **German**: Alpenbirkenzeisig **Spanish**: Pardillo Alpino

Taxonomy. *Fringilla cabaret* Statius Müller, 1776, Europe.

Previously placed in genus *Acanthis*. Was until recently considered conspecific with *C. flammea*, and evidence from mitochondrial DNA suggests that the two, together with *C. hornemanni*, are probably best regarded as closely related sister-species or forming a superspecies; despite wide genetic variation within their ranges, however, recent studies have found little support for lineage division between arctic-breeding and boreal-breeding redpolls, and comprehensive review of gene flow still required in order to determine species limits; pending conclusions of any review, may need to be reclassified within *Acanthis*. Present species has hybridized with *C. flammea* and *C. cannabina*. Birds from Argyll, in SW Scotland, described as race *disruptis* on basis of more tawny-brown upperparts with purer black streaks, but differences small and within range of individual variation of species, and considered insufficient to warrant naming of geographical races. Monotypic.

Distribution. Breeds British Is, SW Norway, S Sweden, Denmark, and N & NE France E to S Belgium and Netherlands; also N & C Germany, Alps (from SE France E to Austria) and Carpathians (SE Czech Republic and S Poland, possibly also N Romania). Widespread in NC & S Europe in non-breeding season.

Introduced in New Zealand.



Descriptive notes. 11·5–12·5 cm; 9–12 g. Small to medium-sized, brownish, streaky finch with pale wingbars, short, conical bill and slightly forked tail. Male breeding has lower forehead and lores black, upper forehead and forecrown deep red or crimson (rarely, orange or yellow), crown to nape dark brown with paler buff or grey-buff feather edges, narrow pale buffish supercilium from above eye to rear of ear-coverts merging into greyish-buff on side of neck, short thin dark eyestripe behind eye, buffish-brown (sometimes tinged light pinkish) cheek and ear-coverts, with variable streaking; upperparts like nape or darker grey-brown (when worn), broadly and boldly streaked with pinkish-brown to earth-brown edges, rump pale buff to pink or bright pink of variable extent (usually brightest on centre of rump) and usually partly concealed by blackish streaks or brown tips; uppertail-coverts dark brown, fringed pale buff; tail blackish-brown, finely edged buffish-brown; upperwing dark brown, median coverts finely tipped buff, greaters more broadly tipped whitish-buff (forming wingbar, whitish or absent through wear in mid-summer), flight-feathers finely edged pale buff, more broadly on tertials; chin black, pale whitish-buff below, throat to breast, upper belly and upper flanks may be tinged bright pink or rose-pink (merging with that on face), flanks and side of belly broadly streaked blackish, belly white and undertail-coverts white to buffy-white, streaked finely darker; iris dark brown or black; bill dull yellow or pale straw, dark horn-coloured culmen and tip; legs black or blackish-brown. Non-breeding male (fresh plumage, in autumn and early winter) has forecrown bright crimson, rest of head and upperparts tawny-brown, streaked black, side of neck buffish, pink on rump more extensively concealed by buff-brown tips, wings slightly paler, wingbars more prominent; throat and side of breast pale tawny or buffish-brown, lightly streaked brownish and washed pink on centre of breast (becoming more extensively pink from face to upper belly when pale tips abrade). Differs from *C. flammea* in slightly smaller size, darker or browner head, upperparts and upper breast and flanks contrasting with whitish belly, also upperparts heavily streaked darker, pale greyish or buff (not white) "tramlines" on sides of back, heavily streaked rump, and duller or more buffish-white tips of greater coverts and edges of flight-feathers. Female breeding is like male, but generally darker or duller brown on head and face, with slightly smaller red patch on forehead, and sometimes pink tinge on centre of breast and on lower back (rump otherwise brown or buff-brown, streaked darker); blackish chin patch often slightly larger than on male, extending to centre of throat, underparts off-white to buff-brown, broadly streaked darker on side of breast and flanks and lightly on centre of breast. Non-breeding female (fresh plumage) has head, upperparts and wings browner, broad buff or whitish-buff wingbars and edges of flight-feathers and tertials, and tips of flight-feathers also finely buff. Juvenile is like breeding female, but tips of tail feathers sharply pointed, lores grey or dark grey and face pale buffish-brown, lightly streaked on ear-coverts, forehead to nape dark brown, streaked greyish-white (lacks crimson on forehead), upperparts streaked warm or dark brown with broad buffish-brown edges, rump and uppertail-coverts buffish or whitish, streaked blackish-brown, upperwing-coverts tipped whitish-buff, edges of flight feathers pale buff-brown, tertials tipped whitish, less black on chin, underparts pale greyish or whitish, more heavily streaked dark brown on breast, flanks and side of belly, bill pale yellow with dark tip; first-winter plumage (acquired Aug–Sept) not always separable in field from adult female, but retains juvenile outer greater coverts, primary coverts, flight-feathers and tail feathers, first-year male (and some adult females) with pink tinge on lower cheek and rump. Voice. Very similar to that of *C. flammea*. Song, usually from prominent perch or during display-flight, a short rippling trill which includes the "chut-ut-ut-ut" call and interspersed with buzzing "errr errrr" notes. Call a distinctive metallic twittering series of "tje" or "che" repeated at intervals, "che-che-che" or "chut-ut-ut-ut" or "chuch-uch-uch-uch", varying in pitch from soft to harsh and frequently uttered in flight, also concludes with dry or rattling "chuch-uch-uch-errrrrrr" (last note also given alone as a softer or more purring "serrrrr") or a rising "tooee" or "dsooeee"; alarm or anxiety call a sharp grating "eeeeze" or "zeeze", similar to that of *C. carduelis*.

Habitat. Open deciduous and coniferous woodlands, principally including birch (*Betula*) and larch (*Larix*), on heaths, hillsides, alder (*Alnus*) carrs and riverine woods, hedgerows, parks and gardens, also conifer plantations (where trees below 3 m in height); in parts of range occurs in birch and alders in coastal dunes. Lowlands and hills; in Alps mostly in subalpine conifer woods, alpine meadows and pastures above 1400 m.

Food and Feeding. Mainly plant and tree seeds, buds, also small invertebrates. Seeds include those of birch, spruce (*Picea*), pine (*Pinus*), alder, larch, juniper (*Juniperus*), beech (*Fagus*), ash (*Fraxinus*), poplar (*Populus*), willow (*Salix*), dogwood (*Cornus*), elder (*Sambucus*), guelder-rose (*Viburnum*), bramble (*Rubus*), currant (*Ribes*), buckthorn (*Rhamnus*), rowan (*Sorbus*), hawthorn (*Crataegus*), also willowherb (*Epilobium*), thistles (*Carduus*, *Cirsium*), nettles (*Urtica*), daisy

(*Bellis*), evening-primrose (*Oenothera*), viper's-bugloss (*Echium*), hops (*Humulus*), dock (*Rumex*), mistletoe (*Viscum*), mugwort (*Artemisia*), burnet (*Sanguisorba*), mayweed (*Matricaria*), lady's-mantle (*Alchemilla*), goosefoot (*Chenopodium*), orache (*Atriplex*), tansy (*Tanacetum*), yarrow (*Achillea*), groundsel (*Senecio*), chickweed (*Stellaria*), buttercup (*Ranunculus*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), hawk's-beard (*Crepis*), hawkweed (*Hieracium*), mouse-ear (*Cerastium*), rose (*Rosa*), charlock (*Sinapis*), radish (*Raphanus*), meadowsweet (*Filipendula*), cinquefoil (*Potentilla*), clover (*Trifolium*), St John's-wort (*Hypericum*), crowberry (*Empetrum*), cranberry (*Vaccinium*), rushes (*Juncus*), sedges (Cyperaceae) and grasses (Gramineae). Recorded also as collecting green algae from branches of ash. Invertebrates include bugs (Hemiptera), flies (Diptera), ants (Formicidae), mites (Acari), springtails (Collembola), dragonflies and damselflies (Odonata), moths (Lepidoptera) and their larvae (particularly those of *Coleophora laricella* during large-scale infestation of larches), stoneflies (Plecoptera), fleas (Siphonaptera), beetles (Coleoptera), spiders (Araneae) and snails (Mollusca). In S England winter diet consists of up to 90% birch seeds, but also resorts to alder (when birch crop poor or fails), and supplements diet with willowherb, meadowsweet, mugwort, tansy and goosefoot seeds; in studies in Oxford, 80% of seeds weighed less than 0·5 mg, 18% 0·5–1 mg, and 2% more than 1 mg (up to 5 mg). Forages mostly in trees, in low vegetation, on growing and seeding plants and on ground; usually on ground in autumn and winter, when tree seeds exhausted or fallen. Actively and acrobatically clings or hangs upside-down on cones, catkins, also outermost twigs; perches nimbly on vertical and bent twigs. Singly, in pairs and in small groups; following breeding season gathers in large flocks, exceptionally of over 100 individuals in favoured feeding areas, prior to moving to wintering grounds.

Breeding. Season, late Mar or early Apr–Jun; two broods, but often only in years with good food supply. Monogamous; exceptionally polygamous. Solitary or loosely colonial. Pair formation apparently takes place before break-up of winter flocks, and pair-bond endures for single season. Displaying male performs circular bounding song flight while giving territorial song; often several males in song flight together. Nest built by female, male assists in collecting material, usually a small platform of twigs, heather, plant stalks and down, leaf stems, roots, grasses, bark strips, moss flowerheads, leaves, animal hair and feathers, placed up to 5 m above ground in shrub or tree, preferentially juniper, spruce, larch, birch and pine, occasionally apple (*Malus*), elder or willow, frequently close to trunk, also in canopy and on more exposed branch; may reuse material from previous nest. Clutch 4–6 eggs, variably bluish-white to pale bluish-green, blotched violet-pink and rust-red with purple-brown spots and lines; incubation by female, period 10–12 days; chicks fed by both parents, nestling period 9–14 days, may leave nest before capable of flying; young fully independent at 26 days; second nest may be started during fledging period of first brood. Breeding success fairly high: of 57 eggs in N Italy (Lombardia) study, 68% hatched and 47% subsequently fledged young, average 2·5 young per successful nest; of 53 nests in S Germany in which eggs laid between mid-Apr and late May, 57% failed largely owing to high predation rate by crows (Corvidae), particularly Common Magpie (*Pica pica*), also Eurasian red squirrels (*Sciurus vulgaris*) and domestic cats (*Felis catus*), leading to 3·7 young per successful nest, and of 36 subsequent attempts 36% failed and only 2·7 young per successful nest. Age of first breeding 1 year.

Movements. Resident and migratory. Alpine breeders largely sedentary or make post-breeding descent short distances to lower altitudes. In W Europe, including British Is, disperses from breeding area in Aug to mid-Sept, moves longer distances late Sept and Oct to S & SE of breeding range, and in years of food shortages flies farther, occasionally reaching Spain, Mediterranean coast of France and N Italy (in irruption years movements continue into Nov); those breeding in N British Is move to continental mainland S to W Germany, but proportion migrating varies annually, depending on birch seed crop; evidence from ringing indicates that some return to winter in same area in successive years, but individuals wintering in Britain in one year may cross North Sea in subsequent winter. Return movements to breeding area from mid-Apr, and arrival back in N areas of range late Apr and May. Most migrants move in small to large flocks of up to 100. Vagrant in Iceland.

Status and Conservation. Not globally threatened. Common to locally common. Densities of more than 50 pairs/km² on heaths and upland birch forests in Britain, 100–400 pairs/km² in mixed larch forest in Switzerland, and up to 400 pairs/km² in spruce–birch forest in E Germany. In second half of 20th century, range expanded to include Belgium, Netherlands, Denmark and S Sweden, Czech Republic and N & C Germany. Throughout European range still increasing, but population breeding in British Is has declined since 1970s; latter decrease associated with similar decline in abundance and seed production of birch in SE England, and this species possibly also significantly affected by intensification of agriculture and loss of hedgerows; has declined also in interior Netherlands since early 1990s.

Bibliography. Arnaiz-Villena *et al.* (1998), Arnaiz-Villena, Álvarez-Tejado *et al.* (1998), Arnaiz-Villena, Lowy *et al.* (2007), Boddy (1984), Clement *et al.* (1993), Cramp & Perrins (1994), Ernst (1998b), Evans (1966, 1969), Evans *et al.* (1967), Gibbons *et al.* (1993), Glutz von Blotzheim & Bauer (1997), Hagemeijer & Blair (1997), Hald-Mortensen (1970b), Herremans (1989, 1990), Howell *et al.* (1968), Knox (1988), Knox *et al.* (2001), Lifjeld & Bjerke (1996), Marthinsen *et al.* (2008), Molau (1985), Newton (1967b, 1972), Nguembock *et al.* (2009), Riddington *et al.* (2000), Seutin *et al.* (1995), Snow & Perrins (1998), Svensson (1992), Vaurie (1959), Wernham *et al.* (2002), Williamson (1961), Wolters (1979).

78. Common Redpoll

Carduelis flammea

French: Sizerin flammé **German**: Taigabirkenzeisig **Spanish**: Pardillo Norteño
Other common names: Mealy Redpoll; Greenland Redpoll (*rostrata*); Iceland Redpoll ("*islandica*")

Taxonomy. *Fringilla flammea* Linnaeus, 1758, Norrland, Sweden.

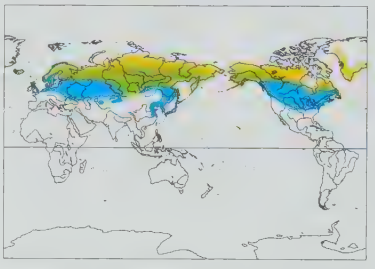
Previously placed in genus *Acanthis*. Was until recently considered conspecific with *C. cabaret*, and evidence from mitochondrial DNA suggests that the two, together with *C. hornemanni*, are probably best regarded as closely related sister-species or forming a superspecies; despite wide genetic variation within their ranges, however, recent studies have found little support for lineage division between arctic-breeding and boreal-breeding redpolls, and comprehensive review of gene flow still required in order to determine species limits; pending conclusions of any review, may need to be reclassified within *Acanthis*. Present species hybridizes with *C. hornemanni* in N Norway and has hybridized with *C. cabaret*. Nominate race intergrades with *rostrata* in E Canada (NE Labrador and S Baffin I); intermediates described as race *fuscescens*. Proposed race *holboellii* (described from C Germany) considered a longer-billed and slender-billed variant of nominate with slightly longer wing and tail and slightly deeper pink of adult male; may predominate along N edge of Asian breeding range from Yamal Peninsula E to NE Siberia and in winter in Russian Altai, but intergrades with nominate occur in W Europe. Affinities of Icelandic population, which includes dark and pale birds, unclear: dark birds, similar to *rostrata* in size and plumage (but with bill and wing slightly shorter and slightly paler rump), proposed as race *islandica*, but differences considered too slight to warrant separation; pale birds similar in plumage and bill size to *C. hornemanni* (but usually separable by buffish, not white, wingbars and edges of flight-feathers and heavier streaks on underparts) and in wing and tail measurements to race *rostrata* of present species may have originated in Iceland, but now apparently rare and widely replaced by invading *rostrata*, although intermediates occur; further study required. Two subspecies recognized.

Subspecies and Distribution.

C. f. flammea (Linnaeus, 1758) – breeds from Iceland and Scandinavia E across N & C Russia and Siberia to Kamchatka and Bering Sea, S to C Urals, Stanovoy Mts, Amurland and Sakhalin, also N North America from Alaska E to Newfoundland; winters S to NW & C Europe, C & E Asia S to Mongolia, NE China (S to Jiangsu), Korea, N Japan (S to N Honshu) and N & C USA (S to Oregon, Colorado and South Carolina).

C. f. rostrata (Coues, 1862) – breeds NE Canada (C & E Baffin I and N Labrador), W & SE Greenland and Iceland; winters E Canada (Manitoba, N Quebec, Labrador), NE USA, Iceland and NW British Is.

Introduced to New Zealand.



Descriptive notes. 12·5–14 cm; 10–17 g. Medium-sized, grey to grey-brownish, streaky finch with pale wingbars, short, conical bill and slightly forked tail. Male nominate race breeding has lower forehead and lores to chin black, upper forehead and forecrown bright crimson (occasionally orange or yellow), crown to nape pale grey or greyish-buff, finely streaked dark brown, narrow pale supercilium from over lores to rear of ear-coverts merging into pale grey on side of neck, thin blackish eyestripe from behind eye to rear of ear-coverts, pale grey-brown cheek and ear-coverts tinged buffish or pinkish on lower parts; upperparts slightly browner than nape, streaked blackish, feathers of mantle and scapulars fringed whitish and forming "tramlines" (in late summer, pale edges very worn and upperparts appear uniformly dark); rump greyish-white, tinged pink (pink variable in extent, usually palest on centre of rump), and streaked dusky brown or blackish, occasionally unstreaked pinkish to pinkish-red, uppertail-coverts grey-brown with darker centres; tail dark grey, finely edged buffish-white; upperwing dark brown, median coverts tipped off-white, greaters more broadly tipped whitish-buff (forming double wingbar, which may be entirely abraded in mid-summer), flight-feathers finely edged pale grey to greyish-buff (more broadly whitish on tertials), pale edges may be lost by mid-summer; whitish-buff to dull greyish-white below, throat to breast tinged pink, pink merging with that on face (or partly concealed by whitish tips); flanks and side of belly streaked brownish, belly and undertail-coverts whiter with broad tapering dark shaft streaks (streaks may be absent); iris dark brown; bill dark horn with dusky tip, dull yellow, or pale straw with brownish-horn culmen and tip; legs blackish-brown. Non-breeding male (fresh plumage, in autumn and early winter) is paler or "frosted" greyer on head and nape, side of neck pale grey, upperparts tinged buffish-brown, may be paler on centre of mantle and back, with prominent "tramlines" and streaked with brown, pink on rump concealed by grey or buff-brown tips; median upperwing-coverts dark grey, tipped buffish or off-white, greaters more broadly tipped whitish-buff, flight-feathers more broadly fringed pale grey, tertials edged buffish and tipped whitish, tail dark grey, fringed greyish-white; throat and breast off-white or greyish, streaked brownish, becoming pink with wear, flanks tinged buff-brown. Female is similar to male, but pink on face to breast and on rump greatly reduced or absent; back and rump more heavily streaked (less broad pale edges), underparts buff (fresh plumage) or greyish-white (worn), streaked brown or dark grey-brown, and dark chin patch more rounded in shape and usually less black. Juvenile is similar to breeding female, but lacks crimson on upper forehead and no pink in plumage, tail feathers sharply pointed (more rounded on adult), forehead to nape and upperparts (including rump) streaked dark brown with pale buff edges, lores grey or dark grey and face pale buffish-brown, lightly mottled greyish and streaked on ear-coverts, upperwing-coverts edged browner and tipped buff or buffish-white, edges of flight-feathers pale buff-brown, tertials tipped whitish, underparts pale greyish or buffish-white, more heavily streaked dark brown on breast, flanks and side of belly, bill pale yellow with darker tip; first-winter plumage (acquired late Aug and Sept) not always separable in field from adult female, but retains juvenile greater coverts, flight-feathers and tail feathers, has crimson (to orange or yellowish) patch on forehead variable in size, may show more pink on cheek, uppertail-coverts and breast than juvenile, occasionally as much as adult female. Race *rostrata* is larger than nominate, has larger bill (less angular and with curved culmen) and longer wing, upperparts browner, heavily streaked and edged tawny-brown, rump as on nominate or whiter, usually streaked buff-brown and blackish, lores, chin and throat more extensively black, and heavily streaked dark brown on side of breast, flanks and undertail-coverts, in summer more heavily streaked above, male has pink of breast less extensive than on nominate, rest of underparts whitish or whitish-buff, and broad white wingbars (especially on greater coverts). Voice. Very similar to that of *C. cabaret*. Song, often a longer and more varied series of rattling, chatter and musical calls; territorial advertising song a series of "chi-chi-chi, chi-chic-chi" or "teu-teu-teu-teu" followed by dry or buzzy trilling or rattling "trrrrrrrreeeee", a shorter "tirr" or "serrrrrr" usually given while in flight or from prominent perch; other songs, given with varying emphasis, usually include also a shorter "chi-chi-tirr" repeated and given together with softer chattering "che-che-che" notes or harsher "chid", "up" or "tip", and usually concludes with upslurred or querulous "tsooee" (second syllable prolonged and loudest). Calls include rapid series of "chi" notes and "tsooee" or "tsooeet", either individually or in combination, also a soft "pyuee", "pyulee, "wooid" and whistled "pweet"; contact call between partners in breeding season a soft "tseet"; alarm a short, explosive "chek" or "tek"; aggression call of male during territory disputes a loud and harsh "chak"; calls of race *rostrata* apparently flatter, but louder and more harsh than those of nominate.

Habitat. In N of range breeds in lowland treeless tundra and dry heath with dwarf birch (*Betula*) and stunted shrubby osiers (*Salix*), also open taiga of pine (*Pinus*) and spruce (*Picea*) and scrub; farther S in wooded slopes and swampy hollows and riverine thickets with birch, willow (*Salix*), juniper (*Juniperus*), alder (*Alnus*) and rowan (*Sorbus*), also mixed birch and pine; in Iceland breeds also in introduced conifer plantations and parks. From sea-level to c. 200 m in Greenland, to c. 1100 m in N & E Russia, to c. 1350 m in Alaska, and in Altai breeds in alpine meadows between 1850 m and 2100 m. In non-breeding season in similar habitat of coastal and lowland open birch woods, heaths and commons.

Food and Feeding. Mainly seeds, buds and small invertebrates. Seeds and buds include those of birch, spruce, alder, larch (*Larix*), juniper, ash (*Fraxinus*), poplar (*Populus*), willow, guelder-rose (*Viburnum*), bramble (*Rubus*), currant (*Ribes*), buckthorn (*Rhamnus*), rowan, hawthorn (*Crataegus*), also willowherb (*Epilobium*), thistles (*Carduus*, *Cirsium*), nettles (*Urtica*), daisy (*Bellis*), evening-primrose (*Oenothera*), viper's-bugloss (*Echium*), hops (*Humulus*), dock (*Rumex*), mistletoe (*Viscum*), mugwort (*Artemisia*), burnet (*Sanguisorba*), mayweed (*Matricaria*), lady's-mantle (*Alchemilla*), goosefoot (*Chenopodium*), orache (*Atriplex*), tansy (*Tanacetum*), yarrow (*Achillea*), groundsel (*Senecio*), chickweed (*Stellaria*), buttercup (*Ranunculus*), cottongrass (*Eriophorum*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), hawk's-beard (*Crepis*), hawkweed (*Hieracium*), buttercup (*Ranunculus*).

mouse-ear (*Cerastium*), rose (*Rosa*), charlock (*Sinapis*), meadowsweet (*Filipendula*), shepherd's-purse (*Capsella*), cinquefoil (*Potentilla*), clover (*Trifolium*), St John's-wort (*Hypericum*), crowberry (*Empetrum*), cranberry (*Vaccinium*), rushes (*Juncus*), sedges (*Carex*) and grasses (Gramineae). Insects include bugs (Hemiptera), leafhoppers (Homoptera), flies (Diptera), ants (Formicidae), mites (Acari), springtails (Collembola), dragonflies and damselflies (Odonata), moths (Lepidotera) and their larvae (including those of *Coleophora laricella* during infestation of larches), stoneflies (Plecoptera), fleas (Siphonaptera), beetles (Coleoptera), spiders (Araneae) and snails (Mollusca). Stomach contents of wintering individuals in Finland contained 90% seeds (mostly spruce), remainder insects and spiders; in N Sweden, changes to insects if birch crop poor or fails. Wintering birds in Alaska, where temperatures drop to −22°C, need to forage for up to 8·5 hours per day to sustain necessary energy levels; in captivity, gross daily intake at lowest tolerable temperature 134 kJ and minimum weight 7·3 g; unhusked birch seeds contain c. 23 kJ/g, a higher energy content than most other tree seeds, enabling survival on this diet at temperatures down to −54°C. Forages in trees, in low vegetation, on growing and seeding plants and on ground; in N tundra in low vegetation and on ground throughout year, elsewhere usually feeds on ground in autumn and winter, when tree seeds exhausted or fallen; in Alaska forages in holes in or under snow. Actively and acrobatically clings to and hangs upside-down on cones, catkins, also outermost twigs; perches nimbly on vertical and bent twigs. Singly, in pairs and in small groups; in non-breeding season largely in flocks of up to several hundred individuals, exceptionally larger flocks in severe weather and at preferred foraging areas. In N Russia associates with *A. hornemanni* throughout year.

Breeding. Season late Apr to Aug; single brood in N of range, elsewhere two broods (possibly only in years with good food supply). Monogamous; exceptionally polygamous. Solitary or loosely colonial. Pair formation apparently takes place before break-up of winter flocks, and pair-bond endures for single season. Displaying male performs circular bounding song flight while giving territorial song. Nest built entirely by female, male may assist in collecting material, a cup of grasses, small twigs, plant fibres and roots, bark strips, moss, animal hair and feathers, placed up to 5 m above ground in shrub or tree, preferentially juniper, spruce, larch, birch or pine, occasionally elder or willow, frequently on branches close to trunk, also in canopy and on more exposed branch in Scandinavia and N Russia often in vicinity of breeding Fieldfares (*Turdus pilaris*); in N tundra in low bush, hummock or rocky ledge or opportunistically in pile of driftwood; may reuse material from previous nest. Clutch 4–6 eggs (mean in Swedish Lapland study 5·3), variably bluish-white to pale bluish-green, blotched violet-pink with purple-brown spots and lines; incubation by female, fed on nest by male, period 11–12 days; chicks fed mostly by female, occasionally by both parents, or male collects food and passes to female, nestling period 9–14 days, chicks may leave nest before capable of flying; fully independent at 26 days; second nest may be started during nestling period of first brood. Breeding success: in study of 33 eggs in Manitoba (S Canada), 24 (72%) hatched and 13 young fledged; in study in N Iceland, mean breeding success over three years 88%; in C Finland study in dense stand of spruce, 80% of all eggs laid fledged young; in Swedish Lapland average of four young per nest, mean of 1·4 eggs addled, and in Finland study in peak year 23% of eggs in 70 nests were addled; in years with high redpoll population many eggs unfertilized and fail to hatch or taken by predators, mainly crows (Corvidae), including Common Magpie (*Pica pica*), Siberian Jay (*Perisoreus infaustus*) and Grey Jay (*Perisoreus canadensis*), Eastern grey squirrel (*Sciurus carolinensis*) and American red squirrel (*Tamiasciurus hudsonicus*). Age of first breeding 1 year.

Movements. Resident, migratory and irruptive. Small numbers resident in N Europe, but majority migrate to non-breeding grounds in Fennoscandia and European Russia, passage mostly Oct to mid-Nov, but as early as mid-Sept in irruption years, when they occur in large numbers farther S in C Europe, exceptionally reaching N Italy and Slovenia; small numbers from N Norway and Sweden move SW to winter mainly along E coast of British Is, exceptionally (during irruptive movements) occurring in larger numbers; in C Siberia passage from late Aug to early Nov, most in mid-Sept; regularly winters N Kazakhstan E to N Mongolia from end Sept to late Oct or Nov, but in irruption years moves farther S, occasionally to Pamir-Alai Mts of Tajikistan and to C & S Gobi; in Russian Far East sometimes common throughout winter and rare in other years, when large passage through Ussuriland; uncommon or erratic on passage Korea and NE China mid-Oct and Nov, less frequent in spring; numbers wintering N Japan (mainly Hokkaido and N Honshu) variable annually, depending on severity of winter and availability of food supply farther N. In North America moves S in Sept–Oct to winter S of breeding range in N USA, regularly S to Oregon and E to South Carolina, but in irruption years reaches N California, Alabama, Arkansas and Georgia. Scale of movement varies annually, depending on birch seed crop; in years of poor seed crop huge numbers irrupt into wintering areas; birds from N Scandinavia move up to 1500 m (exceptionally over 3000 km) between SE and ESE to wintering area in WC Russia, rarely reaching Caucasus. Little evidence of site-fidelity to wintering area, evidence from ringing studies showing short-distance movements to winter in Sweden and Finland in some years, followed by longer movements to C Russia in following year, probably related to food supply; in North America ringed individuals found to winter at localities up to 2000 km apart in successive years. Return to breeding areas in spring begins Feb to mid-Mar, when small-scale movements induced as food supply becomes depleted; most passage in Apr or slightly later in C Siberia; passage through Ussuriland in Mar and arrival Kamchatka between early Apr and end May, N breeders not back on territory until middle to late May or even early Jun. In some years, Scandinavian birds rear first broods in S Finland by early Jun, mainly in areas where spruce abundant, after which adults disperse N to traditional breeding areas in second half of Jun. Vagrant to Cyprus, Turkey and Iraq. Race *rostrata* moves S & SE from end Aug to early Oct to E Canada, mostly between Manitoba and Labrador, less frequently to Ontario E to Newfoundland and S into NE USA (Massachusetts, rare farther S to Ohio and Pennsylvania, and vagrant in Colorado and California), also to Iceland (where breeding population largely sedentary); also in variable numbers to NW & W British Is, either as part of irruption in search of feeding areas or as a result of regular displacement assisted by strong NW winds; return movements prolonged from mid-Apr to early Jun; *rostrata* a vagrant in Azores.

Status and Conservation. Not globally threatened. Common to locally common; in non-breeding areas can be only local or erratically common. Estimated European population 1,200,000–2,400,000 pairs; breeding population in Russia put at between 10,000,000 and 100,000,000 pairs. No information on size of North American population. Average density in N Sweden over 19-year period 26·2 territories/km²; in C Norway, up to 37 pairs/km² in peak years and 6·3 pairs/km² in non-peak years; in peak year in N Finland, 38 pairs in 37 ha (equivalent to 103 pairs/km²); some densities very high, e.g. 17 pairs in 2·5-ha study plot (680 pairs/km²) in N Iceland. Race *rostrata* has extended range N in Greenland in 20th century. In NW Scotland small numbers of nominate race or *flammea–rostrata* intergrades present during summer months in Outer Hebrides, but breeding not yet proven. Common in New Zealand, where introduced.

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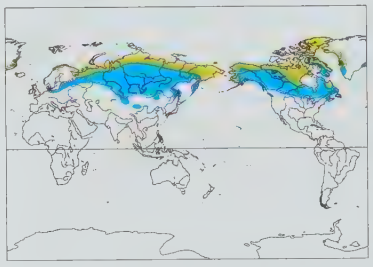
79. Arctic Redpoll

Carduelis hornemanni

French: Sizerin blanchâtre **German**: Polarbirkenzeisig **Spanish**: Pardillo Ártico
Other common names: Tundra Redpoll, Hoary Redpoll; Hornemann's Redpoll (*hornemanni*)

Taxonomy. *Linota hornemanni* Holboell, 1843, Ameralikfjord, Greenland.
Previously placed in genus *Acanthis*. Relationships with closely related *C. flammea* complex, and in the past was considered either a colour morph or a race of that species, but differs in measurements, structure and plumage, and breeding ranges overlap widely with little or only occasional interbreeding; evidence from mitochondrial DNA suggests that the two, together with *C. cabaret*, are probably best regarded as closely related sister-species or forming a superspecies; despite wide genetic variation within their ranges, however, recent studies have found little support for lineage division between arctic-breeding and boreal-breeding redpolls, and comprehensive review of gene flow still required in order to determine species limits; pending conclusions of any review, may need to be reclassified within *Acanthis*. Present species hybridizes with *C. flammea* in N Norway. Two subspecies recognized.

Subspecies and Distribution.
C. h. exilipes (Coues, 1862) – breeds in extreme N Eurasia from N Norway, N Sweden and N Russia E to Bering Sea and Anadyrland, and in N North America from W & N Alaska E in Canada to N Yukon, N Nunavut and N Manitoba; winters N Europe and S in Asia to N China (NW Xinjiang, Gansu and E Inner Mongolia) and Sakhalin I, and throughout Alaska and Canada and S Greenland. *C. h. hornemanni* (Holboell, 1843) – breeds N Canada (Ellesmere I, Axel Heiberg I, Devon I, Bylot I, and N & E Baffin I) and W & E Greenland; winters S to C & NE Canada (to N Quebec and Labrador) and NE USA (New England).



Descriptive notes. 11·5–14 cm; 10–16 g (*exilipes*), 17–20 g (nominate). Medium-sized, grey to whitish, streaky finch with broad pale wingbars, short, conical bill and slightly forked tail. Male nominate race breeding has lower forehead dirty white, upper forehead and forecrown deep blood-red (may also be tinged orange or yellow), white or whitish-grey supercilium merging over ear-coverts with white to pale grey side of neck, lores and chin black, black spot behind eye, whitish cheek and ear-coverts finely streaked greyer; crown to nape and upperparts pale grey or whitish-grey, streaked finely blackish, broadly and more continuously so on upperparts; lower back and rump white or tinged pinkish, uppertail-coverts whitish with dark brown or grey centres; tail blackish or dark brown, finely edged white or pale grey; upperwing blackish, median coverts tipped white or buffish-white and greaters broadly tipped white (forming double wingbar, which may be reduced through abrasion in mid-summer); flight-feathers finely edged whitish or pale grey, broadly so on tertials; mostly white below, centre of breast tinged pink, narrow greyish streaks on flanks, undertail-coverts white, longest coverts with thin dark grey central shaft streak; iris black; bill bright orange or deep yellow, dark culmen and tip; legs black or blackish-brown. Non-breeding male (fresh plumage, in autumn and early winter) has plumage appearing loose and often fluffed out; forecrown pinkish-red, upperparts streaked broadly dark brown with whitish feather edges, darkest on scapulars, rump whiter, dark tips on upper rump in late winter or early spring becoming tinged pinkish with wear; broad white tips of median and greater upperwing-coverts and white edges of flight-feathers and outer tail feathers; breast whiter and uniform with rest of underparts, becoming more prominently pink as wear progresses, undertail-coverts white with or without dark central shaft streak. Female is similar to male, but lacks pink on breast and rump; may have slightly greyer face than male and usually shows smaller area of red on forecrown, also side of mantle and scapulars more buffish-brown; underparts white or greyish-white, streaked grey-brown on side of breast and flanks, and may show one or more shaft streaks on undertail-coverts. Juvenile is similar to female, but forehead to nape and upperparts pale grey or tinged buffish and broadly streaked dark except on rump, and outer edges of flight-feathers and pointed (not rounded) tail feathers whitish or creamy; first-winter plumage (acquired from early Aug) not always separable in field from adult female, has lores, chin and upper throat blackish-grey, face pale buff-brown (may be finely streaked darker), narrow pale band across forehead, blackish crown finely tipped crimson, upperparts as on juvenile except for whitish lower back to uppertail-coverts, the last sometimes streaked darker, wings and tail as on juvenile (unmoulted), wing-coverts tipped whitish, edges of flight-feathers pale buffish-grey or whitish, more broadly whiter on tertials, underparts whitish or with pale buff-brown wash on side of breast or upper flanks and one or two broad dark streaks on flanks and side of belly, undertail-coverts white, sometimes one or two fine dark shaft streaks, bill dull yellow with darker tip. Race *exilipes* is smaller, shorter-billed and duller than nominate, also less extensively white, has head pale buff to buffish-brown, nape to back greyish-white, feathers edged pale buff, rump white but upper edge often streaked or spotted greyish (usually in worn plumage), male in fresh plumage tinged pink on central and lower rump, median coverts tipped pale buff and greater coverts tipped broadly white or buffish-white, underparts white (tinged pink in fresh plumage), flanks may be finely streaked (extending rarely to lower flanks), undertail-coverts usually unstreaked or with single dark central streak on longest covert. Voice. Song mainly of call notes repeated in varying upwardly inflected combinations and ending with long trill, "che, che, che, tschrrrr", or may give extended version of rattled trill in flight display, "tr-r-r-r-r-r-r-r-er", or similar "lil-lil-lil-lil-tw-r-r-r-r-r-ee" while perched or in flight; similar to song of *C. flammea*. Calls also very like those of *C. flammea* or more variable, some more metallic or higher-pitched: an abrupt "che" or "che-che-che" repeated several times in quick succession; a thin or drawn-out and rising "tsooee" often given by members of flock; alarm a sharp "pii".

Habitat. Breeds in high-arctic tundra, including heaths, ravines and rocky mountain slopes with stunted bushes and trees; along S edges of breeding range occurs in dwarf birch (*Betula*), willow (*Salix*) thickets, spruce (*Picea*) and low-spreading shrubs, mainly willows and alders (*Alnus*), down to sea-level. In non-breeding season found in edges and clearings in open woodland, field edges and weedy patches, occasionally around human settlements and villages, mostly along timber-line in N Siberia; in Greenland nominate race winters in valleys and hill slopes of drier interior, and only at coast when snow thaws; occurs from sea-level to 450 m in N Canada and Greenland and to c. 1300 m in Kamchatka.

Food and Feeding. Mostly small seeds, buds, shoots and catkins, principally of shrubs and trees, mainly birch, alder, willow and conifers, also of various other plants including knotweed (*Polygonum*), stink grass (*Eragrostis*), pigweed (*Amaranthus*), goosefoot (*Chenopodium*), crowberry (*Empetrum*), wood-rush (*Luzula*), and grasses including cereals and sedges (*Carex*). Some invertebrates. In Alaska study, diet consisted of seeds, mostly birch and alder, between late Aug and late Mar and insects provided up to 25% of diet during Jun to mid-Aug. Nestlings fed mostly with soft-bodied arthropods and larvae, including bugs (Hemiptera), flies (Diptera), moths (Lepidoptera), beetles (Coleoptera) and spiders (Araneae); in N of range nestlings apparently fed almost solely on seeds of cottongrass (*Eriophorum*). Forages mostly on ground in winter, also in tall plants, low shrubs and trees; often on outer edges of trees, where hangs upside-down to reach catkins and buds. Stores food in extended sections of oesophagus, providing reserves for consumption during long winter nights or severe weather; in N Canada feeds for up 22 hours daily during mid-summer. In pairs and small groups; in non-breeding season in larger flocks of up to 100 individuals, often in company with *C. flammea* where ranges overlap.

Breeding. Season May–Jul; one brood, possibly two in parts of N Canada and Siberia. Monogamous. Solitary and loosely colonial; territorial around nest-site. Pair formation little known, but apparently before arrival in breeding area. Displaying male, giving rapid twittering call, approaches female in flight, hovers in narrow arc over her on ground before mating; courtship feeding part of display, continues through to brooding of young. Nest built by female, mostly from coarse grasses, cottongrass, willow down, plant fibres and rootlets, animal hair or fur and feathers, usually on platform of twigs, placed on ground in rocky crevice or 0·5–2 m up in shrub or low tree, usually willow, poplar or birch, often near or over water; old nests reused in subsequent years. Clutch 4–5 eggs, pale green to pale blue with fine reddish-brown or black speckles and spots; incubation by female, fed on nest by male, period 11–13 days; nestling period 12–15 days. Breeding success little known; many nests in N Siberia adversely affected by rise in water levels. Breeds in first year. Maximum recorded longevity 4 years 7 months.

Movements. Resident and partial migrant, occasionally irruptive; movements, especially of race *exilipes*, often in company with *C. flammea*. Part of nominate population remains all year in C & S areas of breeding range, numbers varying annually and determined by availability of food and severity of weather; remainder of population migrates short distances to areas immediately S of breeding range, from NC & NE Siberia E to Kamchatka and, in North America, from N Nunavut and N Quebec (mouth of Hudson Bay) E to N Labrador. Post-breeding family groups wander within breeding range before moving S mid-Aug to early Oct, in some years majority of *exilipes* present in breeding range to Dec. In N Europe *exilipes* breeding into arctic tundra winters S to S Baltic, moving S in Sept–Dec, with peak in Oct; farther E in Russia, departs from Taymyr region and Yamal Peninsula by mid-Sept, last birds on Chukotskiy Peninsula to mid-Oct; winters S in Siberia to Tomsk and Zaysan Depression, and irregular or uncommon in Mongolia and NE China from mid-Oct to early Apr. In North America *exilipes* arrives C & S Canada and extreme N USA from late Oct and into Nov, with local movements throughout to early Mar. Nominate race may return to breeding areas in late winter or early spring, passage to more N areas along coast of Greenland mid-Apr to mid-May or early Jun; present on N Ellesmere I from late Apr or sometimes not before mid-May, and back on Baffin I by end May. Most *exilipes* depart N USA and S Canada from mid-Mar or early Apr if delayed by severe weather, present British Columbia to mid-Apr; arrives in waves in Alaska, mostly during first half Apr, with some later movements into early May, direction of movement (of *exilipes*) mostly N–S, but recovery on Alaskan coast of individual ringed SE Canada in winter suggests that some move NW–SE. In Russian Far East, arrives Kamchatka mid-Apr, with peak arrival in last ten days of month; reaches Chukotskiy Peninsula late May to early Jun and N coast slightly later. Nominate race uncommon or irregular in winter S in Canada to SW Nunavut, Manitoba, S Ontario and S Quebec and in USA to Michigan and Massachusetts; in Europe Scandinavian breeding *exilipes* irregular or rare on E coast of Britain from mid-Oct or Nov to middle or late winter, rare on Sakhalin I, N Japan, Spitsbergen, and vagrant in Azores and Europe S to France and E to Hungary, Belarus and Ukraine; *hornemanni* rare Faeroes, Jan Mayen I, Norway, Britain, Ireland and Netherlands.

Status and Conservation. Not globally threatened. Common or locally common. Breeding numbers at many localities variable from one year to another, from absent to abundant. Estimated population in Europe 7000–22,000 pairs and in Russia 100,000–1,000,000 pairs. No figures available for North American population. In Siberia, densities of 56 individuals/km² in shrub tundra and 103/km² in open larch woodlands in E Taymyr Peninsula. Breeding population of race *exilipes* in N Scandinavia and NW Russia relatively stable owing to constant supply of main food, i.e. willow seeds and buds.

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80. Twite

Carduelis flavirostris

French: Linotte à bec jaune **German**: Berghänfling **Spanish**: Pardillo Piquigualdo
Other common names: Tibetan Twite (*rufostrigata* and *miniakensis*)

Taxonomy. *Fringilla flavirostris* Linnaeus, 1758, Sweden.

Previously placed in genus *Acanthis*. Has hybridized with *C. cannabina*. High degree of variation within race *montanella*, some populations of which have in the past been separated as *pamirensis* (from Alai and Transalai), *baltistanicus* (from Sanpur, near Skardu, Baltistan, in N Pakistan) and *pallescens* (from Chumbuz Darya, W of Kashkar, in NW China); similarly, range of variation within *korejevi* may encompass populations presently separated as races *kirghizorum* and *altaica*; further research required. Otherwise, geographical variation often weak and in some cases possibly not applicable to birds outside breeding season; also, individuals in worn plumage may not be easily assigned to race. Birds from Outer Hebrides, in W Scotland, have been separated as race *bensonorum* on basis of dull brown upperparts streaked blackish, but considered to fall within range of variation of *pipilans*, with which synonymized. Nine subspecies currently recognized.

Subspecies and Distribution.

C. f. pipilans (Latham, 1787) – breeds N Ireland and N Britain; migrates to coastal SE England, and NE France E to Netherlands.

C. f. flavirostris (Linnaeus, 1758) – breeds Norway, N Sweden and N Finland E to Kola Peninsula (NW Russia); migrates to coasts of Baltic and North Sea and to C & E Europe.

C. f. brevirostris (Bonaparte, 1855) – Caucasus and adjacent S Russia S to SC & E Turkey and NW & N Iran.

C. f. kirghizorum (Sushkin, 1925) – breeds N & C Kazakhstan; migrates to S Kazakhstan and N Uzbekistan.

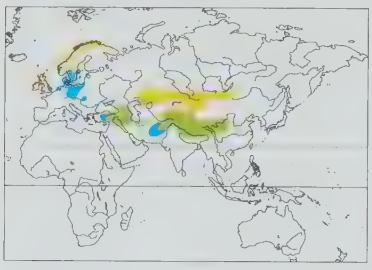
C. f. korejevi (Zarudny & Härms, 1914) – breeds NE Kazakhstan (S Altai, Tarbagatay) and NW China (N Xinjiang); migrates to SE Kazakhstan and Tajikistan S to C Afghanistan.

C. f. altaica (Sushkin, 1925) – breeds S Russia (C & E Altai and W Sayan Mts, and Tuva Republic) and W & N Mongolia.

C. f. montanella (Hume, 1873) – E Kyrgyzstan, Pamir-Alai Mts, Tajikistan, S Uzbekistan, WC China (W & SW Xinjiang S to Karakorum, Kunlun Shan and Altun Shan, E to N Qinghai), Afghanistan and N Pakistan (Chitral, Gilgit and Baltistan).

C. f. rufostrigata (Walton, 1905) – Ladakh, W & S Tibetan Plateau (W & S Xizang), and N India E to N Nepal.

C. f. miniakensis (Jacobi, 1923) – E Tibetan Plateau (S Qinghai and E Xizang) E to C China (E to Gansu and W Sichuan).



Descriptive notes. 12–14 cm; 11·5–21 g. Medium-sized, brownish, streaky finch with pale wingbars, short, stubby bill and slightly forked tail. Male nominate race breeding has forehead to crown brown, finely streaked darker, nape to side of neck lighter brown, streaked darker, pale buff-brown supercilium from upper lores to rear of ear-coverts merging with warm buff-brown on side of neck, lores dark brown, thin dark eyestripe behind eye, cheek and ear-coverts buffish-brown, finely streaked darker along rear and lower edge; upperparts like nape, but more broadly streaked with paler or warm buff edges, rump pink or bright pink, uppertail-coverts dark brown, fringed buffish or buff-brown; tail blackish-brown, outer feathers finely edged pale buff or whitish; upperwing dark brown, lesser and median coverts finely tipped buffish-brown, greaters more broadly tipped pale or warm buff-brown; primaries edged white (forming broad panel on closed wing), secondaries edged pale buff, tertials more broadly edged brown or pale buff-brown; chin and throat to breast and flanks warm buff-brown, centre and side of breast to flanks streaked brown or blackish-brown (variable individually), belly to undertail-coverts white or washed buff (may be lightly streaked on side of undertail-coverts); iris dark brown or black; bill blackish above, dull yellow base of lower mandible; legs black or blackish-brown. Non-breeding male (fresh plumage, in autumn and early winter) is warmer brown on head and upperparts, side of neck buffish, pink of rump heavily concealed by buff-brown tips, tips of greater coverts more extensively pale buff-brown and white edges of primaries (except outer two) more prominent; throat and side of breast darker or more diffusely brown; bill orange-yellow, brown base of lower mandible. Female is very like male, but has pale buff rump with dark centres or tips (in fresh plumage) more uniform with mantle and back; white on primaries less extensive or less prominent. Juvenile is similar to female, but lighter or warmer brown above, with crown and nape feathers edged greyish, has warm buff or gingery-brown tips of greater coverts, fringes of tertials and edges of secondaries, face paler, underparts heavily streaked on breast and flanks, legs dark brown. Races differ mainly in size and in colour saturation, but identification of individuals in worn plumage and of races outside breeding areas not always possible: *pipilans* is like nominate, but from nape and side of neck slightly warmer brown, edges of crown and mantle also warmer buff (streaked darker or browner in worn plumage, when lacks buff edges and tips), wing-coverts and tertials blackish-brown, tips of greater coverts cinnamon-buff (in fresh plumage), face and throat to breast warm cinnamon-buff or tinged orange, side of breast to lower flanks more prominently streaked; *brevirostris* has face to throat and underparts paler buff, mantle and back tawny-brown (greyish-buff when worn), broadly edged pale, rump deeper pink than nominate (pink obscured by brown tips in winter), dark-centred uppertail-coverts broadly fringed white, tail broadly fringed buffish or whitish, edges of grey-brown wing-coverts and secondaries brown or pale buff-brown, tips of greater coverts and tertials broadly whitish, bases of secondaries and edges of outer primaries white, chin and throat white or whitish-buff, sides of lower throat and breast creamy buff, heavily streaked blackish and with buffish feather edges, lower flanks streaked paler brown, rest of underparts white or buffish-white; *korejevi* has paler upperparts than previous race, scapulars cinnamon-tinged sandy-buff and streaked brownish, rump variably pale pinkish-white to pink, wings grey-brown, tips of greater coverts and flight-feathers broadly pale buff or whitish, tail broadly edged white or buffish-white, underparts heavily streaked, patch on side of breast narrower and paler; *kirghizorum* is similar to last, but nape and hindneck paler grey, flight-feathers broadly edged white on inner webs, streaks on upperparts and breast narrower and extending below only to upper flanks; *altaica* is very similar to preceding race, but upperparts browner, tinged cinnamon, broadly streaked dark brown or blackish, male has whitish or pink rump streaked dark brown, both sexes have dark brown streaks on flanks and broad white edges of tail; *montanella* is palest race, upperparts very pale buff or sandy buff, narrowly streaked pale grey-brown, rump variably whitish-pink to pale buff or reddish-pink (tinged brown on female), chin and throat like upperparts or slightly paler buff, becoming creamy or whitish on underparts, narrowly streaked grey-brown on breast (streaks sometimes absent in winter); *miniakensis* has upperparts rufous-brown, diffusely streaked darker, male rump variable from white to pale pink (variably streaked dark brown), female rump white to pale pinkish-buff, both sexes have broad pale edges on primaries; *rufostrigata* has slightly larger bill, mantle rich warm brown, boldly streaked darker, rump bright or deep pink, blackish wings with broad pale buff or whitish tips on median and greater coverts (forming wingbars) and white fringes on outer tail feathers, lower belly and undertail-coverts warm brown, tinged cinnamon. Voice. Calls include a jumbled twitter of metallic and buzzing notes, very similar to those of *C. cannabina* but less musical or varied, "twip" or "tup-tup-up" interspersed with distinctive, sharp, nasal and rising "zweeee", "chweee" or "chwaiie", which may also be given on its own; calls from ground, but most frequently in flocks in flight; call notes in E of range have more pronounced nasal or metallic quality; race *rufostrigata* also has characteristic "ditoo", "didoo" or "didoowit" to-

gether with twanging "twayeee". Song an extension of the calls, "teet-sweet teedle-eu twee-teedle-ee teedl-eu", variable in length, occasionally protracted, and includes some chattering notes "twee-soo-zzrrrrrr" notes alternating with short trills.

Habitat. Breeds on lower montane and submontane plateaux, open moorland, barren hillsides, scree slopes, boulder-strewn areas with little or sparse vegetation, steppes, alpine meadows and areas with stunted bushes, including Tibetan furze (*Caragana*), dwarf rhododendron (*Rhododendron*) thickets and sea-buckthorn (*Hippophae*) scrub and dwarf birch (*Betula*), and often near boggy areas; race *pipilans* breeds mostly on grassy hillsides and moorlands with heather (*Erica*) and bracken (*Pteridium*) at up to 750 m and also in coastal heather in Scotland (including Shetland); breeds at 1000–3000 m in C & E Turkey, to c. 2000 m in Kazakhstan, and at 3500–4900 m in Himalayas and WC China. In non-breeding season in similar open habitat at lower altitudes, including pastures, hillsides, river valleys, open and rocky steppes, and coastal and estuarine saltmarshes; in parts of Europe, especially Germany, regularly wintered in suburban areas and cities (including Berlin) and roosted in large numbers on buildings from c. 1950 to c. 1980 (later in Hamburg); in Himalayas and WC China winters to c. 3000 m, occasionally down to 1500 m in N Pakistan.

Food and Feeding. Mostly seeds and buds, also small numbers of insects. Seeds and buds include those of juniper (*Juniperus*), birch, alder (*Alnus*), oak (*Quercus*), hemp (*Cannabis*), nettles (*Urtica*), sorrels and docks (*Rumex*), knotgrass (*Polygonum*), goosefoot (*Chenopodium*), sea-purslane (*Halimione*), orache (*Atriplex*), glasswort (*Salicornia*), sea-blite (*Suaeda*), saltwort (*Salsola*), amaranth (*Amaranthus*), chickweed (*Stellaria*), mouse-ear (*Cerastium*), corn spurrey (*Spergula*), sea-spurrey (*Spergularia*), buttercup (*Ranunculus*), poppy (*Papaver*), celandine (*Chelidonium*), cabbage (*Brassica*), rocket (*Sisymbrium*), sea rocket (*Cakile*), charlock (*Sinapis*), radish (*Raphanus*), pepperwort (*Lepidium*), penny-cress (*Thlaspi*), shepherd's-purse (*Capsella*), winter-cress (*Barbarea*), cinquefoil (*Potentilla*), bramble (*Rubus*), broom (*Cytisus*), clover (*Trifolium*), flax (*Linum*), St John's-wort (*Hypericum*), loosestrife (*Lythrum*), willowherb (*Epilobium*), evening-primrose (*Oenothera*), wild carrot (*Daucus*), heather (*Calluna*), crowberry (*Empetrum*), self-heal (*Prunella*), woundwort (*Stachys*), snapdragon (*Antirrhinum*), sea-lavender (*Limonium*), thrift (*Armeria*), vervain (*Verbena*), plantain (*Plantago*), goldenrod (*Solidago*), daisy (*Bellis*), sea aster (*Aster*), yarrow (*Achillea*), tansy (*Tanacetum*), colt's-foot (*Tussilago*), groundsel (*Senecio*), burdock (*Arctium*), thistles (*Cirsium*, *Carduus*), knapweed (*Centaurea*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), cat's-ear (*Hypochoeris*), hawkweed (*Hieracium*), duckweed (*Lemna*), rushes (*Juncus*), sedges (*Carex*), grasses (Gramineae), reed (*Phragmites*), and seaweeds (Phaeophyta). Insects and larvae taken include flies (Diptera) and beetles (Coleoptera). Nestling diet mostly softened regurgitated seeds. Forages on the ground, and in low vegetation, bushes and trees. Takes seeds from ground, mud and edge of water; on ground, hops or shuffles. Perches on seedheads of tall plants to take seeds, also perches on stems and may hold stem or seedhead under foot; forages in birch branches in agile manner, reminiscent of behaviour of *C. flammea*, *C. cabaret* or *C. spinus*. In pairs or small groups; following breeding season gathers in larger numbers, often of several hundreds, exceptionally up to c. 3000, and in wintering areas often associates with other finches, mainly *C. cannabina*, and, in coastal *Salicornia*, also with foraging flocks of Horned Larks (*Eremophila alpestris*) and Snow Buntings (*Plectrophenax nivalis*).

Breeding. Season Apr–Aug; usually two broods. Monogamous. Solitary or semi-colonial; up to 15 pairs nesting together in Kazakhstan, smaller numbers more usual in European range. Territorial; territory used for nesting and some feeding, boundary limits not usually advertised or defended and poorly defined. Pair formation takes place during break-up of winter flocks; pair-bond strong and usually endures for more than one season. Male, wings beating rapidly, displays in low flight, moving in short circles or zigzags, above perched female, also hops on ground in front of her while singing, drooping wings and opening primaries and fanning tail, revealing wing patches and pink rump, sometimes tilts body to one side; partners face each other and open and close bills, and male also gently pecks at female's neck; female may give food-begging call and courtship feeding of female by male may follow. Nest built by female, accompanied by male, a compact, deep cup of plant fibres and roots, mostly of heather, bracken, grass, moss, animal hair and feathers, placed on ground or very low down within 3 m of ground in dwarf willow (*Salix*), heather, bilberry (*Vaccinium*), bracken, rushes or grass tussocks, occasionally beneath rock or in crevice in dry-stone wall, sometimes on cliff ledge, exceptionally to 3 m from ground in hedge; in N England often nests in close proximity to *C. cannabina*. Clutch 3–6 eggs, pale to dark blue, variably marked with reddish or purple-brown spots, scrawls or blotches; incubation by female alone, period 12–13 days; chicks fed and cared for by both parents, nestling period 12–13 days; young fed by adults for up to a further 14 days after leaving nest. Few studies of breeding success outside British Is: average brood size at fledging 4·6 young in Scotland and 4·9 young in N England, those nesting in areas close to *C. cannabina* more successful owing to lower altitude and slightly drier weather, concealment of nest and fledglings by taller vegetation, and lower rate of predation. Age of first breeding not confirmed, probably 1 year.

Movements. Resident and migratory. N European breeders move S & SW to wintering grounds mainly in coastal lowlands and estuaries principally around S Baltic and North Sea and E from S England and N France to Poland, sporadically throughout SE Europe. Departs from breeding areas from late Aug, most not until late Sept and Nov; most passage through North Sea areas mid-Oct to early Nov, and returns to breeding areas late Jan–Apr (though most present in breeding areas only from Mar); N passage through Poland and NW Germany mid-Mar to early Apr. Nominate race winters in S Norway and S Sweden (and irregularly along S & W coasts of Finland) S to N France (where overlaps with *pipilans*), Denmark, Germany and Poland and less frequently farther S in C & E Europe; small numbers, possibly of breeding birds from N Kola Peninsula, regular on passage St Petersburg area, where also occasionally winters. Main passage farther S along river valleys in C Poland, Czech Republic and Slovakia (where some remain throughout winter) and occasionally reaching NE Austria; in N former Yugoslavia erratic in winter occurrence, numerous in some years and absent in others; may also winter along R Danube in E Hungary and along Black Sea coast of Romania, and small numbers frequent in mountains of W Bulgaria, also one ringed Norway subsequently recovered wintering in W Ukraine; may also cross North Sea to winter along E coast of Britain, with regular arrivals in autumn and numbers increasing mid-winter. In British Is, small numbers of *pipilans* remain at lower altitudes within breeding range, principally on coasts and islands around Scotland and N Ireland, others move short distances to coasts and estuaries (severity of winter and abundance of food around breeding areas may influence departure and distances travelled); breeding birds from Pennines, in NC England, fly short distances SE to coast of SE England or across North Sea to coasts of Netherlands, Belgium and N France between late Sept and mid-Apr; one ringed individual recovered 1300 km to SE, in NE Italy; a few, possibly also from Pennine breeding areas, winter in coastal NW England; wintering area of breeding birds in Ireland and Wales unknown. C Asian races make post-breeding descent to lower levels: *brevirostris* occurs in foothills of Caucasus (though many still present at high altitudes during severe weather), plains of Azerbaijan and plateau of C Turkey down to c. 900 m, and occasional in N Iran on slopes of Elburz Mts; in Kazakhstan breeding *kirghizorum* from N & C areas move S in late Sept/early Oct, and fairly numerous in winter at mouth of R Ural and along floodplain, river valleys and hills E of Caspian Sea until early Apr; race *korejevi* winters SE Kazakhstan (but absent from W Tien Shan) and S into Tajikistan, occasional Kyrgyzstan and W to S Turkmenistan and NE Iran; *montanella* occurs down to 1500 m in N Pakistan and Kashmir; *altaica* largely sedentary, but more widespread in W from end Jul, also small numbers migrate S to C oases of Gobi Desert; race *rufostrigata* also largely sedentary or moves short distances to lower levels. In Europe, recorded as a vagrant in Faroe Is (has bred), Switzerland, S France, Spain and Portugal.

Status and Conservation. Not globally threatened. Common to locally common; in non-breeding range may be erratic or occasionally numerous. Estimated European breeding population (excluding Russia) between 166,000 and 566,800 pairs, most of which in Norway; population of British Is estimated in 1991 at c. 65,000 pairs, of which 3500 pairs in Ireland, but UK survey in 1999 suggested revised total of 10,000 pairs (Ireland not surveyed), of which less than 1000 pairs in England. Bred in Faeroes between 1938 and 1948; has also bred E Lithuania. Breeding densities of 5–7·8 pairs/km² in N England and 0·7–4·3 pairs/km² in W Norway. British Is breeding population decreased since 1970 most severely in Scotland and N England (Pennines); factors not all clearly understood, but include overgrazing, habitat conversion to agriculture, changes in agricultural management (e.g. controlling bracken, and earlier cutting dates for hay and silage thus precluding plants setting seeds), and climatic factors influencing warmer or drier summers. Similarly, wintering numbers in SE England have decreased markedly since early 1980s, when tens of thousands present; causes unclear, but possibly reflecting shift in wintering area (which may also have included some individuals of nominate race from Norway) or the large-scale decline in Pennines breeding population. Numbers on non-breeding grounds in Waddenzee area of North Sea coast (along with those of Horned Larks and Snow Buntings) decreased significantly since 1960s; reasons thought possibly to have been habitat loss and degradation resulting from creation of huge embankments, probably combined with increase in grazing, which destroyed the lower saltmarshes (this species' preferred foraging habitat); following reduction in grazing pressure, some recovery of numbers recorded. In S Sweden, annual numbers at Falsterbo dropped from 5000–6000 in mid-1970s to only 900–2000 in first half of 1980s. Little information available for Asian populations; said to be common in Afghanistan and in Himalayas E to Nepal.

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gibbons *et al.* (1993), Glutz von Blotzheim & Bauer (1997), Grimmett *et al.* (1998), Hagemeijer & Blair (1997), Hüe & Étchécopar (1970), Kirwan *et al.* (2008), Kumerloeve (1967), MacKinnon & Phillipps (2000), McCarthy (2006), Meyer de Schauensee (1984), Pfister (2004), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Roselaar (1995), Ryabitsev (2001), Snow & Perrins (1998), Stepanyan (2003), Tomialojc (1967), Vaurie (1949, 1959), Wassink & Oreel (2007), Wernham *et al.* (2002).

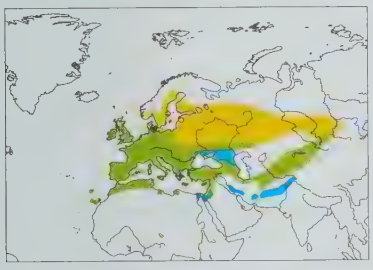

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ssp arctoa
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ssp brunneonucha
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81. Common Linnet

Carduelis cannabina

French: Linotte mélodieuse **German**: Bluthänfling **Spanish**: Pardillo Común
Other common names: Eurasian/European/Brown Linnet

Taxonomy. *Fringilla cannabina* Linnaeus, 1758, Sweden.
Previously placed in genus *Acanthis*. Has hybridized with *C. chloris*, *C. spinus*, *C. flammea* and *C. flavirostris*. Race *guentheri* formerly referred to by name *nana*, but latter invalid, as preoccupied. Geographical variation slight and to some extent clinal, plumage becoming paler from W to E, and races intergrade widely in overlap areas; race *mediterranea* sometimes synonymized with nominate. Birds in Middle East intermediate between European ones and those farther E, possibly closer to latter; proposed races *taurica* (described from Totakoi, near Simferopol, in Crimea), *persica* (from Damavand, in Iran) and *fringillirostris* (from Kashmir) all considered paler variants of *bella*, slightly darker variants of which occur in N Turkey and Caucasus. Seven subspecies recognized.
Subspecies and Distribution.
C. c. autochthona (Clancey, 1946) – Scotland.
C. c. cannabina (Linnaeus, 1758) – W, C & N Europe (S & C Scandinavia S to N Spain, N Italy, NE Greece, W Turkey and Ukraine) and W & SC Siberia E to upper R Yenisey, S Krasnoyarsk and N Altai; non-breeding also N Africa and SW Asia.
C. c. bella (C. L. Brehm, 1845) – WC Turkey, Cyprus and Levant E to Caucasus, NW & N Iran, S Turkmenistan, NW & NE Afghanistan, S & E Kazakhstan (SW Altai, Tarbagatay and Tien Shan), W Mongolia and NW China (N & NW Xinjiang); non-breeding S to N Pakistan (Baluchistan, Salt Range and Punjab).
C. c. mediterranea (Tschusi, 1903) – Iberia (including Balearic Is) E to S Italy, Croatia, Greece, Crete and Aegean Sea islands, also NW Africa (Morocco E to N Tunisia and N Libya).
C. c. guentheri Wolters, 1953 – Madeira.
C. c. meadewaldoi (E. J. O. Hartert, 1901) – W & C Canary Is (El Hierro E to Gran Canaria).
C. c. harterti (Bannerman, 1913) – E Canary Is (Alegranza, Lanzarote and Fuerteventura).



Descriptive notes. 13–14 cm; 15–26 g. Smallish to medium-sized, brownish finch with grey or greyish head, conical bill and notched tail. Male nominate race breeding has lower forehead, lores and short supercilium and subocular crescent pale buff, forecrown rich crimson (over blackish feather bases), crown to lower nape, side of neck, cheek and ear-coverts pale grey, finely streaked blackish on crown, pale buffish centres on ear-coverts; broad pale or whitish-buff submoustachial stripe to side of throat, lightly brown-streaked malar stripe; upperparts, including most of upperwing-coverts, bright chestnut, slightly paler or sandy (may also be tinged pinkish) on lower back and rump; uppertail-coverts and tail black, finely fringed pale buff or whitish-buff, broadly so at side of tail base; outer greater coverts black, finely fringed pale buff, alula, primary coverts and flight-feathers black, primaries broadly edged white (forming broad panel in flight), secondaries and tertials darker brown, edged warm buff-brown; chin and throat pale whitish-buff; upper breast and side of breast crimson or crimson-pink (with browner feather bases), extreme side of breast and flanks warm buffish-brown (flanks sometimes with slightly darker tips), centre of lower breast and upper belly pale buff to pale pink, rest of underparts white or pale sandy-buff; iris dark brown to black; bill blackish-brown, grey base; legs dark pinkish-brown to blackish. Non-breeding male (fresh plumage, from autumn) has forehead buffish-brown, crown to nape edged pale buff, upperparts slightly darker brown, streaked finely blackish, and breast warm buff or brownish-buff, streaked blackish-brown. Female breeding is similar to male, but duller, lacks pink on forehead and breast; forehead to nape grey-brown, finely streaked darker, upperparts dull warm brown, broadly streaked darker, rump and uppertail-coverts brown; wing and tail as for male, but median and greater upperwing-coverts fringed warm brown, greater coverts with broad buff-brown tips, white on primaries not so broad (smaller panel on open wing); distinctive pale areas around eye and on cheek; pale buff-brown (may be tinged pinkish) below, washed more heavily buffish and streaked dark brown on breast and flanks, bill more horn-brown than male's. Non-breeding female (fresh plumage) is slightly more heavily streaked, with pale buffish-brown feather edges on upperparts and pale buff tips of primaries. Juvenile is like female, but browner above, streaked darker brown on head to side of neck and upperparts, face buffish-brown with darker brown cheek and ear-coverts, wing and tail as on adult, and underparts pale sandy or light buff, streaked dark brown; first-winter like adult female. Races differ mainly in wing length, bill size (length, depth and width), and intensity of plumage coloration (mostly of hindneck and upperparts): *autochthona* differs little from nominate, having slightly longer wing, more slender bill, darker grey hindneck, and dull dark brown mantle and scapulars with darker streaks; *bella* is slightly larger, but wing as for nominate, bill slightly thicker at base, paler above and below, male in summer has pale grey crown and nape with smaller crimson patch on forehead, upperparts more cinnamon-brown (lacking chestnut), lower back and rump sometimes tinged rose-pink, lower rump and uppertail-coverts pale greyish or whitish, finely streaked blackish (occasionally unstreaked), breast rose-pink, flanks tawny-buff, female paler and greyer than nominate, upperparts buffish-brown (less warm), underparts less heavily streaked; *mediterranea* is slightly paler than nominate, has shorter wing, more slender bill, upperparts more rufous-brown, sometimes pale buff nape patch and more prominent streaks on crown, rump spotted dusky olive or blackish, and flanks darker rufous-brown; *guentheri* has slightly shorter wing and more slender bill than nominate, upperparts (including upper rump) dark rufous-brown, flanks deep rufous-cinnamon, and has bright pinkish or ruby-red forehead and breast, female more heavily streaked below; *meadewaldoi* resembles previous in size and bill shape and in forehead and breast colour, differs from nominate in slightly darker grey nape and hindneck, darker rufous-brown upperparts and brighter pinkish-red forehead and breast; *harterti* is similar to *guentheri*, but male has grey of hindneck tinged buff, upperparts paler or lighter brown, flanks rufous-cinnamon. Voice. Song, from open or exposed perch at top of bush or low tree, occasionally from ground, a soft and varied lilting and hurried musical warble interspersed with twitters, whistles and trills, often initiated with rising "gigigi" and concluding with "te-ooor te-chee tsurrrr-ze-tk-ze". Calls include rapid trilling "chi-chi-chi-chit", also given in flight with other twittering notes and similar to call of *C. flavirostris*, though lacking distinctive metallic "twee", but has softer and unmetallic, fairly high-pitched "tswi"; also a very soft or subdued "peeeuu", "too-ee" or "too-hwee" and "pee-yer", usually given in breeding season at or near nest; flight call a series of soft twitters or trills, including "chek-chek" or "tett-tett-terrett", "chichichichit" or "chit-ip, kip-it kit-ip terreeeeeee"; alarm or anxiety call a sharp "tsooeet"; juvenile in autumn emits sharp "wit" or "twit", not unlike a call of *Loxia curvirostra*.
Habitat. Lowland open heaths and commons, especially with gorse (*Ulex*) and broom, moorlands and hills with scattered trees and light woodlands, also woodland and forest clearings and edges, edges of cultivation, fallow fields, scrub and weed patches, plantations, orchards, vineyards, hedgerows, parks and large gardens; also open rocky hillsides, mountain slopes, alpine meadows and maquis or valleys with low shrubs, and in non-breeding season also coastal dunes, saltmarshes, shingle banks and along tideline. Usually below 2000 m, but breeds to 2300 m in Switzerland, to c. 3000 m in Tien Shan and c. 3600 m in Moroccan High Atlas.
Food and Feeding. Mostly small to medium-sized seeds of a wide range of flowers and shrubs, also buds; also some invertebrates. Seeds and fruits include those of conifers, poplar (*Populus*), birch (*Betula*), alder (*Alnus*), elm (*Ulmus*), dogwood (*Cornus*), buckthorn (*Rhamnus*), guelder-rose (*Viburnum*), privet (*Ligustrum*), hemp (*Cannabis*), nettle (*Urtica*), knotgrass (*Polygonum*), sorrel and docks (*Rumex*), goosefoot (*Chenopodium*), orache (*Atriplex*), beet (*Beta*), glasswort (*Salicornia*), sea-blite (*Suaeda*), chickweed (*Stellaria*), mouse-ear (*Cerastium*), corn spurrey (*Spergula*), buttercup (*Ranunculus*), poppy (*Papaver*), rape (*Brassica*), hoary cress (*Cardaria*), rocket (*Sisymbrium*), charlock (*Sinapis*), radish (*Raphanus*), garlic mustard (*Alliaria*), sea-kale (*Crambe*), common whitlowgrass (*Erophila verna*), scurvygrass (*Cochlearia*), penny-cress (*Thlaspi*), shepherd's-purse (*Capsella*), meadowsweet (*Filipendula*), strawberry (*Fragaria*), cinquefoil (*Potentilla*), avens (*Geum*), burnet (*Sanguisorba*), rowan (*Sorbus*), hawthorn (*Crataegus*), trefoil (*Trifolium*), flax (*Linum*), purple-loosestrife (*Lythrum salicaria*), willowherb (*Epilobium*), evening-primrose (*Oenothera*), bilberry (*Vaccinium*), primrose (*Primula*), alkanet (*Anchusa*), forget-me-not (*Myosotis*), speedwell (*Veronica*), eyebright (*Euphrasia*), thyme (*Thymus*), dead-nettle (*Lamium*), self-heal (*Prunella*), plantain (*Plantago*), bindweed (*Convolvulus*), goldenrod (*Solidago*), daisy (*Bellis*), mugwort (*Artemisia*), sea rocket (*Cakile*), bur-marigold (*Bidens*), chamomile (*Anthemis*), mayweed (*Matricaria*, *Tripleurospermum*), tansy (*Tanacetum*), butterbur (*Petasites*), groundsel (*Senecio*), burdock (*Arctium*), thistles (*Carduus*, *Cirsium*), knapweed (*Centaurea*), goat's-beard (*Tragopogon*), sow-thistle (*Sonchus*), lettuce (*Lactuca*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), hawk's-beard (*Crepis*), hawkweed (*Hieracium*), and various cereals and other grasses (Gramineae). Invertebrates taken include adult and larval insects, mainly mayflies (Ephemeroptera), damselflies (Odonata), grasshoppers (Orthoptera), bugs (Hemiptera), scorpion flies (Mecoptera), moths (Lepidoptera), caddis flies (Trichoptera), flies (Diptera), beetles (Coleoptera), also spiders (Araneae) and small snails (Pulmonata). Nestlings often fed mainly with insect larvae for first few days, thereafter seeds. Forages mainly on ground (particularly in winter), also in low vegetation, bushes and low trees, especially thorny bushes; hops on ground. Feeds from perched position and on flowerheads of bent grass stem, and unlike other finches does not hang upside-down; also perches on trees, fences and roadside wires. In pairs and small flocks; in non-breeding season often forms larger flocks of up to 500 individuals (less frequently thousands), and joins mixed-species flocks with *C. chloris*, *C. cabaret* and Eurasian Tree Sparrow (*Passer montanus*) foraging in open agricultural fields (especially those left fallow or after harvesting cereals), also in semi-desert areas and along coasts.
Breeding. Season mid-Apr to early Aug; two or three broods. Monogamous, rarely polygamous; pair-bond strong, but only for duration of season. Solitary and semi-colonial. Territorial; apparently defends nest and immediately surrounding area, which may include songposts; most foraging outside territory. Displaying male ruffles crown and breast feathers, droops wings and spreads tail while swaying slightly from side to side, singing loudly, and hopping around female on ground or on level perch; the two may also bill-touch, and male pursue female in erratic flight through low bushes; courtship feeding of female by male continues through incubation stage. Nest built by female, mostly from small twigs, plant fibres and down, roots, moss, animal fur and feathers, placed low down, within 3 m of ground, in dense bush or shrub, usually thorn bush e.g. gorse, rose (*Rosa*), bramble (*Rubus*), hawthorn or sea-buckthorn (*Hippophae*), also hedge or conifer sapling, especially spruce (*Picea*), sometimes on ground or in woodpiles; site-fidelity variable, ringed individuals using same sites in N France and Belgium over 4 years, and 38% of 70 colour-ringed yearlings returning to natal area on Heligoland (Germany) in following year, but none of more than 400 young ringed at W Russian breeding site subsequently recovered there. Clutch 4–6 eggs, pale or whitish-blue, distinctly spotted or streaked pink to purple-brown or with larger blotches or red to purple-black; incubation by female alone, period 11–13 days; chicks fed and cared for by both parents, nestling period 10–14 days; young independent after a further 14 days. Breeding success: in study of 154 nests in N France 57% produced fledged young, and of 353 eggs in Switzerland 38% produced fledglings, giving average of 4·4 young/successful nest, losses due to human agency, failure to hatch, and death of nestlings in severe summer drought; cool and wet years also result in increased predation, also low siting of nests increases vulnerability to predators, mainly crows (Corvidae), weasels and martens (Mustelidae), fox (*Vulpes*), cats, rodents, humans and Red-backed Shrike (*Lanius collurio*). First breeds at 1 year. Maximum recorded longevity 8 years 11 months.
Movements. Resident, migratory and partially migratory. S European, Mediterranean and Atlantic island races entirely sedentary. Elsewhere, numbers making post-breeding movement vary annually, and some individuals migrate in some years but not in others. N breeders of nominate race, mainly those from Fennoscandia, NE Europe and W Russia, move S & SW to winter within and slightly S of breeding range in C & S Europe from N Belgium (small numbers also in Britain) S to coastal N Africa, S Israel (Negev Desert), N Egypt and S along R Nile. In C Asia nominate race common on passage W Kazakhstan late Aug to Nov, and at same time race *bella* moves S through lower levels of breeding range and both races scarce in winter mostly in extreme S; *bella* an altitudinal migrant in NW China, also uncommon and irregular winter visitor to N Pakistan between Oct and early Apr. Passage through Europe from mid-Sept to end Oct/early Nov, with peak mid-Sept to mid-Oct; breeders in Britain either sedentary or fly S across S North Sea (fewer across English Channel) before heading SW to wintering grounds in W France and N Spain, with smaller numbers in Portugal and Morocco; those breeding in N & C France move S to winter in S Spain and N Morocco, population wintering in France largely from Czech Republic, Slovakia, Germany and Switzerland, and Spanish wintering birds including also individuals from Sweden, Finland and Belgium; up to 30% of German breeding population resident (large numbers wintering in valleys and plains of Rhineland), and most of those that leave are immatures, which head between SW and SE to wintering grounds from Spain E to Italy and Sicily and S to NW Africa. In W Russia, small numbers resident in S (mainly around Black and Caspian Seas), remainder make variable-distance movements to Poland or fly longer distances to N Italy and SE France. Common passage migrant across Strait of Gibraltar mid-Sept to Nov, including considerable number of Spanish breeders;

On following pages: 82. Yemen Linnet (*Carduelis yemenensis*); 83. Warsangli Linnet (*Carduelis johannis*); 84. Ankober Serin (*Carduelis ankoberensis*); 85. Plain Mountain-finch (*Leucosticte nemoricola*); 86. Brandt's Mountain-finch (*Leucosticte brandti*); 87. Sillem's Mountain-finch (*Leucosticte sillemi*); 88. Asian Rosy-finch (*Leucosticte arctoa*); 89. Grey-crowned Rosy-finch (*Leucosticte tephrocotis*); 90. Black Rosy-finch (*Leucosticte atrata*); 91. Brown-capped Rosy-finch (*Leucosticte australis*).

movements of NW African breeding population largely local, but frequent at oases in Algerian Sahara; ring recoveries on Malta include individuals from E Europe (N to Lithuania), Austria, Switzerland and Croatia. Passage in E Mediterranean mid-Oct and Nov from Cyprus E to N & W Iran (more numerous and widespread in winter to early Apr), occasionally S to Gulf coast and regular Iraq; passage through Israel includes nominate race on broad front between mid-Oct and mid-Dec. Spring return movement in early Feb to early May; passage through Strait of Gibraltar, Sicily and Cyprus mostly over by late Apr, and in S & C Europe by early May, when first birds back in breeding areas in Britain; arrives S Sweden from end Mar and at same time in early springs in St Petersburg area of NW Russia, but most arrivals and onward passage in Apr and early May. High degree of fidelity to natal area in Britain, where 87% of recoveries of breeding adults within 20 km from site where ringed in previous years. Movements usually diurnal, large flocks along coasts and river valleys and gathering at headlands and migration crossing points during daylight hours; some nocturnal migration. Has occurred in E Saudi Arabia; vagrant N to Iceland, Faeroes and Lapland S to Mauritania, Senegal, Libyan desert, Sudan, United Arab Emirates, NW India and Nepal.

Status and Conservation. Not globally threatened. Common to locally common, local in N parts of range; fairly common in Madeira and E Canary Is, occasionally abundant in Spain and Israel, uncommon in NW China. Estimated European breeding population (including Russia) between 7,000,000 and 10,000,000 pairs, most of which in Spain, France and Ukraine. High breeding density of 59 pairs in 0·6 ha of dense spruce plantation near Halberstadt, E Germany; 38 simultaneously occupied nests in 400 m of sea-buckthorn bushes on Juist I (off N Germany); up to 20 pairs/ha of gorse in England; and up to 69 pairs in 2 ha of gorse heath in France. In late 20th century declined over large parts of C & NW Europe owing to intensification of agriculture, which resulted in destruction of hedgerows (enlarged fields), improved harvesting of cereals, and eradication of fallow and weedy fields through application of herbicides; some evidence of recovery in parts of range, e.g. Britain and Finland, following redistribution in alternative habitats in parks, gardens and urban areas and improved foraging opportunities provided by new crops, e.g. oilseed rape (*Brassica napus*).

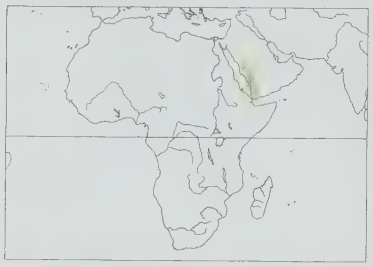
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82. Yemen Linnet

Carduelis yemenensis

French: Linotte du Yémen **German**: Jemenhänfling **Spanish**: Pardillo Yemení
Other common names: Arabian Linnet

Taxonomy. *Pseudacanthis yemenensis* Ogilvie-Grant, 1913, Menacha, Yemen.
Previously placed in genus *Acanthis*. May form a superspecies with *C. johannis*. Monotypic.
Distribution. SW Saudi Arabia and W Yemen.



Descriptive notes. 11–12 cm; 13–15 g. Small to medium-sized, grey and brown finch with pale rump, short bill with curved culmen, and notched tail. Male breeding has entire head to hindneck, side of neck, chin, throat and centre of upper breast pale grey, slightly paler whitish-buff line above lores and subocular crescent, and short, thin dark eyestripe; upperparts, including upperwing-coverts, chestnut-brown, rump greyish-white or grey-brown, slightly darker uppertail-coverts fringed paler buffish-grey; tail black, bases of feathers broadly edged white; flight-feathers black, primaries (except outer three) broadly edged white at base (forming broad patch on closed wing, and wingbar in flight), secondaries and tertials edged light chestnut-brown, tertials tipped whitish; side of lower breast chestnut or rich brown, becoming paler on flanks, rest of underparts white or washed sandy-buff; iris black; bill dark horn above, paler or yellowish-horn below; legs brown or dark brown. Non-breeding male (fresh plumage, in autumn) has head and upperparts duller and wing and tail feathers tipped buff. Female is similar to male, but paler; head to nape duller grey and merging with finely dark-streaked paler brown mantle and upperparts, greater coverts with more obvious blackish centres and broad pale buff-brown tips, white panel at base of primaries less extensive; side of lower breast light brown or buffish-brown, becoming whitish-buff on rest of underparts. Juvenile has forehead to nape pale brown, finely streaked darker, face plain grey-brown or tinged buffish, paler buff area above and below eye, upperparts brown, streaked darker or blackish, upperwing-coverts fringed pale chestnut, flight-feathers and tail as on adult, breast and flanks warm buff, streaked dark brown, rest of underparts whitish-buff. Voice. Song, usually by male from prominent perch at top of tree or bush or in display-flight, a lively and rapid musical twittering interspersed with fluty and buzzing notes and high-pitched trills, recalling similar notes given by *Serinus canaria* and *C. carduelis*. Call a musical "tirrrit" or "wid-lee-ee", also a soft but short rippling "vliet".

Habitat. Dry montane and submontane plateaux, boulder-covered hillsides, rocky scree slopes and wadis with scattered thorn-scrub, including acacias (*Acacia*), euphorbias (*Euphorbia*) and junipers (*Juniperus*); occasionally in junipers at edges of cultivation, orchards and plantations. At 1600–3660 m; recorded down to 580 m in Nov.

Food and Feeding. Seeds of bushes and low-growing plants, including grasses, herbs and shrubs e.g. *Plectranthus barbatus*, also fruiting heads of docks (*Rumex*), *Acyranthes* (Amaranthaceae), *Sorghum* and cereals such as barley. Forages almost entirely on the ground; perches in bushes and trees. Usually in pairs or small flocks; in non-breeding season in larger flocks of up to 60 individuals, and often in company with *Serinus menachensis*.

Breeding. Season Mar–Jul, also adults feeding recently fledged young in Oct; probably two broods. Displaying male pursues female in flight while singing, also during circular display-flight; also in perched display, when partners adjacent and male holds wings partially spread and drooped, tail also partly spread. Nest a cup of small twigs, grass, plant fibres, down and roots, lichen, animal hair and gossamer, placed 1·5–4 m above ground in low bush or tree, frequently in juniper. Clutch 2–4 eggs, dull white or very pale blue, finely streaked or spotted with pale brown or reddish-brown; incubation by female; no information on duration of incubation and nestling periods.

Movements. Resident and partially nomadic. In non-breeding season, apparently large wandering flocks occur in Asir Mts, in Saudi Arabia.

Status and Conservation. Not globally threatened. Restricted-range species: present in South-west Arabian Mountains EBA. Common to locally common. Likely to be adversely affected by clearance of acacia, which it uses for song perches, foraging and nesting sites; such sites otherwise extremely scarce. Small-scale trapping of this species for local cagebird market thought unlikely to have any serious effect on its populations.

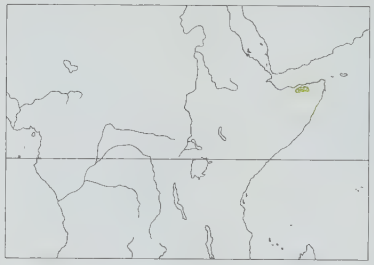
Bibliography. Ash & Miskell (1998), Bates (1937), Bowden & Brooks (1987), Castell *et al.* (2001), Clement *et al.* (1993), Collar & Stuart (1985), Hall & Moreau (1970), Jennings (1981), Phillips (1982), Sclater (1917), Stagg (1984).

83. Warsangli Linnet

Carduelis johannis

French: Linotte de Warsangli **German**: Somalihänfling **Spanish**: Pardillo Somalí

Taxonomy. *Warsanglia johannis* S. R. Clarke, 1919, Mush Haled, 4000 feet [c. 1220 m], Warsangli country, Somalia.
Previously placed in genus *Acanthis*. May form a superspecies with *C. yemensis*. Monotypic.
Distribution. Daalo and Mash Caleed, in N Somalia.



Descriptive notes. 12·5–13·5 cm; 11·8–15 g. Medium-sized finch with pale wing-flash, short, conical bill and notched tail. Male has forehead and supercilium white, lores broadly black, narrow blackish line behind eye; lower cheek and subocular crescent white, rest of cheek and ear-coverts pale grey; upper forehead to crown and upperparts (to lower back) pale grey, upper rump bright orange-rufous, lower rump white, uppertail-coverts dark grey, tipped white or whitish-grey; tail and upperwing black, wing-coverts tipped whitish (in fresh plumage), narrow white patch at base of all except outermost two primaries (broad white patch in flight); throat and underparts white, washed buffish or pale grey on side of breast, lower flanks rich brown or rufous; iris black; bill dark grey, slightly paler lower mandible; legs dark brown. Female is like male, but forehead and face with less white, crown and nape finely streaked darker, becoming more heavily or boldly streaked on mantle, back and scapulars, and rump and lower flanks duller; bill as on male, with paler base of lower mandible. Juvenile (known from single specimen) has head and nape to upper mantle pale greyish-buff (paler or creamy buff on forehead), rest of upperparts buffish-brown, heavily streaked darker, rump pale creamy buff, streaked or spotted dark brown, uppertail-coverts blackish, fringed with white, wing finely edged buffish-brown and more broadly tipped pale buff-brown on tips of greater coverts and edges of tertials and inner secondaries, underparts pale buff to brownish, heavily streaked dark brown on breast and flanks. Voice. Song a rambling jumble of twitters, buzzes and trills, very similar to song of *Serinus serinus*. Calls include high-pitched "tsee-wit" and short "tweek", a twittering "sis-sis-sis" and a clear "sweet-ee".

Habitat. Little known. Occurs within a restricted range of open country or degraded montane juniper (*Juniperus*) forest and adjacent woodland, thickets and scrub, including olive (*Olea*), *Dodonaea viscosa*, *Cadia purpurea* and *Sideroxylon*; at 1200–2400 m.

Food and Feeding. Mostly seeds of shrubs and other plants, including those of euphorbias (*Euphorbia*) and *Salvia* and grasses. Forages on the ground and in low-growing vegetation; also perches at tops of trees and on exposed dead branches. Singly, in pairs and in small groups.

Breeding. Birds in breeding condition in May and juvenile seen in Jul. No other information.

Movements. Resident.

Status and Conservation. ENDANGERED. Restricted-range species: present in North Somali Mountains EBA. Poorly known. Recorded at only five locations within the two small areas of Daalo and Mash Caleed, in highlands of N Somalia. Believed to have a small population which is possibly declining. Previously regarded as locally common. Threats to its apparently small population include widespread and possibly total destruction, through felling and by fire, of juniper forest, which may be a main part of its required habitat. Occurs within Daalo Forest Reserve. Because of the continuing political and social instability in the country, however, no protection is provided for habitats and their wildlife; moreover, this situation may be adding to pressures on habitat, resulting in further losses of valuable woodland and forest. As soon as conditions allow, surveys should be undertaken in order to establish the species' current distribution and population and to determine its precise habitat requirements; any threats to its survival need to be identified and, if feasible, any remaining areas of suitable habitat effectively protected.

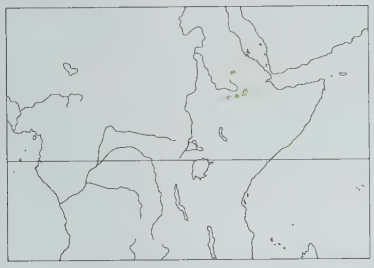
Bibliography. Anon. (2009i), Archer & Godman (1961), Ash & Miskell (1981, 1983, 1998), Butchart & Stattersfield (2004), Clement *et al.* (1993), Collar & Stuart (1985), Sinclair & Ryan (2003), Stattersfield & Capper (2000), Williams (1956, 1957a).

84. Ankober Serin

Carduelis ankoberensis

French: Linotte d'Ankober **German**: Ankoberhänfling **Spanish**: Pardillo de Ankober
Other common names: Ankober Seedeater

Taxonomy. *Serinus ankoberensis* Ash, 1979, Ankober, Shoa Province, Ethiopia.
Sometimes placed in genus *Serinus*, and has been considered conspecific with *Serinus menachensis* on grounds of plumage pattern and colour, long wings, breeding biology and egg colour; differs significantly from that genus, however, in bill morphology. Monotypic.
Distribution. N & C Ethiopia (N Gondar and N Shoa Provinces, in Amhara Region).
Descriptive notes. 12–13 cm; 14–15 g. Medium-small, drab-coloured streaky finch with relatively long, slender bill. Male has feathers of forehead to nape finely streaked blackish-brown with buffish or light brown edges, slightly lighter brown on nape and side of neck (forming poorly defined pale collar), upperparts brown (paler on rump), thinly streaked darker or blackish; face grey or greyish-olive, small pale suborbital crescent, cheek unstreaked, ear-coverts finely streaked blackish, and olive or olive-grey moustachial stripe; tail dark brown, outer feathers edged paler grey; upperwing dark brown, median and greater coverts tipped pale brown or buff, secondaries finely edged buff-brown, tertials fringed grey-brown and tipped grey; chin and throat white or whitish-grey, spotted finely blackish, becoming pale buffish-brown with heavy grey or grey-brown streaking on breast to undertail-coverts; iris black; bill greyish-horn, paler lower mandible; legs flesh-coloured or pinkish-brown. Female is very like male, but cheek and moustachial area not so contrastingly pale.



Juvenile is poorly known; considered similar to adult. Voice. Song, often given by several males in concert, a series of musical chirps and chirruping notes, possibly a more prolonged extension of call notes. Calls include chattering "chee-chachachacha", a double "treet-treet" often given by several individuals together, or singly as a high-pitched "chree" or "cheet", also "witchu" or "weetchu" similar to a sparrow (*Passer*) call, a twittery "twi-ti-twi-twi" or "tchweet-weet-lu" and a nasal "chirp".

Habitat. Lower montane or submontane, windswept cliffs and hill tops with vertical bare rock faces, open grassy areas and low-spreading vegetation, including stunted tree-heath (*Erica arborea*), with rocks and lichen-covered boulders; occurs also in terraced patches of cereals, and grazed pasture strips. At 2620–4250 m.

Food and Feeding. Mostly seeds of grasses and herbs and of other locally available plants. Forages almost entirely on ground, usually in and around earth banks and rocks; often clings to vertical surfaces. In pairs and in groups of up to 60 individuals, on ground often in close proximity to or in contact with other flock-members; non-breeding flocks often restless, moving rapidly between rocks or flying up in compact group and circling around before dropping back down to ground. May associate loosely with *Serinus tristriatus* and *Serinus striolatus*.

Breeding. Season Oct–Mar; possibly also at other times after heavy rain. Nest material collected by both partners; nest a deep cup of fine roots, animal hair and wool, placed in hole under overhanging earth bank. Clutch 3 eggs, pure white. No other information.

Movements. Resident; may make local movements in search of food.

Status and Conservation. VULNERABLE. Restricted-range species: present in Central Ethiopian Highlands EBA. Generally little known. Scarce or uncommon, with population estimated at between 10,000 and 20,000 individuals. Recorded only a few times since its initial discovery, in 1976. Since 1991 recorded from four main sites, and annually in at least one of these. In 2002, total of 300 individuals found in three-day period in Abuna Yosef Mts (in Semien Wollo Zone). Thought likely to be more widespread in Ethiopian highland massif, perhaps in ecologically suitable habitat from Tigray, in N, S throughout Amhara Region. Considered to be at risk from increased cultivation, grazing pressure from sheep, goats and cattle, and habitat fragmentation; also from planting of trees, particularly *Eucalyptus globulus* and *Cupressus lucitanica*, at one site. Occurs in Simien Mountains National Park, which provides a reasonable degree of protection, and in a small area in Guassa Reserve, which is managed effectively by local community. Field surveys required in order to gain better knowledge of this species' full range and population size, and to evaluate possible threats.

Bibliography. Anon. (1996b, 2009i), Ash (1979), Ash & Atkins (2009), Butchart & Stattersfield (2004), Clement et al. (1993), Collar & Stuart (1985), Dowsett & Dowsett-Lemaire (1993), van den Elzen (1985), Fry & Keith (2004), Shimelis (1999), Sinclair & Ryan (2003), Stattersfield & Capper (2000).

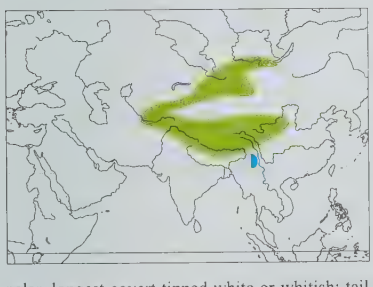
Genus *LEUCOSTICTE* Swainson, 1832

85. Plain Mountain-finch

Leucosticte nemoricola

French: Roselin de Hodgson **Spanish**: Pinzón Montano de Hodgson
German: Waldschneegimpel
Other common names: Hodgson's Mountain-finch, Hodgson's Rosy-finch

Taxonomy. *Fringilauda nemoricola* Hodgson, 1836, central and northern Nepal.
Geographical variation somewhat clinal; races weakly differentiated. Two subspecies recognized.
Subspecies and Distribution.
L. n. altaica (Eversmann, 1848) – S Russia (C & SE Altai E to S Baikal area) and W Mongolia S in mountains to E & S Kazakhstan (Tien Shan), NW China (NW Xinjiang S to NW Xizang), W & N Tajikistan and NE Afghanistan, thence E in NW Himalayas of N Pakistan and N India (Uttarakhand).
L. n. nemoricola (Hodgson, 1836) – Tibetan Plateau E to C & S China (E Qinghai, Gansu, S Shaanxi, W Sichuan and NW Yunnan), and Himalayas from C Nepal E to Bhutan; non-breeding visitor NE Myanmar.



Descriptive notes. 14–15 cm; 18–25·5 g. Medium-sized to large, slender, brownish finch with pointed bill, long wings and notched tail. Nominate race breeding has head brown or dark gingery brown, finely streaked darker on forehead and crown, slightly paler or buffish-brown over eye and ear-coverts (poorly defined supercilium); hindcrown to nape dark brown fading to buff-brown on lower nape and side of neck; upperparts dark warm brown, broadly streaked paler tawny-buff (feather edges), pale buff edges forming "tramlines" at sides of mantle and back; lower back and rump paler or greyer, uppertail-coverts dark grey, tipped paler, longest covert tipped white or whitish; tail dark brown, finely edged buff; upperwing dark brown, median coverts brown with blackish centres and white tips, greater coverts dark brown with buff to white tips, mainly paler brown outer webs of outer feathers, alula and primary coverts finely edged whitish, flight-feathers edged warm brown, or paler on inner secondaries, tertials broadly edged warm brown and tipped light buff; throat and underparts pale grey-brown (duller brown in fresh plumage), vent and undertail-coverts whitish, tipped greyish; axillaries pale to deep yellow; iris bright red to reddish-brown or black; bill brown or brownish-horn, paler base of lower mandible; legs dark brown. Non-breeding plumage duller, with pale buff tips reduced or absent, creating more uniform or less prominently streaked appearance. Sexes alike. Juvenile is similar to adult, but paler or warmer brown, crown and face dark rufous-brown, finely streaked paler, upperparts less heavily streaked (lacking "tramlines") and feathers edged warmer rufous-brown, tips of median and greater upperwing-coverts whitish or whitish-buff, underparts gingery brown, finely streaked darker, belly to undertail-coverts paler; first-year like adult, but retains rich brown on crown and ear-coverts and edges of upperparts. Race *altaica* differs from nominate in having head and upperparts slightly more rufous-brown with darker brown centres, underparts paler, axillaries pale grey or greyish-white, juvenile and first-winter also deep ginger or rich warm brown on underparts. Voice. Song, usually from top of boulder or prominent rocky perch, a short series of sharp twittering metallic "trit-tit-tit-tit" similar to that given by *Carduelis carduelis*, including "rick-pi-vitt" or "dui-dip-dip-dip" and interspersed with variously pitched twittering trills and sweeter, more musical warbling notes or occasionally more reedy warbling and whistling notes. Calls include loud dry "tchit-ti-tit" in flight (flocks in flight make loud continuous twittering) and softer twittering "chi-chi-chi-chi", also a shrill piping or whistled double note.

Habitat. Submontane and montane hillsides. Breeds above tree-line on open boulder-strewn ridges, slopes and plateaux and in upper forest zone with alpine meadows, pastures with dwarf bushes and scrub; at 2350–4275 m, occasionally to 5300 m. In non-breeding season found in upper edges of valleys and mountain forests, rocky hillsides, edges of cultivation, particularly rice paddies, open fields and in and around villages; down to 450 m in Altai Mts, to c. 1800 m in Bhutan (many still present above 2000 m) and to 4000 m elsewhere in Himalayas, moving lower (exceptionally to 750 m in N Pakistan) only when forced down by severe weather.

Food and Feeding. Mostly seeds of grasses and alpine herbs; occasionally small invertebrates. Seeds include those of dandelions (*Taraxacum*), *Artemisia*, lady's bedstraw (*Galium*), forget-me-not (*Myosotis*), salsify (*Tragopogon*), five-fingers (*Potentilla*), seeds and buds of spruce (*Picea*), also cereals including barley. Invertebrates include springtails (Collembola), bugs (Hemiptera), moths (Lepidoptera), dragonflies (Odonata), flies (Diptera), sawflies, bees and wasps (Hymenoptera), beetles (Coleoptera), bristletails (Thysanura), also spiders (Araneae), woodlice (Isopoda) and snails (Pulmonata). Nestling diet a mixture of plant and animal food. Forages on open ground, in grassy areas among rocks or screes and, less frequently, in open woodland, where it perches in or on trees; often tame, and known to take household scraps around settlements. Occasionally alone, usually in small groups; in non-breeding season often in larger flocks of up to 200 individuals (exceptionally to 1000), frequently in loose association with *Serinus pusillus*, and in late winter forages with flocks of *Fringilla montifringilla* on seeds uncovered by melting snow. Flocks (often comprising individuals of same age or same sex) fly fast in tightly packed formation, turning and wheeling in unison, frequently changing direction before suddenly swerving and swooping down to land, similar to actions of Common Starlings (*Sturnus vulgaris*).

Breeding. Season Jun–Aug; one brood. Solitary or loosely colonial. Displaying male on ground in front of female raises and holds both wings erect over back, and may run, with wings held high, towards female while giving excited calls. Nest built by female, a shallow cup of grass, leaves, plant fibres and roots, moss, animal hair and feathers, placed up to 2 m above ground in hole or rocky crevice or beneath rocks, boulders or heap of stones, occasionally below ground in active burrow of rodent, e.g. marmot (*Marmota*). Clutch 3–6 eggs, pure white or tinged pinkish; incubation by female, fed on nest by male, period 13–15 days; chicks fed and cared for by both parents, nestling period 15–19 days. In Tien Shan, 73·6% of nests survive, most predation by foxes (*Vulpes*), stoats (*Mustela*), dogs, copperhead snake (*Gloydius*) and large snails (*Limax turkestanicus*).

Movements. Resident, and partial or altitudinal migrant. In non-breeding season, in Oct to early Nov, or late Dec, descends to lower levels within range, immatures wandering more widely and descending lower than adults; occurs farther S in Murree Hills area of N Pakistan, and occurs in Adung Valley, in N Myanmar; return movement in May and early Jun. Rare or scarce visitor in N Arunachal Pradesh, in NE India.

Status and Conservation. Not globally threatened. Common to locally abundant in most of range; rare in NE (Tuva Republic area of S Siberia).

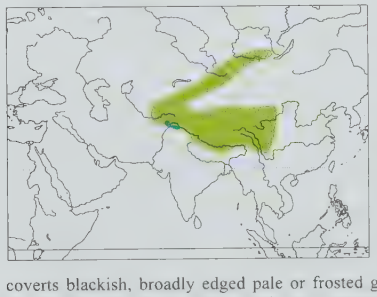
Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), Korelov *et al.* (1974), Kovshar (1979), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Paludan (1959), Pfister (2004), Raja *et al.* (1999), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Rogacheva (1992), Sangha & Naoroji (2007), Spierenburg (2005), Stakheev (2000), Stepanyan (2003), Vaurie (1949, 1959), Wassink & Oreel (2007).

86. Brandt's Mountain-finch

Leucosticte brandti

French: Roselin de Brandt **German**: Mattenschneegimpel **Spanish**: Pinzón Montano de Brandt
Other common names: Brandt's Rosy-finch, Black-headed/Rosy-rumped Mountain-finch

Taxonomy. *Leucosticte brandti* Bonaparte, 1850, Turkestan.
Proposed races *audreyana* (described from Yabuk, on Zemu Glacier, in N Sikkim) and, in China, *walteri* (from Songpan, in N Sichuan) and *intermedia* (from Burhan Budai Shan, in Qinghai) synonymized with *haematopygia*. Five subspecies recognized.
Subspecies and Distribution.
L. b. margaritacea (Madarász, 1904) – NE Kazakhstan (Tarbagatay and Altai Mts), S Russia (Altai, W Tuva and W Sayan Mts), NW China (N Xinjiang) and W Mongolia.
L. b. brandti Bonaparte, 1850 – Kyrgyzstan, SE Kazakhstan (Dzhungarian Alatau and Tien Shan) and W China (W & C Xinjiang); non-breeding also N Pakistan.
L. b. pamirensis Severtsov, 1883 – Tajikistan, Kyrgyzstan (Pamir–Alai Mts and S Tien Shan), NE Afghanistan and W China (SW Xinjiang); non-breeding also N Pakistan.
L. b. pallidior Bianchi, 1908 – W & C China (Kunlun Mts E to N Qinghai); non-breeding E to NW Gansu.
L. b. haematopygia (Gould, 1853) – SW China (Xizang, Qinghai and NW Gansu S to W Sichuan and N Yunnan), Karakoram Mts and Himalayas E to NE Nepal and India (Sikkim).



Descriptive notes. 16·5–19 cm; 26–34 g. Medium-sized to large, slender or robustly built pale grey to blackish finch with pointed bill, long wings and notched tail. Male nominate race breeding has head dark grey to grey, blackish on forecrown and foreface; lower nape and upperparts pale grey to grey-brown, streaked blackish-brown, lower back and rump pale pearl-grey with rosy-pink feather edges, rump tipped paler or grey, uppertail-coverts pale grey, tipped paler; tail blackish-brown, all outer feathers edged and tipped whitish or whitish-buff; lesser upperwing-coverts pale grey, tipped pale pink or white, median and greater coverts blackish, broadly edged pale or frosted grey; alula, primary coverts and flight-feathers blackish, finely edged and tipped pale grey (more uniform in summer, when worn), tertials broadly

edged pale buffish-grey; throat and underparts dingy grey-brown, tinged buffish and paler on undertail-coverts; iris dark brown; bill and legs black. Non-breeding male has head to mantle and back buff-brown or tawny-brown, blackish tips on forehead and crown, broad pale buff edges of greater coverts, tertials and tips of flight-feathers; bill dark brown with yellow base in winter. Female is very like male, but has rump duller grey, with pink less extensive. Juvenile is paler, more sandy brown than adult on head and upperparts, has dark brown feather centres on mantle and back, with rump and uppertail-coverts fringed light orange-buff, wing and tail edged buffish-brown, light pink tinge on lesser coverts; first-winter like juvenile, but with blackish bases on lores and forehead to crown, pale yellowish-buff tips on nape to lower back, or brighter yellow on lower back and scapulars, pale ash-grey lesser and median upperwing-coverts edged golden-buff, tips of greater coverts creamy or pale buff-brown, throat whitish to pale buff, breast, belly and flanks grey-brown or buffish-brown, lower underparts pale buff, bill grey-brown with dark or blackish tip, pale yellow base of lower mandible. Race *pamirensis* is like nominate in extent of black on crown, has nape and mantle grey, heavier dark streaks on mantle and back, tips of rump feathers reddish or deep red, face grey or pale grey, but lores to below eye sometimes blackish, and breast to belly and flanks grey; *pallidior* has mantle and back as on nominate, but black crown and hindcrown and browner (or dark brown) upper nape, cheek and ear-coverts, lores blackish, lacks pink tips on plain grey lesser coverts, and chin and throat grey or pale buff; *haematopygia* male breeding has blackish-brown forehead to nape, mantle and scapulars, tips of rump more vinous, lesser coverts pale grey (lacking pink tips), face to lores and chin brownish-black and side of neck deep dull brown, female has less extensively blackish hood, paler throat and smaller rump patch; *margaritacea* is plainer grey than others, forehead and underparts paler, silvery grey, pink tips in wing feathers extend to edges of outer primaries. Voice. Song a short and weak trill, given during short breeding season. Call a loud "twitt-twitt", "twee-ti-ti" or "peek-peek", often given in flight and by members of flock; flight calls mostly "twee-t-ti" or a disyllabic "peek-peek", occasionally as a dry "chirrup"; alarm call a harsh "churr" or a series of short dry chirps.

Habitat. Breeds on montane crags and cliffs, barren, treeless plateaux, boulderfields, stony alpine meadows and high-altitude valleys, and scree slopes, often in boggy areas or along edges of streams in summer, at 2100–6000 m; 2100–3500 m in Russian Altai, 3000–4050 m in E & SE Kazakhstan, 3650–4800 m in N Pakistan and to 5500 m in Ladakh, and down to c. 3000 m in W Himalayas (sometimes reaching 1500 m in Gilgit). n winter in similar habitat or around farmland and edges of cultivation at lower altitudes; down to c. 3600 m Sikkim, to 1500 m in Tuva (S Russia), and occasionally to 1200 m in Uzbekistan and Kazakhstan.

Food and Feeding. Mostly seeds and shoots of small alpine plants, including those of *Artemisia*, *Corydalis*, *Sedum*, *Primula*, alpine poppy (*Papaver*), *Potentilla*, sorrel (*Rumex*), groundsel (*Senecio*), chickweed (*Stellaria*) and campion (*Silene*), also some cereals, including barley taken from fallow fields; rarely, berries of juniper (*Juniperus*). Forages on the ground, and often along edge of snow-melt or from snowfields; takes floating seeds from edge of montane lakes, also readily perches on long grasses, bushes, boulders and walls. Gregarious throughout year, in summer in flocks of up to 60 individuals; in non-breeding season in larger numbers, up to 1000 (often of same sex) together, smaller groups occasionally foraging in association with *L. nemoricola*, *L. arctoa* and *Carpodacus rubicilla*, and sometimes associating loosely with Black-winged Snowfinch (*Montifringilla adamsi*). In flight forms tight, swift, twisting and wheeling formations, like those of *L. nemoricola*.

Breeding. Season Jun–Aug. Colonial, loosely colonial or solitary; in Kazakhstan, three nests 80–200 m apart in cliff. Male defends nest and partner, but not territory. Male lands close to female and displays with head raised and bill pointing skywards, wings partially spread, drooped and quivered, and tail partially raised and spread, while giving rapid weak trill. Nest a loose or rough cup of grass, moss, leaves, animal hair and feathers, placed deep in hole, crevice, beneath rocks or loose stones or down rodent burrow. Clutch 3–5 eggs, plain white; incubation by female, fed on nest by male, period c. 13 days; chicks fed and cared for by both parents, nestling period 15–17 days.

Movements. Resident and partial or altitudinal migrant. Those in higher-lying areas make post-breeding descent to lower-level foothills, although many remain at high elevations unless winter particularly severe; in non-breeding season also becomes nomadic, and wanders to lower valleys.

Status and Conservation. Not globally threatened. Common in most of range; scarce in N Pakistan, locally common or rare in Altai, and rare in Tuva. Locally abundant in non-breeding season. In Russian Altai, 5–6 pairs found breeding in 2 km².

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gavrilov & Gavrilov (2005), Grimmett *et al.* (1998), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Irisova (2007), Korelov *et al.* (1974), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Paludan (1959), Pfister (2004), Potapov (1963), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Stepanyan (2003), Vaurie (1949, 1959), Wassink & Oreel (2007).

87. Sillem's Mountain-finch

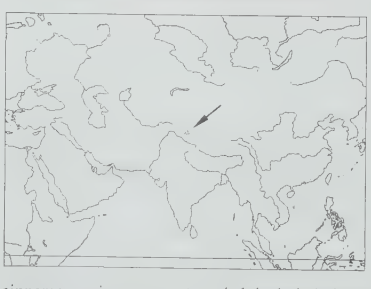
Leucosticte sillemi

French: Roselin de Sillem **German**: Sillemschneegimpel **Spanish**: Pinzón Montano de Sillem
Other common names: Sillem's Rosy-finch, Tawny-headed Mountain-finch

Taxonomy. *Leucosticte sillemi* Roselaar, 1992, Kushku Maidan, 5125 m, west Tibetan Plateau, China.

Relationships uncertain; may possibly belong within genus *Kozlowia* if found to be sexually dimorphic; further research required. Monotypic.

Distribution. SW Xinjiang, in SW China.



Descriptive notes. 15 cm. Known only from two specimens (adult male and juvenile male). Medium-sized to large grey or grey-brown finch. Male has head and neck bright tawny-cinnamon, or slightly paler on lower neck, with pale buff around base of bill; upperparts drab grey, feathers tipped buff in worn plumage, rump and uppertail-coverts isabelline-white or washed greyish; tail dark drab grey, narrowly fringed pale pinkish-buff in fresh plumage (fringes white when worn); upperwing-coverts like upperparts, bases of inner webs of greater coverts and tertials sometimes darker, outer edges of greater coverts washed pale pinkish-cinnamon; primary coverts and alula dark drab grey, tipped blackish, flight-feathers also dark drab grey, outer webs narrowly fringed paler grey, tips of secondaries and inner primaries off-white; chin to breast and side of breast pale cinnamon-buff, rest of underparts white with pale yellowish-buff wash, heaviest on flanks; underwing-coverts and axillaries white; bare parts undescribed. Differs from male *L. brandti* (of race *pallidior*) in tawny-cinnamon head and neck lacking black on forehead and sooty grey on sides, in unstreaked lower mantle and scapulars, off-white (not drab grey) rump and uppertail-coverts lacking pink fringes, drab grey (not blackish) tail, primary coverts and flight-feathers, greatly reduced pale grey (not strongly contrastingly white) fringes in wing, buff (not drab grey) chin to breast and off-white (not drab grey) belly, differs also in wing and tail ratio. Female unknown. Juvenile male has upperparts heavily streaked pinkish-buff and dark grey-brown, rump less heavily streaked pale buff and grey-brown, uppertail-coverts uniformly drab grey with slight darker streaking, tail as on adult male, lesser and median upperwing-coverts drab grey with pale cinnamon-grey tips, rest of wing as on adult, sides of head and neck mottled off-white or pale buff and grey-brown, chin white, throat to breast and upper flanks white with broad and poorly defined grey-brown shaft streaks, rest of underparts as on adult. Voice. Undescribed.

Habitat. No information; specimens collected at 5125 m on high montane barren plateau.

Food and Feeding. Unknown.

Breeding. No information.

Movements. No information. Presumed resident, as adult collected was in full moult in Sept.

Status and Conservation. Data-deficient. Restricted-range species: present in Southern Xinjiang Mountains Secondary Area. Unknown in the wild. Described in 1992 from two specimens (adult male and juvenile male) collected in early Sept 1929, both on a barren plateau between upper R Kara Kash and upper R Yarkand, in extreme SW Xinjiang (in an area under Chinese administration, but also claimed by India). The juvenile's wings were not yet fully grown, and the collector considered that the birds had bred close either to where they were taken or on nearby peaks in Kunlun Shan. Species presumably localized and scarce, although it is unlikely that any threats exist in the remote area where it was found.

Bibliography. Anon. (2009i), Butchart & Stattersfield (2004), Collar *et al.* (2001), MacKinnon & Phillipps (2000), Pfister (2004), Rasmussen & Anderton (2005a, 2005b), Roselaar (1992), Sillem (1934).

88. Asian Rosy-finch

Leucosticte arctoa

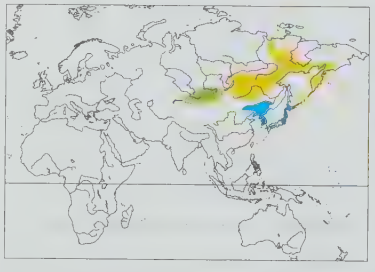
French: Roselin brun **German**: Rosenbauch-Schneegimpel **Spanish**: Pinzón Montano Pardo
Other common names: Siberian Finch, White-winged Rosy-finch/Mountain-finch, Arctic/Japanese Rosy-finch

Taxonomy. *Passer arctous* Pallas, 1811, Russian Altai.

Has been thought possibly to form a superspecies with *L. tephrocotis*, *L. atrata* and *L. australis*, and all are often treated as conspecific; recent analysis of mitochondrial DNA indicates close genetic similarity among all four. Five subspecies recognized.

Subspecies and Distribution.

L. a. arctoa (Pallas, 1811) – breeds in SC Russian Siberia (C, S & SE Altai, W Sayan Mts, Tannu Ola Mts), NE Kazakhstan and NW Mongolia; winters (possibly breeds) NW China (NW Xinjiang).
L. a. cognata (Madarász, 1909) – Siberia (E Sayan E to C Baikal Mts) and N Mongolia.
L. a. sushkini Stegmann, 1932 – Khangai (Hangayn) Mts, in WC Mongolia.
L. a. gigliolii Salvadori, 1869 – SE Siberia from N Baikal Mts E to W Stanovoy Mts (SW Yakutia).
L. a. brunneonucha (J. F. Brandt, 1842) – breeds in Russian Far East and NE Siberia (from Lena delta S to C Stanovoy Mts, E to Anadyr Range, S Chukotskiy Peninsula, Koryak Mts, Kamchatka and Kuril Is) and S to NE China (NE Inner Mongolia and W Heilongjiang); non-breeding also NE China (Inner Mongolia and Heilongjiang S to Hebei), Korea and Japan (S to C Honshu).



Descriptive notes. 14–18 cm; 22–48 g. Large and large-billed, stout finch, variably blackish to buff-brown and streaked or washed pinkish, with white or pinkish edges of flight feathers and forked tail. Male nominate race has lores, side of lower forehead and chin black, forehead to crown sooty black, indistinctly spotted pale greyish-white subterminally, nape and side of neck paler, greyer or greyish-buff, cheek and ear-coverts dark brown or blackish, finely streaked or flecked whitish; lower nape and upperparts dark chocolate-brown, tinged rust-brown, mantle and back with paler brown edges, rump grey with darker shafts and tips, uppertail-coverts and tail pale grey or whitish with black shafts, tail feathers with dark grey or blackish tips; median coverts pale grey with blackish shafts and fringes, greater coverts and alula to flight-feathers white or whitish-grey, broadly tipped blackish-brown, tips of alula, primary coverts and greater coverts blackish, tertials blackish, broadly edged pale silvery grey; underparts as upperparts, indistinctly tipped paler on breast and pinkish or light purple on lower breast to belly and flanks; undertail-coverts grey or grey-brown with darker shaft streaks and tips; iris brown; bill black in summer, pale brown to straw-yellow base of lower mandible in winter; legs black. Female is very like male, but has paler brown head, face slightly darker and without paler flecking, crown streaked (in worn plumage), paler brown body with paler buff-brown edges and tips on upperparts and underparts, wing and tail duller or less intensively silvery. Juvenile is much paler and more uniformly brown or grey-brown than adult, with buffish or sandy edges and tips, median and greater upperwing-coverts tipped pale buff, face and underparts flecked or streaked pale grey, belly paler buff-brown. Race *sushkini* male is more heavily tinged pink above and below, greater coverts, flight-feather and tail grey or greyish-brown, female wings and tail darker; *cognata* male is deeper or more rose-pink on body than nominate, female paler on head and body, both sexes with darker wings and tail; *gigliolii* has dark grey or brown forehead to crown and face (sometimes flecked paler buff), in fresh plumage (winter) forehead red or deep red, nape to upper mantle pale buff/buffish-brown, upperparts rich brown with reddish-purple tinge, rump deeper reddish-brown, black uppertail-coverts finely tipped reddish-brown, chin to breast dark grey/blackish, side of belly and flanks deep reddish-brown, undertail-coverts blackish, wing and tail blackish-brown, flight-feathers finely fringed buff (fresh plumage), bill horn-grey, sexes almost alike, female more drab grey-brown with paler head and browner upperparts (lacking red) streaked darker, and in fresh plumage (winter) upperwing-coverts tipped pale buff, and tertials broadly edged buff, underparts like face or slightly darker; *brunneonucha* has forehead to crown black, sometimes with greyish feather centres, nape and side of neck yellowish or tawny yellowish-buff, upperparts dark brown with rich tawny or sandy-brown edges, lower back to uppertail-coverts blackish-brown with whitish feather centres and tipped deep pink, median and greater upperwing-coverts dark brown, edged pink (broadly on greaters), flight-feathers black, edged pinkish (broadly so on bases of secondaries), tail blackish-brown, edged paler, throat and upper breast black, finely tipped pearl-grey or whitish, lower breast, belly and flanks blackish-brown, tipped white or pale pink, female much duller than male, browner or grey-brown, pink in wing restricted to edges of outer median coverts, flight-feathers

edged whitish, lower flanks and undertail-coverts pale orange-pink. Voice. Song, from ground, top of rock or during undulating circular flight, a slow descending series of the "chew" or "tew" call note. Calls include "chew", "tew" or "cheew" notes given repeatedly, also dry or hoarse "pert" and high-pitched "chirp" like that of a sparrow (*Passer*).

Habitat. Breeds on barren and treeless montane plateaux, alpine tundra, moraine at edges of snowfields and glaciers, rocky slopes, cliffs, shorelines and boulder beaches; above 2700 m in N & C Altai and at 2300–3000 m in S Altai, to 1300 m in Stanovoy range, to 1900 m in Kamchatka, and to 5500 m in N China. In winter found in open grassy areas on hillsides, edges of cultivation, coastal plains with scattered trees, rocky shorelines and beaches; often at lower elevations than when breeding, and down to sea-level in some areas.

Food and Feeding. Mostly seeds, buds, stamens and shoots; some invertebrates. Seeds include those of grasses (Gramineae), knotweed (Polygonaceae), sedges (*Carex*), five-fingers (*Potentilla*), dandelion (*Taraxacum*), saxifrage (*Saxifraga*), clematis (*Clematis ochotensis*), shepherd's-purse (*Capsella*) and goosefoot (*Atriplex*); seeds and stamens of Papaveraceae; seeds and shoots include those of birch (*Betula*), also buds of willow (*Salix*); also shrub pine nuts (*Pinus pumila*), and berries, including those of great bilberry and red whortleberry (*Vaccinium*), and crowberry (*Empetrum*). Invertebrates taken include larvae and adults of mosquitoes (Culicidae) and other flies (Diptera), butterflies, moths and larvae (Lepidoptera), beetles (Coleoptera), spiders (Araneae) and snails (Pulmonata). Feeds on ground and in low vegetation; in mountain regions usually forages near melting snowfields, and in winter in Kamchatka feeds in weedy areas. In pairs and small flocks; in-non-breeding season in large flocks of up to 300 or more individuals.

Breeding. Poorly known; few nests found. Season Jun–Aug, from Jul in coldest climatic areas; one brood. Solitary or loosely colonial. Nest built by female, male occasionally bringing material, a loose, thick-walled cup of grass, moss, dry herbs, animal hair, fur and feathers, placed in rocky fissure or crevice in rocks, cliff or under boulders and scree or in burrow in stony ground. Clutch 2–5 eggs, pure white or white with light pink tinge; incubation by female, period c. 12 days; young fed and cared for by both parents. No further information.

Movements. Migratory, partial migrant and altitudinal migrant; may be entirely sedentary in breeding area until forced to move by heavy snowfall or severe weather severe. Moves to lower levels in non-breeding season, mostly from late Sept/Oct; arrives in Altai valleys from late Oct, and in Japan (mainly Hokkaido S to C Honshu) from late Nov; present Japan to early Mar, but peak numbers Jan–Feb. Return movement to breeding areas in Altai from middle or end Mar, and present around N parts of L Baikal from late Feb/early Mar, returning to breeding area in May; race *gigliolii* recorded N of breeding range to R Nizhnyaya Tunguska, nominate race variably common in some winters in valleys of Kazakhstan Altai, vagrant in SE Kazakhstan (Dzhungarian Alatau); *brunneonucha* common in winter in Kamchatka, flocks frequently consisting solely of males, also rare passage migrant Beidaihe, in NE China, and vagrant in E Kazakhstan and S Korea.

Status and Conservation. Not globally threatened. Common in C Altai, and occasionally abundant in wintering area of Russian Far East and Mongolia; otherwise uncommon or locally common, scarce in Korea, rare NE Kazakhstan. Densities of 25–30 individuals/km² in C Altai alpine tundra, 3 individuals/km² in high stony tundra of W Sayan Mts and 2–4 individuals/km² in C Kamchatka. Small numbers may breed in mountains of C Hokkaido (N Japan), where observations of birds in juvenile plumage, including one still being fed by adults, but no nests found.

Bibliography. Brazil (1991, 2009), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gerasimov (2000), Gore & Won Pyong-Oh (1971), Korelov *et al.* (1974), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Nechaev (1991), Rogacheva (1992), Shipunova (1972), Stepanyan (2003), Sushkin (1938), Vaurie (1949, 1956a, 1959), Vorobiev (1963), Wassink & Oreel (2007).

89. Grey-crowned Rosy-finch

Leucosticte tephrocotis

French: Roselin à tête grise **Spanish**: Pinzón Montano Nuquigris
German: Schwarzstirn-Schneegimpel

Taxonomy. *Linaria* (*Leucosticte*) *tephrocotis* Swainson, 1832, near Carlton House, Saskatchewan, Canada.

Has been thought possibly to form a superspecies with *L. arctoa*, *L. atrata* and *L. australis*, and all are often treated as conspecific; recent analysis of mitochondrial DNA indicates close genetic similarity among all four. Has hybridized with *L. atrata*. Nominate race and *griseonucha* intergrade in Alaska. Proposed race *irvingi* (described from Anaktuvuk Pass, in N Alaska) considered synonymous with nominate, and *maxima* (from Commander Is, off NE Russia) synonymized with *griseonucha*. Six subspecies recognized.

Subspecies and Distribution.

L. t. griseonucha (J. F. Brandt, 1842) – Commander Is, and Aleutian Is (including Shumagin Is and Semidi Is) E to Alaskan Peninsula; non-breeding S to Kodiak I.

L. t. umbrina Murie, 1944 – Hall I, St Matthew I and Pribilof Is, in Bering Sea.

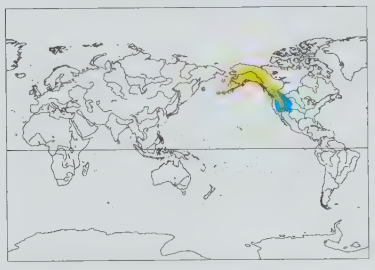
L. t. littoralis S. F. Baird, 1869 – breeds SC Alaska E to W Canada (SW Yukon, NW British Columbia) and S in W USA from Washington and Oregon (along Cascade Mts) to N California (Mt Shasta); winters in S of breeding range E to C Montana, W Nevada, N Utah and C New Mexico.

L. t. tephrocotis (Swainson, 1832) – breeds N & C Alaska E to NW Canada (C Yukon, British Columbia, W Alberta) and NW USA (NW Montana); winters from S British Columbia E to SW Saskatchewan and South Dakota, S to NE California, Nevada, Utah, W Colorado and N New Mexico.

L. t. wallowa A. H. Miller, 1939 – breeds NE Oregon (Wallowa Mts); winters S to WC Nevada and CE California.

L. t. dawsoni Grinnell, 1913 – E California (Sierra Nevada and White Mts).

Descriptive notes. 14–18 cm; 21–29 g, 41–60 g (*griseonucha* and *umbrina*). Large and large-billed, stout brown finch with long pointed wing, whitish or pinkish edges of flight-feathers and forked tail. Male nominate race has whitish nasal tufts, lores, forehead and forecrown black, hindcrown, upper nape and upper side of neck to behind eye grey; cheek, ear-coverts and side of neck to upperparts warm brown, indistinctly streaked darker on mantle and back, more heavily or broadly streaked browner on scapulars; rump and uppertail-coverts brown, broadly fringed or tipped pale pink; tail black or blackish, outer feathers finely fringed pale brown or pink distally; median upperwing-coverts black, broadly fringed pink, greaters black, broadly fringed and tipped pale pink; alula and primary coverts finely fringed pale or whitish-pink, flight-feathers black, broadly edged pink or light reddish-pink, tertials blackish, narrowly fringed pale buff; below, same colour as upperparts, or slightly darker brown on chin to lower breast, more broadly tipped darker brown on breast and belly, brown flanks and undertail-coverts (also lower belly on some) broadly fringed pinkish (pale buff or yellowish when worn); iris black; bill black or slate-grey, in non-breeding season pale brown with straw-yellow base of lower mandible; legs black. Female is similar to male, but generally paler or duller brown, with fine blackish tips on browner forehead



and crown (grey on hindcrown may be reduced or absent); lacks pink fringes and tips on wing feathers and on flanks to undertail-coverts, has median and greater upperwing-coverts broadly tipped and flight-feathers and tertials edged pale buff or whitish. Juvenile has head, upperparts, including wing, and underparts dark slate-grey, tips of median and greater upperwing-coverts and edges of flight-feathers bases broadly warm buff-brown, tips of flight-feathers also narrowly buffish, undertail-coverts whitish with broad grey central shafts and tips. Race *griseonucha* is largest, has forehead to crown black and face to hindcrown, nape and side of neck silvery grey, upperparts deep brown, rump and uppertail-coverts blackish-brown with pale pink feather tips, wing and tail blackish-brown, tips of wing-coverts bright pink (fading to whitish in worn plumage), chin and throat blackish, breast deep brown (lacking white tips), lower breast and belly prominently tipped rose-pink, juveniles generally sooty brown, tinged ash-grey, upperwing-coverts dull grey, edged paler, flight-feathers black, narrowly edged whitish on primaries and pale buff-brown on secondaries and (broadly) tertials; *umbrina* is very similar to previous but longer-billed, darker or blackish above and below, especially on head and throat, with breast, mantle and back rich dark brown, broadly mottled blackish; *littoralis* is similar to nominate, smaller and shorter-billed than previous, forehead to crown black, rest of head and face ash-grey, and chin and upper throat grey and black contrasting with dusky-brown breast; *wallowa* is similar to nominate, but underparts duller cinnamon to sooty brown, back feathers broadly streaked darker and only narrowly fringed yellowish or reddish-brown, black of throat merges with that on breast; *dawsoni* has more slender bill, rounded wingtip, upperparts paler, more tawny-brown, narrowly streaked pale brown, underparts darker grey. Voice. Song, usually only at start of breeding season from early Feb (and usually only in early morning), by male on ground or occasionally in flight and mostly directed at female, a series of slow repeated "chew" notes or "jeew jeew jeew" descending whistles, varying in pitch and intensity, interspersed with warbling or lilting and occasional buzzing notes; some song given also by females of race *griseonucha*. Contact and flocking calls include "chew", at varying intensity and pitch, variations include "see-ew", "chew-woo", "cheew-wip", "chee-up"; also "peent", usually just before taking flight, and a series of rapid chirps; anxiety and distress calls similar, including high-pitched "peee" and loud chirps at approach of predator near nest.

Habitat. Mainland races breed in alpine snowfields, meadows, glaciers, cliffs, scree slopes and rocky areas above tree-line, island races on lower-level tundra, cliffs, hillsides and grass-covered dunes, scrubby areas, boulder-strewn and rock-covered beaches and edges of cultivation, roadside edges, towns and human settlements; from sea-level to 3000 m.

Food and Feeding. Mostly seeds, buds, shoots; some insects. Seeds and shoots include those of *Cochlearia*, crowberry (*Empetrum*), wild parsnip (*Angelica*), chickweed (*Stellaria*), buttercup (*Ranunculus*), water chickweed (*Montia*), cinquefoil (*Potentilla*), eriogonum (*Eriogonum*), bluebell (*Campanula*), saxifrage (*Chrysosplenium*), willowweed (*Epilobium*), mustard (*Sisymbrium*), sea-parsley (*Ligusticum*), whitlowgrass (*Draba*), sunflower (*Helianthus*), Russian thistle (*Salsola*), rushes (*Juncus*), sedges (*Carex*) and grasses (Gramineae). Insects taken include flies (Diptera), mayflies (Ephemeroptera), cutworms (Lepidoptera), scale insects (Coccoidea), craneflies (Tipulidae), and beetles (Coleoptera), including weevils (Curculionidae); proportion of insects taken increases during summer. Nestling diet mainly insects or larvae. Forages on open ground, where it walks or hops, with slight head-bobbing movement, among rocks and along edges of snow-line and glaciers; also in bushes and conifers. Picks seeds from ground and insects from grasses and plants; also pursues and catches insects in flight; eats snow crystals and feeds in salted and urine-covered ground. In non-breeding season gathers in large flocks of up to 100 or more individuals, which may wander at random over large areas in search of food; often congregates on fence posts, bushes or telephone wires, and sometimes gathers at feeding stations when snow covers natural feeding areas.

Breeding. Season late Apr to Jul/Aug; montane populations usually single-brooded, island populations (Aleutian Is and Pribilof Is) two or three broods. Monogamous. Pair formation takes place in late winter and early spring, usually before departure from wintering area. In courtship display, male, with sleeked plumage or body feathers ruffled, tail slightly raised and wings slightly drooped, crouches on ground in front of female, and the two may advance slowly towards each other and touch bills; male also slowly lifts and lowers stiffened open wings. Nest built by female, accompanied by male when collecting material, a large or bulky cup of sedges, grass, moss, lichen, animal hair and feathers, placed among rocks, boulders, in scree or in hole in cliff or on ledge, frequently on building (including houses) in Aleutians. Clutch 2–5 eggs, white or pale creamy, unmarked or faintly speckled or spotted with red or yellowish-brown; incubation by female, period 12–16 days; chicks fed and cared for by both parents, nestling period 15–22 days; young fed by both parents for up to 21 days after leaving nest. Breeding success apparently very high for arctic and alpine populations: of 35 nests in Aleutian Is study, 74% survived to hatching, and overall success rate 57%; of 24 nests in Sierra Nevada (California), 20 successfully fledged young, remainder lost to predation; five nests in Montana all successfully fledged young; predators include arctic fox (*Alopex lagopus*), Peregrine Falcon (*Falco peregrinus*), Gyrfalcon (*Falco rusticolus*), American Kestrel (*Falco sparverius*), Western Screech-owl (*Otus kennicottii*), Great Grey Shrike (*Lanius excubitor*), rodents, including golden-mantled ground-squirrel (*Spermophilus lateralis*), and weasels (Mustelidae). Breeds in first year. Maximum recorded longevity 6 years 7 months.

Movements. Resident and migratory. Races *griseonucha* and *umbrina* sedentary; *dawsoni* and *wallowa* make post-breeding descent to lower levels; nominate race and *littoralis* move longer distances in non-breeding season. Timing of departure largely dependent on onset of winter weather; most movement away from breeding areas from early Nov, but may leave highest parts of range in late Oct; arrives in wintering area from early Nov. Departure from wintering areas in late Mar in NW & NC USA and Saskatchewan. High-altitude breeding populations of race *dawsoni* may be sedentary in some years, otherwise return to breeding areas in first half Apr. Rare migrant in USA E to Iowa, Wisconsin, Illinois, Michigan and Ohio; vagrant to Maine.

Status and Conservation. Not globally threatened. Common, locally common or scarce. In early 20th century, numbers of this species breeding on Pribilof Is severely reduced by extremely large winter invasion of Gyrfalcons, which nearly exterminated breeding population; only partial recovery achieved in following four years.

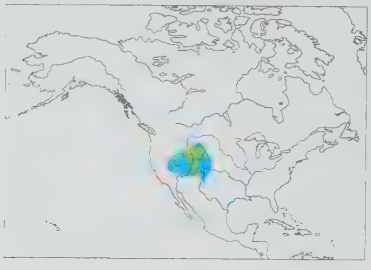
Bibliography. Bent & Austin (1968), Clement *et al.* (1993), Dawson (1922), Dixon (1936), Godfrey (1986), Grinnell (1913), Hanna (1922), Johnson (1977, 1983), King & Wales (1964), Leffingwell & Leffingwell (1931), MacDougall-Shackleton *et al.* (2000), Mailliard (1922), Marten & Johnson (1986), Mayr & Short (1970), McCarthy (2006), Miller, A.H. (1939, 1941), Miller, J.H. (1988), Moody (1910), Potter (1935), Pyle *et al.* (1997), Ray (1910), Shaw (1936a, 1936b), Shreeve (1977, 1980), Sibley (2000), Small (1994), Stepanyan (2003), Taylor (1923), Twining (1938, 1940), Vaurie (1956a, 1959), Wheeler (1940).

90. Black Rosy-finch

Leucosticte atrata

French: Roselin noir **German**: Rußschneegimpel **Spanish**: Pinzón Montano Negro

Taxonomy. *Leucosticte atrata* Ridgway, 1874, Cañon City, Colorado, USA.
Has been thought possibly to form a superspecies with *L. arctoa*, *L. tephrocotis* and *L. australis*, and all are often treated as conspecific: recent analysis of mitochondrial DNA indicates close genetic similarity among all four. Has hybridized with *L. tephrocotis*; hybridizes with *L. australis* in area of overlap. Monotypic.
Distribution. Breeds WC USA (SC Montana S to N Nevada, N Utah and W Wyoming); more widespread S to SC USA in non-breeding season.



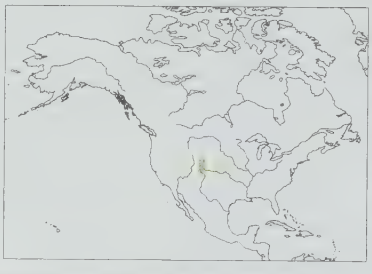
Descriptive notes. 14–16 cm; 20·7–32 g. Large, stoutly built blackish finch with bright pink edges of flight-feathers and forked tail. Male has whitish nasal tufts, lores, forehead and forecrown black, hindcrown and side of crown (from behind eye) to upper nape silvery grey; rest of face to side of neck and chin to breast black or blackish-brown; upper mantle slate-grey, rest of upperparts black or blackish, finely fringed paler, rump and uppertail-coverts grey-brown with subterminal blackish band and broad pink tips (appears barred deep pink with blackish tips in fresh plumage); tail blackish with narrow pale fringes, which are pale pink basally becoming whitish towards tip; upperwing black, lesser to greater coverts broadly fringed pink, inner greaters with increasing extent of black, alula and primary coverts finely fringed pale pink, flight-feathers broadly edged pink or pinkish-white distally, tertials fringed pale grey, off-white or light pink; side of breast to belly dark brown or black, feathers finely fringed paler or whitish, becoming broadly fringed bright pink on belly and flanks; undertail-coverts blackish, broadly tipped pink or whitish when worn; iris dark brown; bill black or slate-grey in summer, yellow with black tip in winter (change often beginning in mid-summer); legs black. Female is like male, but grey on hindcrown and upper nape may be reduced or absent in mid-summer (only side of crown pale grey), upperparts generally paler or browner, streaked darker in summer and more scalloped in winter, edges of upperwing-coverts and flight-feathers whitish or frosted pink; underparts more broadly fringed whitish, most feathers with broad white fringes, may show pale pink on lower flanks and belly (feathers with blackish tips), undertail-coverts whitish or pale buff, sometimes tinged pinkish. Juvenile has head mostly dull grey, tinged brownish, back and scapulars dark brown, fringed paler, tail dark brown, all outer rectrices edged finely pale brown or pinkish, outermost edged whitish, wing blackish, median and greater coverts edged pale grey and broadly tipped pale or buffish-cream or whitish, flight-feathers edged pale grey, outer edges of primaries finely edged pink to white distally (male) or mostly whitish (occasionally light pink on female), upper mandible yellowish or dusky brown, legs yellowish or dark brown; first-year retains outer wing-coverts, all primaries and tail feathers, otherwise like adult, but wing-coverts more worn and with pale edges contrasting with fresh inner feathers, outer flight-feathers appear more tapered, crown feathers with fine whitish tips and grey feathers of sides of crown and upper nape may be tipped blackish, upperparts (in fresh plumage) narrowly fringed whitish, and longest uppertail-coverts tipped paler than rest. Voice. Song, by male only, a long series of tuneless "chew" notes, either in phrases or as a long series at varying pitch and volume; reported as occasionally giving melodious twitter in breeding season. Calls include descending, harsh "chew", similar to "chirp" note of House Sparrow (*Passer domesticus*) and often given in rapid series and at varying pitch, also lower-pitched "pert", usually by flock-members and often given with other notes e.g. "pert, pert, chew..."; alarm/anxiety note a high-pitched "peent".
Habitat. Breeds on montane and submontane tundra, edges of snowfields and glaciers, cliffs and open scree slopes above tree-line (sometimes below in similar habitat) and around edges of alpine lakes; 2600–3600 m. In non-breeding season found on lower-level mountain slopes and valleys, usually near or above snow-line, and may occur along roadsides, cattle yards and edges of cultivation, also in open plains or sparsely vegetated areas between mountains in pinyon pine (*Pinus*) and juniper (*Juniperus*) woodlands, sagebrush (*Artemisia*), greasewood (*Sarcobatus*) and rabbitbrush (*Chrysothamnus*); also occurs at feeding stations within forests and at edges of large cities; roosts communally in caves, mine shafts, barns, and clusters of Cliff Swallow (*Petrochelidon pyrrhonota*) nests.
Food and Feeding. Mainly seeds and small insects. Seeds include those of families Brassicaceae (mostly *Smelowskia*, *Arabis* and mustard), Caryophyllaceae (*Silene*), Rosaceae (*Sivversia*, *Sibbaldia*) and Portulacaceae (*Lewisia*), also Russian thistle (*Salsola*), alpine sorrel, spotted saxifrage (*Saxifraga*), *Potentilla* and grasses (Gramineae); also wide variety of lowland herbs in winter; in non-breeding season occurs at feeding stations, where it takes various seeds including sunflowers (*Helianthus*), corn (*Zea*), millet (*Panicum*) and peanuts. Insects and larvae of aphids and leafhoppers (Hemiptera), mayflies (Ephemeroptera), flies (Diptera) including craneflies (Tipulidae), moths (Lepidoptera), bees and wasps (Hymenoptera), beetles (Coleoptera); also other invertebrates, including mites (Acari), spiders (Araneae) and roundworms (Nematoda). Nestlings fed mostly with invertebrates and larvae. Forages entirely on ground, usually at edge of snow-line, on sparsely vegetated boggy alpine meadows, grassy patches and bare rocky areas, also along edges of streams and ponds; perches on roadside wires. Takes seeds from standing plants, and occasionally pursues insects in flight, particularly those flushed from ground. Forages in pairs and small flocks, in non-breeding season in larger flocks of up to 1000 individuals, often associating with *L. tephrocotis* and *L. australis*. Foraging flocks move forward in leap-frog manner in successive waves, as birds move over each other to adjacent areas; flock in flight moves in tight gliding and wheeling formation. Adults travel up to 4 km from nesting area to forage.
Breeding. Season Jun–Aug; one brood. Monogamous. Solitary or loosely colonial. Displaying male crouches with head held forward (may hold nesting material in bill), body horizontal, wings held out from body and slightly quivered, and tail partly raised and spread, while giving rapid chirping call; may continue while hopping left and right or in semi-circle around female, or following her on ground; receptive female may respond in similar display; male also displays with body held more upright and plumage sleeked, wings closed, but tips of primaries touching ground, and wings alternately lifted up and down (similar to wing-wave displays of *L. australis* and race *griseonucha* of *L. tephrocotis*). Nest built entirely by female, mostly from grass, moss and plant stems, animal hair, occasionally wool and some feathers, placed in crevice in cliff, under rocks or in scree slope, usually under overhang. Clutch 3–6 eggs, pure white; incubation by female, period 11–14 days; chicks fed and cared for by both parents, nestling period apparently up to 20 days; young remain in family group for up to two weeks, then join other groups to form flocks of up to 150 individuals. Breeding success little studied, but thought to be high; known to suffer predation from Clark's Nutcracker (*Nucifraga columbiana*). Breeds in first year. Maximum recorded longevity 5 years 8 months.
Movements. Altitudinal migrant, mostly remaining within breeding range or E to c. 200 km and S to c. 450 km beyond. Remains at high altitude until forced lower by heavy snowfall or winter storms, usually in Oct; may make daily return flights to higher levels during winter to feed in snow-free areas. Leaves lowest areas of wintering range from mid-Mar, returning to highest parts of breeding area in Apr, but sometimes forced lower again by late storms throughout Apr and May. In winter months, irregular and widely scattered throughout Nevada, irregular in occurrence in Arizona and N New Mexico; rare winter visitor to E Oregon, E California and N & E Colorado, and vagrant to Ohio.
Status and Conservation. Not globally threatened. Common in Wyoming and Utah; less numerous elsewhere.
Bibliography. Clement *et al.* (1993), French (1959a, 1959b, 1968), Howell *et al.* (1968), Johnson, R.E. (1972, 1977, 2002), Lichtwardt (2000), Marten & Johnson (1986), Mayr & Short (1970), McCarthy (2006), Miller, A.H. (1941, 1955), Miller, F.W. (1925), Pyle *et al.* (1997), Sibley (2000), Small (1994).

91. Brown-capped Rosy-finch

Leucosticte australis

French: Roselin à tête brune **Spanish**: Pinzón Montano Coronipardo
German: Coloradoschneegimpel

Taxonomy. *Leucosticte tephrocotis*, var. *australis* Ridgway, 1874, Mount Lincoln, Colorado, USA.
Has been thought possibly to form a superspecies with *L. arctoa*, *L. tephrocotis* and *L. atrata*, and all are often treated as conspecific; recent analysis of mitochondrial DNA indicates close genetic similarity among all four. Hybridizes with *L. atrata* in areas of overlap. Monotypic.
Distribution. W USA (Rocky Mts from S Wyoming S to N New Mexico).



Descriptive notes. 14–16·5 cm; 23–33 g. Large and large-billed, stout brown finch with long wings edged pinkish and forked tail. Male has whitish nasal tufts, lores, forehead and forecrown blackish, feathers behind eye to hindcrown and upper nape tipped paler or greyer (on some, a broad whitish or light grey supercilium from over eye to side of nape); cheek, ear-coverts, side of neck and upperparts warm russet-brown, streaked darker on mantle and back and more heavily or broadly browner on scapulars; rump and uppertail-coverts brown or grey-brown, broadly fringed pale pink or rose-pink; tail dark brown or blackish, finely fringed whitish or pale pink; all upperwing-coverts broadly fringed pale pink, becoming more scarlet in mid-summer; alula and primary coverts finely fringed pale pink, flight-feathers dark brown or black, broadly edged deep pink, tertials blackish, narrowly fringed pale buff or whitish; below, same colour as upperparts, or slightly darker brown on chin to lower breast (chin feathers sometimes tipped reddish), feathers more broadly tipped paler on breast; lower flanks and belly broadly tipped pinkish or deeper ruby-red, undertail-coverts blackish, broadly tipped whitish or pink; iris black; bill black or slate-grey, in winter straw-yellow base of lower mandible; legs black. Female is like male, but paler or greyer; forehead to crown and hindcrown variably dark brown (forming distinct cap) to dark grey-brown with fine pale grey or whitish fringes (pronounced scaled effect), upperparts deep brown, finely fringed whitish or pale buff, rump and uppertail-coverts sometimes appear barred pale pink and black; median upperwing-coverts blackish, broadly tipped deep pink, outer greater coverts broadly tipped pink, becoming paler or buffish on inners, edges of flight-feathers and tertials pale buff to whitish, primaries finely edged pinkish in fresh plumage; breast and upper belly cinnamon-brown, fringed whitish, becoming deep pink or pinkish in mid-summer. Juvenile has forehead to nape grey-brown and upperparts dark olive-brown, fringed paler, uppertail-coverts light cinnamon, broadly tipped cream or white, tail dark brown, edged pale brown to wine-red on outers and white on edge of outermost, median upperwing-coverts broadly tipped creamy buff or white, greater coverts deep cinnamon, tipped pink or deep pink, flight-feathers dusky brown, outer webs of primaries narrowly edged light brown to pinkish or reddish-pink and white distally (male) or paler pink to light cream or buffish (female). Voice. Song, by male from rock or top of cliff or in circling song flight, mostly a long series of tuneless "chew" notes given individually or as a series of phrases, varying in pitch and volume, and can incorporate other call notes, including "peee", "peent" and "weu". Calls similar to those of other rosy-finches and include low and descending guttural "chew", often given in flight and repeatedly, or with variations, "chew-chew, choy" or "chee-eu"; "peent" and "weu", singly or as a series in flight or when about to fly in flocks; loud "chirp" similar to that of House Sparrow (*Passer domesticus*), usually given when perched or in flight, as alarm or mobbing call (male's call lower-pitched than female's); also a high-pitched whistled "pee".
Habitat. Montane tundra above tree-line, snowfields, edges of glaciers, rocky areas and boulderfields, cliffs and scree slopes, at 3350–4330 m. In non-breeding season in high-altitude open meadows, alpine slopes and grassy valleys, usually at or around lower snow-line, and may occur on roadsides, open fields, parkland, around cattle troughs and infrequently at feeding stations in forests and edges of cities; also moves irregularly short distances to adjacent open plains.
Food and Feeding. Seeds; also insects in summer. Seeds include those of Cyperaceae (*Carex* and *Kobresia*), Juncaceae (*Luzula*), Asteraceae (*Hymenoxys*), Boraginaceae, Brassicaceae (mustard), Caryophylaceae (*Alsine*), Polygonaceae (*Polygonum*), Portulacaceae (*Lewisia*), Ranunculaceae (*Caltha*), Rosaceae; also pigweed (*Amaranthus*), Russian thistle (*Salsola*) and grasses (Gramineae), including grama grass (*Bouteloua*); in wintering area takes various seeds at feeding stations, including millet (*Panicum*), canary seed (*Phalaris*) and corn (*Zea*), but apparently not sunflower seeds (*Helianthus*). Insects taken are flies (Diptera), including craneflies (Tipulidae), moths (Lepidoptera), beetles (Coleoptera), aphids (Aphidoidea) and leafhoppers (Homoptera). Proportion of insects in diet highest (84%) in early Jul, dropping to c. 5% by early Sept. Nestling diet largely insects and larvae. Daily intake requirement of adult calculated as 5–6 g of insects and 6–8 g of seeds; stores fat for overwinter period, and on average up to 3 g heavier in winter than in summer; new seeds preferred over year-old ones, possibly selected for higher energy value. Forages on open ground, on snow and mud in boggy areas of snow-melt, also on cliffs, rocky screes and along shores of montane lakes for emerging insects; picks seeds from plants and grasses. Turns seeds in bill and ejects husks, may swallow large seeds whole. Also pursues and catches insects in flight or by jumping from ground. Forages singly, in pairs and in small groups; in non-breeding season occurs in large flocks of several hundreds of individuals, often in company with *L.*

tephrocotis and *L. atrata*; also in post-breeding flocks of up to 60 juveniles and early-summer flocks of up to 50 (mostly males) together. Makes local movements of several kilometres in search of feeding areas in summer.

Breeding. Season end Jun to early Sept; one brood. Monogamous. Solitary, also loosely colonial, with inter-nest distance 2 m. Territorial; male strongly defends female during entire season, and both sexes defend area of up to 20 m around nest-site. Pair formation little known, possibly before break-up of wintering flocks or on arrival in breeding area. Male performs prolonged aerial song flight during early part of nesting season; on ground, displaying male leads female across cliff face and crouches with head and neck stretched horizontally, plumage fluffed out, tail raised and wings drooped and slightly quivered, while giving rapid series of loud chirps (may also carry or attempt to pick up grass stems) at potential nesting sites; female may have similar responding display, but also with begging calls. Nest built by female, male sometimes assisting by carrying material, a cup of tightly woven grass, bark strips, plant stems, roots, leaves, moss, animal hair, feathers and mud, placed in fissure or crevice or on ledge on cliff (usually under protecting overhang), under rocky scree, in cave, mine shaft or tunnel, and has been recorded as nesting on rafter in disused building. Clutch 3–5 eggs, pure white; incubation by female, fed by male for part of incubation stage, period 12–14 days; nestling period 17–20 days; young independent 10–14 days after leaving nest, but remain with parents in family party or join with other juveniles in larger flock. Breeding success little known: at one Colorado site at least one young fledged at five of seven nests, and at second site only four young fledged from 18 eggs; little information on predation, but at third Colorado site present species accounted for 21·4% of 89 prey items at Prairie Falcon (*Falco mexicanus*) eyrie, also at cliff sites fledglings preyed on by Clark's Nutcracker (*Nucifraga columbiana*) and Common Raven (*Corvus corax*); hole-nesting pairs suffer predation by least chipmunk (*Tamias minimus*), golden-mantled ground-squirrel (*Spermophilus lateralis*) and long-tailed weasel (*Mustela frenata*). Breeds in first year.

Movements. Resident and altitudinal migrant. Post-breeding descent to lower-level grasslands and valleys between mountain ranges; departure usually triggered by onset of severe weather, with deep snow covering feeding areas, from late Sept and Oct; present at lower elevations until Mar, but makes frequent visits to high areas to forage in areas exposed by wind.

Status and Conservation. Not globally threatened. Locally common to rare in Colorado, uncommon or rare in New Mexico, rare in Wyoming. In Colorado the most abundant breeding bird in alpine habitat, with population estimated at c. 19,000 pairs in 1998. In some parts of range, availability of nest-sites may be a limiting factor on numbers of breeding pairs.

Bibliography. Andrews & Righter (1992), Bailey & Niedrach (1965), Clement *et al.* (1993), DeSante & Pyle (1986), Dorn & Dorn (1990), Hendricks (1977, 1978), Howell *et al.* (1968), Hubbard (1965), Johnson, R.E. (1972, 1977), Johnson, R.E. *et al.* (2000), King & Wales (1965), Lincoln (1916), Marten & Johnson (1986), Mayr & Short (1970), McCarthy (2006), Miller (1941), Nelson (1998), Packard (1968), Pyle *et al.* (1997), Ridgway (1875), Shreeve (1977), Sibley (2000).


inches 3
cm 8
PLATE 41
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93
ssp sanguineus
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94
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98
97
ssp lepidus
ssp sibiricus
100
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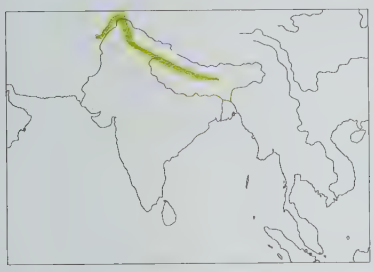
Genus *CALLACANTHIS* Bonaparte, 1850

92. Spectacled Finch

Callacanthis burtoni

French: Roselin de Burton **German**: Rotmaskengimpel **Spanish**: Pinzón de Anteojos
Other common names: Red-browed/Red-spectacled Finch, Red-browed Rosefinch

Taxonomy. *Carduelis Burtoni* Gould, 1838, Srinagar, Kashmir. Monotypic.
Distribution. NW Pakistan and W & C Himalayas E to Nepal and NE India (Sikkim).



Descriptive notes. 17–18 cm. Large finch with large conical bill, distinctive face pattern and deeply notched tail. Male has forehead and lores and patch around and behind eye scarlet, often paler rosy pink below eye (on some, red continues to side of nape), crown to nape, ear-coverts, cheek and moustachial area black, neck usually tawny-brown; upperparts greyish-olive, feathers broadly fringed reddish-brown, paler cinnamon-brown on rump and uppertail-coverts; tail black, tipped white, amount of white increasing outwards, forming wedge-shaped spot on outermost rectrix; upperwing-coverts jet-black, broadly tipped pinkish-white on greater coverts, alula has white spot at tip of lower feather, primary coverts broadly tipped white, flight-feathers jet-black, broadly tipped white, tertials broadly tipped pinkish-white; chin finely spotted blackish, throat scarlet, tipped blackish, becoming cinnamon with pinkish-red feather fringes on breast and brown on belly and flanks; undertail-coverts pale buffish-brown; iris dark brown; bill yellow, dusky brown or black tip and orange-brown base of lower mandible in breeding season; legs pinkish or flesh-brown. Female has crown to nape and face to side of neck dusky brown or blackish, streaked paler; lower forehead to broadly around eye pale yellow or orange-yellow, upperparts (to uppertail-coverts) olive, tinged grey, tail as on male but blackish-brown, upperwing black, lesser coverts like scapulars, median coverts broadly fringed paler, greater coverts and primary coverts tipped white (less broadly than on male); pale grey-brown below, spotted blackish on chin and throat and yellowish on lower throat and breast; bill paler than male's, and legs yellowish-brown. Juvenile is similar to female, but browner, head pattern less distinct, initially uniformly brown, becoming pale buff around eye, upperparts grey-brown and less olive, fringes of median upperwing-coverts like scapulars, tips of greater coverts, primary coverts, secondaries and primaries buff or buffish-white (whiter on primaries), but all tips smaller than on adult, underparts dull buffish with gingery-buff tinge, bill pale yellowish-horn. Voice. Song, usually from high open perch (often from bare branch), a series of 3–4 downslurred whistles followed by single or disyllabic upslurred whistle, "teee-uh-tee e-uh-te-ee-uh", or ending with more pronounced "tee-yih", and often repeated several times; also a light but loud and high-pitched trilling "til-til-til", similar to some notes of *Carduelis carduelis* song; also a single note repeated monotonously. Calls include loud, clear whistled "tew-tew" or "tewtya", like that of *Pyrrhula pyrrhula* but louder and more prolonged, also a softer "pewee" or "chew-ee" which may be followed by melodious descending "pweu, pweuweu" or "chipeweu"; contact note within family group a light "chip"; alarm or anxiety note a rising "uh-eh" or "twee-yah".
Habitat. Breeds in submontane and lower montane conifer and rhododendron (*Rhododendron*) forests including deodar (*Cedrus deodara*), firs (*Abies*), birch (*Betula*), oak (*Quercus*) and hemlock (*Tsuga*), at 2270–3350 m. In non-breeding season found in more open areas along forest edge, grassy slopes, edges of melting snow and roadsides; down to c. 1800 m (exceptionally to c. 800 m).
Food and Feeding. Mostly tree seeds, buds and shoots, principally of deodars, spruce (*Picea*), also rhododendron bark and berries of *Viburnum nervosum* and *Berberis lycium*; recorded also as taking succulent leaves and pecking at flowerheads. Forages on the ground in the open (including at edges of melting snow) or under bushes, in tall vegetation, in rhododendrons and in lower levels of trees. Fairly shy or unobtrusive; hops on ground and flies short distances when disturbed, and often perches at tops of trees. In pairs and in small family groups of up to 15 individuals; in non-breeding season forms slightly larger flocks, exceptionally containing up to c. 40 individuals.
Breeding. Season mid-May to Aug. Monogamous. Territorial; size of territory apparently small, pairs nesting within 150 m of one another. Displaying male with crown feathers raised, wings held out from body, drooped and slightly quivering, approaches female on ground. Nest built by both sexes, a large shallow cup of strong twigs, pine (*Pinus*) needles, lichens, plant fibres, dry roots, animal hair and some feathers, placed 3–21 m above ground on branch of pine or fir. Clutch 3 eggs, pale greenish-blue, blotched with purple and sparsely spotted black or blackish-brown; male feeds incubating female on nest, and nestlings fed and cared for by both parents; no information on duration of incubation and fledging periods.
Movements. Little known; possibly only altitudinal and short-distance shifts. In non-breeding season occurs at lower elevations and in areas where not known to breed, e.g. Murree Hills (N Pakistan).
Status and Conservation. Not globally threatened. Restricted-range species: present in Western Himalayas EBA. Locally common or scarce; widespread, but erratic in parts of range. In E parts, in Nepal and Sikkim, probably a rare breeding resident, but may be only a rare non-breeding visitor; extremely few records in Sikkim.
Bibliography. Ali & Ripley (1983), Bates & Lowther (1952), Clement *et al.* (1993), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Raja *et al.* (1999), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Vaurie (1949, 1959).

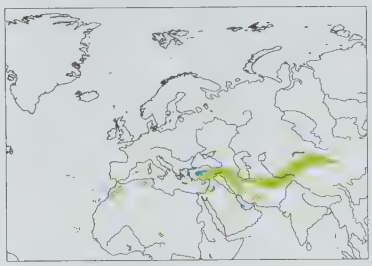
Genus *RHODOPECHYS* Cabanis, 1851

93. Crimson-winged Finch

Rhodopechys sanguineus

French: Roselin à ailes roses **German**: Rotflügelgimpel **Spanish**: Camachuelo Alirrojo
Other common names: Crimson-winged Desert Finch

Taxonomy. *Fringilla sanguinea* Gould, 1838, Erzurum, Turkey.
Morphometric data indicate that treatment of the two races as separate species, forming a superspecies, may be more appropriate; further research, including molecular analysis, required. Two subspecies recognized.
Subspecies and Distribution.
R. s. alienus Whitaker, 1897 – Morocco and NE Algeria.
R. s. sanguineus (Gould, 1838) – CS & E Turkey, Lebanon, N Israel, W Syria, S Caucasus, Iran, S Turkmenistan and N Afghanistan E to SE & E Kazakhstan,Tajikistan, and NW China (N & W Xinjiang).



Descriptive notes. 15–18 cm; 32–48 g. Large, large-billed, long-winged, sandy finch with bright pink in wing and notched tail. Male nominate race breeding has lower forehead, lores and anterior cheek (to base of bill) bright rose-pink, forehead to hindcrown black, rest of head sandy brown, finely streaked darker, with broad pale sandy supercilium (from behind eye), warmer buffish on side of neck; lower nape and upperparts pale buff-brown with rufous-brown feather centres and blackish shafts, lower rump and uppertail-coverts sandy brown, tipped rosy pink; tail black, except for white outermost feathers, inners broadly fringed pale pink at base and narrowly tipped white; upperwing-coverts brown (with black shafts), broadly fringed pale pink, greaters blackish-brown, broadly fringed pale pink and tipped brighter or deeper pink, rest of wing black, feathers broadly edged bright pink and narrowly tipped whitish, tertials broadly edged pale brown (or finely pinkish) and tipped buffish-white; chin and throat sandy brown with darker tips (chin may also have some pale pink tips); breast like throat, but with larger blackish bases tipped pale buff-brown, lower breast creamy or whitish (may be tinged pinkish), flanks sand-brown with blackish streaks, belly to undertail-coverts white; iris black; bill yellow, darker brown culmen and tip; legs pale pinkish-brown. Non-breeding male in fresh plumage (autumn and winter) is duller or browner, with pink on face replaced by dull sandy buff, which may form paler buffish band across mid-forehead; bill greyish-horn. Female is similar to male, but lacks pink on face and on rump to tail, crown browner, finely streaked paler or sandy brown, upperparts browner and less heavily streaked, rump and uppertail-coverts sandy brown, tipped whitish on longest feathers; pink in wing paler and less extensive, mostly on edges of flight-feathers (brown bases of wing-coverts more visible), and breast and flanks less heavily spotted or streaked with black; bill yellow to dark greyish-horn. Juvenile is like female, but head and upperparts sandy brown, mantle and back streaked darker, pink in wing duller and restricted to bases of secondaries, bill dark horn-yellow; first-year like adult with unmoulted wing and tail feathers, greater coverts blackish-brown, edged buffish and finely fringed pinkish, tail darker or blacker, underparts often paler, with unstreaked breast and flanks. Race *alienus* male often has less black on crown (sometimes restricted to forecrown), hindcrown and nape grey or greyish-buff, upperparts greyer brown with pale pink or vinous tinge, except for darker brown rump and uppertail-coverts, wings duller, less broadly edged pink, inner secondaries tipped off-white, tail broadly tipped white (except for blackish outer web of outermost), pinkish bases of all outer webs (mostly concealed beneath uppertail-coverts) becoming whitish towards tips (except outermost), supercilium and side of neck cream to pale buffish-brown, no pinkish in front of eye, lores usually browner and duskier, usually lacks dark streaks on ear-coverts, has chin and throat white or pinkish-white, narrow brown breastband lacking blackish tips, female similar but paler earth-brown crown, less grey on nape, upperparts greyer than nominate female, face browner (pink reduced or absent) and chin and throat white. Voice. Song, usually between May and early Sept, from top of bush or grassy tussock or in flight, a clear but soft and melodious quiet grating "tchwili-tchwilichip", like that of a sparrow (*Passer*); in undulating song flight a rippling "turdel-edep-weep-ou" or more protracted "di-did-dle-de did-dle-de did-dle-de diu". Calls include harsh chirping and disyllabic "chilip", often given in flight; most frequent contact note a soft but musical "wee-tll-ee" or "wee-tell-er", and in flight gives soft "chee-rup", "tlweep" or "toik" and a rich, fluty "dy-lit-dy-lit" recalling similar notes of Woodlark (*Lullula arborea*).
Habitat. Breeds on montane and submontane slopes and in high-level valleys, open semi-desert areas of bare, dry rocky, stony and sandy plains and slopes above tree-line, volcano craters, boulderfields and edges of snowfields, occasionally in alpine meadows or patches with sparse grass tussocks or scattered herbs, scrub, sage (*Salvia*) and junipers (*Juniperus*); usually at 1100–4200 m in N & E Turkey (occasionally down to 900 m in W), 1350–2500 m in Lebanon, 1900–2000 m in Israel, 1700–3000 m in SE Kazakhstan and Tajikistan, above 2700 m in Afghanistan, 2000–3000 m in W China and mainly 2400–3600 m in Morocco. In non-breeding season in similar areas at lower levels, including edges of cedar (*Cedrus*) and fir (*Abies*) forests, low scrub in foothills, and edges of cultivation and settlements; down to c. 550 m.
Food and Feeding. Mostly small seeds, buds and shoots of grasses, semi-desert and alpine plants; also some insects. Seeds and buds include those of honeysuckle (*Lonicera*), knotgrass (*Polygonum*), goosefoot (*Chenopodium*), sandwort (*Arenaria*), woad (*Isatis*), shepherd's-purse (*Capsella*), penny-cress (*Thlaspi*), salvias, alison (*Alyssum*; particularly *Allysum granatense* in NW Africa), whitlowgrass (*Draba*), stonecrop (*Sedum*), cinquefoil (*Potentilla*), sainfoin (*Onobrychis*), goat's-thorn (*Astragalus*), bedstraw (*Galium*), hound's-tongue (*Cynoglossum*), alkanet (*Anchusa*) including blossom, forget-me-not (*Myosotis*), thistles (*Carduus*, *Cirsium*), goat's-beard (*Tragopogon*), viper's-grass (*Scorzonera*), leek (*Allium*), sedges (Cyperaceae), cereals (mainly *Avena*) and grasses (Gramineae). Insects taken include larval moths (Lepidoptera), flies (Diptera) and beetles (Coleoptera). Nestlings fed mostly with regurgitated pulp of seeds and insect larvae. Forages almost entirely on the ground, perches on rocks, bushes (especially when singing) and roadside wires; hops on ground, and has distinctive waddling walk. Pulls tall grass seedheads down and stands on stem while extracting seeds; also hangs head down from plant stems, and sometimes digs up bulbs from shallow soil. Singly and in pairs, and often in flocks throughout year; in non-breeding season in flocks of up to 100 individuals, often associating with *Bucanetes githagineus*, Common Rock-sparrow (*Petronia petronia*) and Horned Lark (*Eremophila alpestris*).
Breeding. Season Apr to mid-Jul, from mid-May in Morocco; often two broods, but only single broods recorded in Israel and Kazakhstan. Monogamous. Solitary or loosely colonial. Territory not well defined or well defended, apparently used only for nesting. Pair formation usually takes place in flock towards end of winter. Male display includes deeply undulating, circling song flight alter-

On following pages: 94. Trumpeter Finch (*Bucanetes githagineus*); 95. Mongolian Finch (*Eremopsaltria mongolica*); 96. Desert Finch (*Rhodospiza obsoleta*); 97. Long-tailed Rosefinch (*Uragus sibiricus*); 98. Przevalski's Rosefinch (*Urocynchramus pylzowi*); 99. Blanford's Rosefinch (*Carpodacus rubescens*); 100. Dark-breasted Rosefinch (*Carpodacus nipalensis*).

nating between fluttering ascents (often to good height) and gliding descents, also rapid and erratic chases of female low over ground and male's courtship-feeding of female. Nest built mostly by female, a neat, loose cup of dry grasses, cereals, plant stems and fibres and sometimes animal hair, placed on stony ground on scree slope, under overhanging rock, in lava or in crevice, grass tussock or thorn-scrub, occasionally in low bush, on cliff ledge or in wall of derelict house. Clutch 4–5 eggs, pale blue with small purple-brown spots; incubation by female alone, period 13–15 days; chicks fed by both parents, in Morocco flocks mostly of males make daily early-morning flights to lower altitudes to collect seeds for adult female and nestlings; nestling period 13–15 days; young often leave nest before able to fly, and fed by parents for up to 3 weeks after leaving nest.
Movements. Altitudinal and short-distance migrant; descends to lower levels in non-breeding season between Sept/Oct and Mar–May. Post-breeding family flocks wander over wide area within breeding range before pre-migration gathering; breeders from S & E Turkey occur more widely over C Taurus Mts, occasionally reaching W Turkey; those in Lebanon disperse to lower areas above tree-line, and birds from Mt Hermon (N Israel) make short-distance post-breeding dispersal to higher levels before moving E to Syria, occasionally still present in breeding area into Dec; in Iran descends to plains and S slopes of Elburz Mts and N to Azerbaijan; breeding birds from SE Kazakhstan occasional in winter in W Tien Shan, but most move S to lower plains of Tajikistan, Uzbekistan and Afghanistan from middle to late Aug, return to lower levels in Mar to mid-Apr and to breeding areas in May, males usually arriving ahead of first females; present throughout year in S Tajikistan, but more numerous in winter than in summer; in NW China moves to adjacent foothills, valleys and plains. Vagrant in N Caucasus (N Ossetia), Iraq and N Pakistan (Chitral).
Status and Conservation. Not globally threatened. Locally common to abundant or scarce; uncommon in Morocco, Lebanon and Caucasus. Status in NE Algeria unclear; possibly a scarce resident or summer visitor, intermittently recorded from mid-19th century and again in 1970 and 1980. Turkish breeding population at least 100,000 pairs; population in N Israel (Mt Hermon) c. 30 pairs in 1970s and 1980s. No numerical data for rest of range.
Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Cherkaoui *et al.* (2006), Clement *et al.* (1993), Cramp & Perrins (1994), David & Gosselin (2002b), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1967, 1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Hagemeijer & Blair (1997), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Isenmann & Moali (2000), Kirwan & Gregory (2005), Kirwan, Atkinson *et al.* (2006), Kirwan, Boyla (2008), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Paludan (1959), Porter *et al.* (1996), Ramadan-Jaradi *et al.* (2008), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Roselaar (1995), Shirihai (1996), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1959).

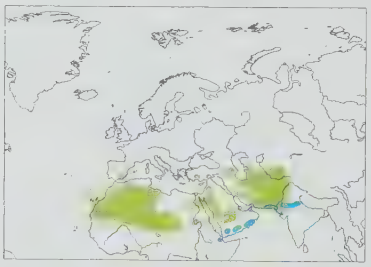
Genus *BUCANETES* Cabanis, 1851

94. **Trumpeter Finch**

Bucanetes githagineus

French: Roselin githagine **German**: Wüstengimpel **Spanish**: Camachuelo Trompetero
Other common names: Common Trumpeter Finch

Taxonomy. *Fringilla githaginea* M. H. C. Lichtenstein, 1823, Deram, Upper Egypt.
Genus has sometimes been subsumed in *Rhodopechys* or *Carpodacus*. Geographical variation slight, not always constant, and largely clinal. Four subspecies tentatively recognized.
Subspecies and Distribution.
B. g. amantum (E. J. O. Hartert, 1903) – C & E Canary Is (Tenerife E to Alegranza, La Graciosa, Lanzarote and Fuerteventura).
B. g. zedlitzi (Neumann, 1907) – SE Spain, and N Africa (S Morocco E to S Tunisia and Libya, S to Mauritania, N Mali, N Niger, N Chad and NW Sudan).
B. g. githagineus (M. H. C. Lichtenstein, 1823) – Egypt and NC & NE Sudan.
B. g. crassirostris (Blyth, 1847) – SE & E Turkey, Armenia, Azerbaijan; E Lebanon, C Syria, E & S Israel, Jordan, NE Egypt (Sinai), S Iraq and N & C Arabian Peninsula; and Iran E to Turkmenistan, Uzbekistan, Afghanistan and N & W Pakistan; winters also to S Arabian Peninsula, S Pakistan (Sind, Makran Coast) and NW India (Punjab, Haryana and Rajasthan).
Descriptive notes. 12·5–15 cm; 16–25 g. Medium-sized to large, stocky, large-headed finch with large, blunt bill and short tail. Male nominate race breeding has forehead to cheek, chin and throat bright red to reddish-pink (appears as frontal band on lower forehead), lores washed ash-grey, upper forehead to nape, side of neck and face pale ashy grey, tinged slightly browner or pinkish on face and streaked finely darker on crown; narrow white eyering; upperparts (including lesser and median upperwing-coverts) sandy brown with slightly darker feather centres, rump and uppertail-coverts pink; tail dark brown or grey-brown, broadly edged pink; median upperwing-coverts fringed pale pink, greater coverts drab brown with pink fringes, broadly fringed pink, rest of wing dark brown, finely edged pale pink on primary coverts and secondaries and deeper pink on primaries and finely tipped whitish-buff, tertials browner and fringed pinkish-buff; side of throat and breast pinkish-buff, tipped or spotted brighter pink, lower breast and belly pinkish-buff with paler or greyer feather bases, flanks paler brown, tinged pink, undertail-coverts whitish, washed pale pink; iris dark brown or black; bill bright orange-red; legs flesh-brown. Non-breeding male in fresh plumage (winter) lacks pink on forehead and face and is paler or duller grey-brown or sandy brown on head, mantle, back, underparts and edges of wing-coverts and flight-feathers; edges of greater coverts and primary coverts and flight-feathers narrowly tinged pinkish, tips of secondaries and primaries more broadly pale buff; bill yellow. Female is like non-breeding male, but paler or duller sand-brown, rump, uppertail-coverts, tips of wing-coverts and edges of flight-feathers variably pale buff or pinkish-buff to pinkish-orange; may show tinge of pink on lores, lower ear-coverts, chin, throat and breast, rest of underparts sandy buff, lightly streaked more heavily buffish; bill pale yellow to yellowish-horn with pinkish or orange tinge, during breeding lower mandible usually yellow or orange-yellow. Juvenile is browner or more sandy than female (but many indistinguishable), lacking pink, all upperwing-coverts and edges of flight feathers fringed pale brown or buff-brown (often forming pale or bright panel on closed wing), bill dull brown or greyish-horn. Races vary little: *crassirostris* is slightly larger and darker than nominate on head and upperparts, lacks pink fringes on hindneck, mantle and scapulars, has narrower pinkish or reddish-pink edges of flight-feathers and tail feathers, underparts washed rose-pink or reddish; *zedlitzi* male is pale sandy grey, tinged rose-pink (especially on rump and underparts), female has pale to bright reddish-pink edges of scapulars, greater coverts and flight-feathers and pale cream to yellowish belly; *amantum* has short, thick bill wider or swollen at base, grey head and face with reddish-pink forehead, dull grey-brown or sandy-tinged hindneck to mantle and scapulars, male variably (depending on wear) tinged deep pinkish-red to ruby or orange-red, female bill straw-yellow. Voice. Song, from ground and during song flight, a drawn-out nasal and slightly rising wheezing "cheeeee...", "zeeeeer zeee-er" or "eeeeeeeeee", or "t-yu t-yu t-yu zi dzzzaaaaaaaaar choo choo choo choo", and often followed by slightly discordant phrases like sound of tin-trumpet and interspersed with metallic clicks, buzzes and short whistles. Call a short or abrupt "chee", "chit", "chik", "kek", "tset" or "chee-chup", often as contact note; in flight a low-pitched "dzit" or "zik" and a soft "weechp".



Habitat. Desert, semi-desert and desert edges, vast open steppe areas, including dry desolate hills with sparse low scrub, edges of cultivation, mountain slopes, treeless stony plains, cliffs, ravines, gorges and wadis, in C Sahara also in villages and gardens; generally avoids open areas of sandy desert, but frequent at oases. Mostly below 1700 m; to 1900 m in Afghanistan and to 3000 m in N Pakistan (Chitral). In non-breeding season found in similar habitat at lower levels, including down to coastal areas; in Nile Valley (Egypt) occurs in cultivated fields.
Food and Feeding. Mostly small seeds, shoots and buds of grasses and low ground-loving plants, including *Salvia* (especially *Salvia aegyptiaca* in Morocco) and *Nicotiana glauca* (on Canary Is), also docks (*Rumex*), glasswort (*Salicornia*), crucifer (*Schouwia*), mugwort (*Artemisia*), grasses (Gramineae) and cereals, also berries and possibly buds and seeds of *Salvadoria persica*. Also some insects and larvae, mostly of grasshoppers (Orthoptera). Nestling diet seeds, either green or as regurgitated pulp. Forages on ground, where it creeps, runs, hops and shuffles (squats on tarsi), often rapidly; becomes upright when alarmed. Extracts seeds from bent-over grassheads, also digs into soft sandy soil and pecks grains from camel dung; in Egypt feeds on spilt grain along roadsides. Perches on rocks, boulders and roadside wires. In pairs and in small to large flocks of up to 20 individuals; in non-breeding season gathers in larger flocks, often comprising juveniles, exceptionally of several hundreds or occasionally more than 1000 individuals; in Canary Is associates with flocks of *Carduelis cannabina* and Spanish Sparrows (*Passer hispaniolensis*). Frequently flies a good distance to drink, especially in late afternoon or evening.
Breeding. Season Feb–Jun; two broods in Canary Is, Caucasus, Israel, Morocco and C Asia. Monogamous. Solitary or loosely colonial. Pair formation from break-up of flocks at start of breeding season. Male performs song flight, rising rapidly with vigorous wingbeats in wide circles, changing direction erratically, and descending in long glide; courtship includes also bill-touching by the two partners, and displaying male may stand upright with plumage sleeked, crest feathers raised, wings lowered (exposing pink rump) and tail partly spread, belly and flanks feathers also ruffled, while hopping from side to side, calling loudly, in front of female. Nest built by female, mostly a loose collection of twigs, plant stalks, down and fibres, grass, animal hair and occasionally feathers, placed in shallow depression in ground, under rock, shrub or grass tussock, or up to 6 m above ground in pipe or wall of house, derelict building or old tomb, sometimes below ground in wall of deep well; nests in cavity between rocks may have small stones placed at entrance. Clutch 4–6 eggs, pale blue, sparsely spotted or speckled with rust-brown to purple-black; incubation by female (male also has brood patch), period 11–14 days; chicks fed and cared for by both parents, nestling period 12–14 days; young frequently leave nest before able to fly, independent 11 days after fledging.
Movements. Resident, nomadic and partially migratory. Post-breeding movements dispersive or nomadic, and within breeding range or slightly beyond. Scale of movement usually determined by availability of food or water; seasonal or erratic in appearance, numerous in some years (leading to temporary colonization of some areas) and absent in others, and may not breed regularly in some areas; occasionally or exceptionally irruptive, and has occurred in large flocks in non-breeding areas e.g. Malta, and in smaller numbers N to C Europe. In Canary Is, race *amantum* a rare non-breeding visitor to El Hierro. E birds more migratory: post-breeding movements in Lebanon mid-Aug to early Sept, and in Israel altitudinal movements to lower areas Sept–Nov and return to Mt Hermon and Negev Desert Mar–May; in Iran and Afghanistan either resident or moves locally S to Gulf coast or longer distance to Makran coast of Pakistan and NW India, where widespread and occasionally abundant in winter in Rajasthan (and less numerous or infrequent in Punjab and Gujarat); regular but scarce post-breeding visitor to Jordan, E Gulf states and N Yemen, occasional in Oman (where possibly a scarce resident), and scarce winter visitor United Arab Emirates late Oct–Mar and Djibouti Dec–Mar. Scarce and irregular during post-breeding dispersal mostly mid-May to Jul in S Italy, Sicily, Malta, Greece, Cyprus and N Israel. Vagrant in C Europe N to British Is, Fennoscandia and Germany; in E to S Kazakhstan and in S to Cape Verde Is.
Status and Conservation. Not globally threatened. Common to locally common. European breeding population (in Spain) between 100 and 300 pairs, and up to a further 50 pairs in S & E Turkey. Scarce or rare resident in Lebanon; in Syria first bred in 2003 and 2004 following large influx in area. Has increased in Israel since 1970s with spread of agricultural developments, providing water in previously arid desert areas; population now estimated at several thousands, but varies annually. Has bred in Armenia and probably also in Kuwait. Increased wintering numbers in S Spain in late 1960s led to first breeding in 1971, and has since spread E along coastal mountain chain; in N Africa, breeding range extended N in Morocco and Tunisia in second half of 20th century; first recorded in S Turkey in 1974 and subsequently increased along S coastlands, and has bred also SE Anatolia.
Bibliography. Ali & Ripley (1983), Ananian *et al.* (2002), Borrow & Demey (2001), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1967), Fry & Keith (2004), Glutz von Blotzheim & Bauer (1997), Goodman & Meininger (1989), Grimmett *et al.* (1998), Hagemeijer & Blair (1997), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Kirwan & Gregory (2005), Kirwan & Konrad (1995), Kirwan *et al.* (2008), Krieger (1988), Manrique & Miralles (1988), Murdoch (2005), Paludan (1959), Panov & Bulatova (1972), Porter *et al.* (1996), Ramadan-Jaradi *et al.* (2008), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Roselaar (1995), Shirihai (1996), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1956a, 1959).

Genus *EREMOPSALTRIA*

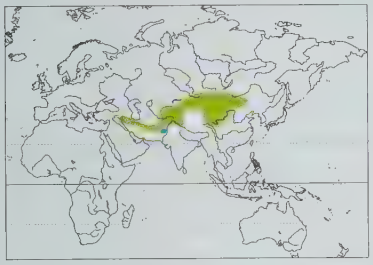
Kirwan & Gregory, 2005

95. **Mongolian Finch**

Eremopsaltria mongolica

French: Roselin de Mongolie **German**: Mongolengimpel **Spanish**: Camachuelo Mongol
Other common names: Mongolian Trumpeter Finch

Taxonomy. *Carpodacus mongolicus* Swinhoe, 1870, Keming, southern Chahar [north-west Hebei], China. Previously placed in genus *Rhodopechys* or *Bucanetes*. Monotypic.
Distribution. E Turkey, S Caucasus, Azerbaijan (Nakhichevan) and N & E Iran E to S & E Kazakhstan, Tajikistan and Mongolia, S to C Afghanistan, N Pakistan (Chitral, Baltistan and Gilgit), Ladakh, and W, C & NE China (S to N & W Xinjiang, N Qinghai, Gansu & W Inner Mongolia); winters also W Pakistan (Baluchistan).



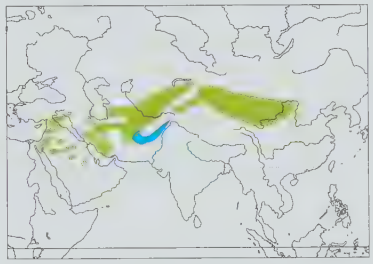
Descriptive notes. 14–15 cm; 18–26 g. Medium-sized, stocky, large-headed and blunt-billed, long-winged pale finch with notched tail. Male has forehead to nape pale grey-brown, streaked finely darker (may show pink tinge on side of forehead), side of neck pale buffish-brown or buffish-sandy; upperparts like nape or slightly greyer, and indistinctly streaked darker, rump pale sand-brown, tinged pink, uppertail-coverts sand-brown, tipped grey-brown; lores dull buff to sandy, paler narrow supercilium fading over light sandy-brown ear-coverts; narrow pale buff or greyish-white eyering; cheek to sides of chin and upper throat pale sandy, washed pink; tail black or blackish-brown, broadly edged whitish on outer feathers; median upperwing-coverts like scapulars, tipped pale pink, greater coverts blackish, broadly edged whitish or deep pink on outers, alula, primary coverts and flight-feathers black, edged pale pink on primary coverts and primaries and whitish on inner secondaries (forming contrasting pale panel on closed wing), primaries finely tipped pale or whitish-buff, tertials dark brown, edged whitish; below, deep rose-pink (fresh plumage) on side of breast and flanks, whitish on belly to undertail-coverts; in worn plumage (late summer), paler and more uniformly grey-brown, with less pink on rump and in wing (cheek and supercilium pale pinkish), bases of flight-feathers buffish-brown and fringes of tail whiter, side of breast and flanks pale grey with pink or pale pink wash; iris dark brown or black; bill greyish-yellow, paler base of lower mandible; legs brown or pale brown. Female is like late-summer male, but more uniformly buffish-brown on upperparts to rump and uppertail-coverts, greater coverts edged white at base, tipped light pink, secondaries edged pale or whitish-buff and edges of primaries narrowly pale pink; may show faint tinge of pink on lores to cheek; underparts pale whitish-grey, often washed or finely streaked sandy-buff on flanks; bill pale yellow. Juvenile is browner or more sandy brown than female and lacks pink, lightly streaked browner on crown, nape and upperparts, upperwing-coverts fringed bright sandy brown and flight-feathers edged pale buff-brown to whitish-buff (often forming short pale wingbar on closed wing), tips of flight-feathers fringed sandy or pale sandy buff, tertials broadly edged pale brown and tipped paler, underparts buff-brown, paler on belly to undertail, bill brown or dull yellowish-brown. Voice. Song, usually only through breeding season (including occasionally at night), from ground or top of boulder, also in flight, a slow rising and falling "do-mi-sol-mi" or "towit-too whit-tu-tu-churrrh" or "whi-whi-churrrh", with various phrases repeated and interspersed with occasional chirps; several males sing together from perch. Otherwise usually silent (especially in winter), but has soft nasal "dju-vud", "djuduvu", "witjwit" or "chilk-chik"; foraging flocks give constant twittering "t'yuk-t'yuk-t'yuk-t'yuk".
Habitat. Montane and submontane, arid, desolate and semi-desert areas with slopes, cliffs, screes, ravines and steep valleys, also open stony, sandy areas with grassy patches or low scrub (e.g. *Caragana*), occasionally on edge of alpine meadows and cultivated fields; at 500–2000 m in Kazakhstan and 800–2700 m in E Turkey, above 2900 m in Afghanistan, at 2750–3350 m in N Pakistan, 4000–4500 m in Ladakh, and up to 4200 m in N & NW China. In non-breeding season found in similar habitat at lower altitude, at 1500–3000 m in N Pakistan.
Food and Feeding. Mostly small seeds, also buds and shoots, including those of *Agriophyllum gobicum*, *Krascheninnikova ceratoides*, saltwort (*Salsola*), wormwood (*Artemisia maritima*), grasses (Gramineae) and sedges (*Carex*). Nestling diet mostly green seeds. Forages on ground, around or beneath low vegetation, usually hopping in horizontal position; picks seeds from bent-over seedheads and extracts seeds from cattle dung. Tame and often confiding. Singly, in pairs and in small flocks; in non-breeding season and early summer more social, and occurs in larger groups of up to 50 individuals, exceptionally in larger numbers (to c. 1000), often in same-age or single-sex flocks. Makes regular dawn and dusk flights over some distance in search of water; often forages at good distance from nest-site.
Breeding. Season mid-Apr to late Jul or Aug; two broods in S Caucasus and NE Iran. Monogamous. Solitary and semi-colonial. Pair formation takes place in winter flocks or during spring passage. Male performs song flight; displaying male on ground, with plumage sleeked down and crown ruffled, leans towards female; same posture adopted by partners for bill-touching; some courtship feeding recorded. Nest built by female, a loose foundation of twigs, plant stalks, down and fibres, leaves, grass and animal hair, placed in shallow saucer or depression on ground, under low bush or grass tussock, in scree slope, between rocks or boulders, in crevice or niche in cliff or rock face, or in wall of building, well or ruin (sometimes with entrance tunnel of up to 40 cm). Clutch 4–6 eggs, white, pale blue or tinged greenish-blue, finely spotted or speckled with brownish-black; incubation possibly by both sexes (males have brood-patch), no information on duration; chicks fed and cared for by both parents, nestling period c. 18 days; young independent 12–17 days after fledging.
Movements. Resident, altitudinal migrant and partial migrant. Between Oct and May found at lower levels within breeding range, including foothills of Tien Shan and Kunlun ranges and edges of Takla Makan and C Gobi Deserts, and winter visitor to NW Hebei (N China). In S Kazakhstan passage migrant late Sept to late Nov (occasionally winters in S), peak of passage through Chokpak Pass (W Tien Shan) in Oct; in Tajikistan largely deserts Pamir-Alai Mts by end Sept, when occurs in lower-level foothills, valleys and adjacent plains; winter visitor Oct–May in valleys of N Pakistan (North-West Frontier Province and Baluchistan); erratic summer visitor and breeder to parts of range, including Dzhungarian Alatau Mts (E Kazakhstan) and higher levels of Ladakh. Spring passage and return to breeding areas from mid-Feb, with peak of movement Apr and May. Vagrant in Bahrain, NW India, NW Nepal and NE China (Jilin).
Status and Conservation. Not globally threatened. Scarce to locally common. Known population in E Turkey small, numbering merely c. 25 pairs, but extent not fully determined, and in 1999 found breeding in E Pontic Mts; has also bred (and may do so infrequently) in Armenia. First recorded breeding in E Turkey and Caucasus in late 1970s, although possibly present from early years of 20th century; recorded on Turkey–Armenia border in early 20th century.
Bibliography. Ali & Ripley (1983), Ananian & Busuttil (2003), Barthel *et al.* (1992), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Hagemeijer & Blair (1997), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Kirwan & Gregory (2005), Kirwan & Konrad (1995), Kirwan *et al.* (2000), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Paludan (1959), Panov & Bulatova (1972), Pfister (2001, 2004), Porter *et al.* (1996), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Roselaar (1995), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1956a, 1959), Wassink & Oreel (2007).

Genus *RHODOSPIZA* Sharpe, 1888

96. Desert Finch
Rhodospiza obsoleta

French: Roselin de Lichtenstein **German**: Weißflügelgimpel **Spanish**: Camachuelo Desertícola
Other common names: Black-billed/Lichtenstein's (Desert) Finch

Taxonomy. *Fringilla obsoleta* M. H. C. Lichtenstein, 1823, Kara-ata, near Bukhara, Uzbekistan. Genus previously subsumed within *Rhodopechys*, but molecular-genetic analysis indicates no molecular relationship with latter genus, and this species appears to have closer affinities with greenfinches in genus *Carduelis*. Monotypic.
Distribution. SC & SE Turkey, Israel and NE Egypt (Sinai) E to C Jordan, N Iraq, N Saudi Arabia, Iran, Turkmenistan, C, S & E Kazakhstan, Tajikistan, NW & N China (Xinjiang E to Inner Mongolia and Gansu), S to N Afghanistan and W Pakistan (Baluchistan); winters also to Syria, S Afghanistan and N Pakistan (Chitral & North-West Frontier Province).



Descriptive notes. 14·5–15 cm; 17–28 g. Medium-sized, slender sandy-coloured conical-billed finch with black-and-pink wings and notched tail. Male has broad black line from base of lower forehead across lores to eye; crown, nape and upperparts (including rump) pale sandy brown, tinged pink in fresh plumage (greyish when worn), slightly warmer buffish sandy on face, uppertail-coverts warmer brown; tail black, broadly fringed white; median upperwing-coverts pale sandy, tipped deep pink, greater coverts broadly edged bright pink and tipped paler, rest of wing blackish, narrowly (on alula and primary coverts) edged pale pink, primaries broadly edged white or silvery white, secondaries broadly edged pale rose-pink with white or whitish-pink tips, tertials black with contrasting white or pale sandy-buff fringes; throat and underparts pale sandy brown, whiter on belly to undertail-coverts; in worn plumage much greyer overall, and uppertail-coverts more concolorous with rest of upperparts; iris black; bill black in summer, yellowish-horn with dark tip in winter; legs dark flesh-coloured to deep pinkish-brown or greyish-horn. Female is similar to male, but paler buff, lacking pink tinge; has lores brown, uppertail-coverts same colour as rest of upperparts, white edges of primaries greyer, pink edges and tips of wing-coverts and flight-feathers (and tertials) less extensive, bill variably yellowish-horn to dull brown or black. Juvenile is like female, but with duller brown wings, buff-brown tips of wing-coverts and edges of tertials, greyish-white bases of primaries and pale pink bases of secondaries, bill dull straw-yellow with dusky tip. Voice. Song, from ground, top of rock, bush or low tree, a pleasant series of rambling or chattering disconnected notes, including call notes, nasal buzzes and several harsher trills and rolls, "prrrrp prp-zink tzank urrrrrrr", or with longer "zwooeee", reminiscent of songs of both *Carduelis cannabina* and *Carduelis chloris*, with some notes louder but more nasal and harsher; also a weak series of soft, high and low-pitched croaking (including frog-like notes) calls interspersed with drawn-out buzzing "beeze" or "zweee-e-ah" and rising and falling, melodious, twittering trills; several individual phrases may be given on their own in short bursts. Call a soft whistled "pink-pink", "prrrit-prrrit" or "prink-prink", often given in flight, or a more drawn-out "feenk-feenk"; nasal "hear" as contact call, and a rippling or purring "r-r-r-r-r-ee", also a sharp "shreep" or harsher "turr"; alarm call a higher-pitched and interrogative "pink pink pink" or "prink-prink".
Habitat. Lowland and submontane dry, arid and semi-arid areas of open plains, semi-deserts and wadis with sparse vegetation, low scrub, thickets and scattered trees, oases and saxaul (*Haloxylon*) stands and plantations, also irrigated areas and edges of cultivation, particularly orchards and vineyards; in C & S Asia occurs in orchards, large gardens, parks and roadside trees in urban areas and in centres of large cities. Sea-level to 1400 m; sometimes higher, e.g. post-breeding flocks occur at up to 2000 m in Turkmenistan.
Food and Feeding. Mostly small seeds, buds, shoots; some insects. Seeds and buds include those of elm (*Ulmus*), Polygonaceae, Chenopodiaceae including saltwort (*Salsola*), Ranunculaceae, Cruciferae including winter-cress (*Barbarea*, *Euclidium*, *Malcolmia*), Leguminosae including camel's-thorn (*Alhagi camelorum*) and *Halimodendron*, Boraginaceae including stickseed (*Lappula*), Asteraceae including sunflower (*Helianthus*), and grasses (Gramineae) and wheat (*Triticum*). Insects taken include grasshoppers (Orthoptera). Nestling diet mostly milky fluid of seeds and green shoots, occasionally insect larvae. Forages on the ground in or under vegetation; perches in trees and bushes and takes buds and shoots. In pairs and small flocks; in non-breeding season may occur in larger flocks, occasionally numbering hundreds of individuals on passage and in wintering areas. Makes frequent visits to water.
Breeding. Season late Mar to Jul; two broods. Monogamous; pair-bond long-lasting, including into years when not nesting. Solitary or loosely colonial. Territorial. Pair formation takes place before break-up of winter flocks. Few data on display; includes song display of male from high and prominent perch, courtship-feeding of female by male (continues through to brood stage), and begging display by female with shivering wings. Nest built by both sexes, mostly by female, an untidy cup mostly of twigs, plant stalks, fibres and down, occasionally also animal hair or fur and scraps of cloth, placed 1–5 m (exceptionally to 25 m) above ground in fork of branch in shrub or low tree, in desert or semi-desert areas usually tamarisk (*Tamarix*) or *Arthrophytum*, in agricultural areas often in orchard and then in *Prunus*, vine (*Vitis*) or pistachio (*Pistacia*), also in eucalypt (*Eucalyptus*), acacia (*Acacia*) or pine (*Pinus*), poplar (*Populus*), elm or mulberry (*Morus*). Clutch 4–6 eggs, white to pale greenish-blue with fine blackish or purple spots and streaks; incubation by female, period 12–15 days; chicks fed and cared for by both parents, nestling period 13–14 days; young fully independent after further 14–16 days. Breeding success variable: in Turkmenistan study 18·5% of 119 eggs infertile, 54% of clutches lost at egg stage and 22% of chicks at nestling stage, and in Uzbekistan study 50% of clutch size succeeded to fledging stage (average 2·6 young per nest), in both studies predators included Common Magpie (*Pica pica*), Little Owl (*Athene noctua*), wildcat (*Felis silvestris*), snakes and ants, also some nests destroyed by strong winds; of 295 eggs in 67 nests in Israel, 60% hatched, 16% infertile and 24% lost to predation, human disturbance or weather.
Movements. Resident and partial migrant. Post-breeding dispersal from end Jun or wanders locally short distances away from breeding areas Oct–Mar. In S Kazakhstan passage through W Tien Shan end Aug to beginning Nov and return mid-Mar to early May; in Kyrgyzstan departs from breeding areas end Aug, peak movement in early Sept, and returns from mid-Feb. Largely seden-

tary in W China (Xinjiang) and in S Turkmenistan; in latter region moves only in harsh winters, returning in Apr or as soon as weather permits; passage flocks fly over open desert areas. Winter visitor to Eilat area of S Israel from late Oct, main arrival during Nov and present to end Mar; also non-breeding-season visitor to E Iraq, Gulf coast of Iran, C & S Afghanistan. In Pakistan mostly resident in Baluchistan (Quetta area), but numbers increase from late Mar, and in N irregular non-breeding visitor to Chitral and North West Frontier Province. Scarce or rare winter visitor to Beqaa Valley, in Lebanon (also single summer record). Individual at Hovd (Khovd), in W Mongolia, in Apr 2007 (the first for that country) presumably a wanderer.

Status and Conservation. Not globally threatened. Common to locally common or erratic; uncommon in China and Pakistan. Turkish breeding population estimated at between 1000 and 10,000 pairs. Prior to late 1950s an irregular winter visitor to Israel; breeding population now established, and locally common following development of agriculture and irrigation at edges of desert areas. Formerly scarce or irregular winter visitor in NE Egypt (Sinai), where first confirmed breeding in 1994; at same time has increased also in Jordan and N Arabia.

Bibliography. Ali & Ripley (1983), Andrews (1995), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Goodman & Meininger (1989), Grimmett *et al.* (1998), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Khoury *et al.* (2009), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Paludan (1959), Porter *et al.* (1996), Ramadan-Jaradi *et al.* (2008), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Roselaar (1995), Shirihai (1996), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1959), Wassink & Oreel (2007), Yosef (1991), Zamora, Lowy *et al.* (2006).

Genus *URAGUS* Keyserling and J. H. Blasius, 1840

97. Long-tailed Rosefinch

Uragus sibiricus

French: Roselin à longue queue **German**: Meisengimpel **Spanish**: Camachuelo Colilargo
Other common names: Siberian Rosefinch

Taxonomy. *Loxia sibirica* Pallas, 1773, "near montane rivers and streams of southern Siberia". Five subspecies recognized.

Subspecies and Distribution.

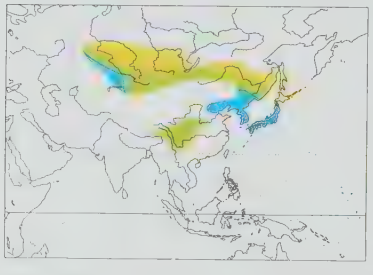
U. s. sibiricus (Pallas, 1773) – breeds SW & SC Siberia E to middle R Amur, S to NE Kazakhstan, N Mongolia and NW & NE China (NW Xinjiang; NW Inner Mongolia); winters SC & SE Russia, E Kazakhstan (Tarbagatay, Dzhungarian Alatau, E Tien Shan) and NW & NC China.

U. s. ussuriensis Buturlin, 1915 – breeds Russian Far East (middle R Amur E to Ussuriland) and NE China (Heilongjiang and Jilin); winters in Korea and E China (Liaoning S to Hebei and Shanxi, also S Gansu).

U. s. sanguinolentus (Temminck & Schlegel, 1848) – breeds Sakhalin I, S Kurils and N Japan (Hokkaido, N Honshu); winters C & S Japan.

U. s. lepidus David & Oustalet, 1877 – C China (E Xizang E to S Shaanxi and SW Shanxi).

U. s. henrici Oustalet, 1892 – S China (SE Xizang, N Sichuan and W & NW Yunnan).



Descriptive notes. 16–18 cm; 16–26 g. Medium-sized, long-tailed finch with short stubby bill. Male nominate race breeding has lower forehead and lores deep crimson, cheek and ear-coverts to chin and throat deep pink with broad pale pink tips; supercilium from over eye pale grey to pearl-white, eyestripe to side of neck crimson; upper forehead to nape pearl-grey, tinged pink and finely streaked blackish (may show reddish tips on nape); upperparts pinkish-red, broadly streaked black, fringed grey when fresh, lower back and rump uniformly deep pink, longest uppertail-coverts dusky or black, fringed dull pink; tail black, finely edged white, outer three feathers mostly white; lesser upperwing-coverts deep pink, median and greater coverts black, broadly edged and tipped white (appear mostly whitish on closed wing); alula and primary coverts black, finely edged white, flight-feathers black, broadly edged white on secondaries and tertials (forming panel on closed wing), narrowly edged white on primaries, inner webs of tertials black; breast to belly and upper flanks rose-pink, fringed paler, undertail-coverts white; iris black; bill yellow; legs dark brown. Non-breeding male in fresh plumage (winter) is generally greyer on upperparts, forehead pale pearl-grey (lower forehead may be tipped crimson); median and greater upperwing-coverts blackish, finely edged buff-brown and broadly tipped white, primaries narrowly edged whitish and rest of flight-feathers narrowly edged buffish (broadly fringed on tertials); underparts paler with pale grey or whitish edges and tips; upper mandible brown, lower mandible paler or whitish-horn. Female has lower forehead and lores ashy white, ear-coverts tinged buffish and finely streaked darker; rest of head to upper mantle pale grey, narrowly streaked darker, lower mantle to scapulars dull buffish-brown, streaked darker or blackish, rump orange-brown, becoming darker on tips of uppertail-coverts; tail blackish-brown, outer two feathers white; wing blackish-brown, median and greater coverts broadly tipped white, primaries narrowly edged whitish, secondaries edged and tipped whitish-buff or whitish, tertials similar but with broader edges; chin and throat ashy white or buffish, finely streaked darker, underparts dull buffish-brown, streaked darker on breast and flanks, belly to undertail-coverts white; bare parts as for male. Juvenile is like female, but greyer above and below; juvenile and first-winter male has upperparts warm brown or reddish-brown, streaked blackish, rump unstreaked orange to pale pinkish-red, cheek and ear-coverts tipped pale or off-white, lower throat, breast and flanks washed light orange or pinkish, some silvery-white feather tips on throat and whitish tips on breast and upper belly, flanks paler or warm buff, indistinctly streaked darker; first-winter female like adult, but lacks orange on rump. Race *ussuriensis* male differs from nominate in having upperparts more broadly streaked darker and underparts slightly deeper pink, female more heavily streaked, rump pink and sometimes pink tinge on breast; *sanguinolentus* is slightly shorter-tailed and darker than nominate and previous, in fresh plumage male has head and upperparts brownish, becoming white or pale pinkish-white on upper forehead and ear-coverts to chin and throat, female has warm buff ground colour on breast, flanks and belly; *lepidus* has shorter tail than nominate and previous, is darkest race, male has silvery-pink of forecrown extending to over ear-coverts, crown to back grey or grey-brown and only lightly tinged pink on feather edges, tips of median and greater coverts narrower and white on edges of flight-feathers less extensive, tail has only outer two feathers white, female warmer brown than nominate, less white in wing and less heavily streaked underparts; *henrici* male also is shorter-tailed than nominate (and *sanguinolentus*), hindcrown and nape tipped buff-brown, becoming sandy brown on mantle and back, scapulars heavily streaked black, wings dark brown or blackish, median and greater coverts tipped white, flight-feathers edged pale brown, tail blackish-brown with outer three feathers white or mostly white, breast to belly deep pink and side of belly and flanks dark-streaked buffish-brown, female more heavily streaked above and below and more sandy brown than females of other races, rump pale cinnamon, white outermost tail feather and small wedge of white at tips of adjacent feather. Voice. Song a musical series of rapid rippling trills, "churu churu chee fee fee fee", reminiscent of that of *Loxia curvirostra*. Calls include melodious and liquid 3-syllable warble, "pee-you-een", or " su we, su wee, sweeoo, cheweeoo", and rising "sit-it-it"; alarm or anxiety note a sharp "pink", similar to that of *Fringilla coelebs*; race *sanguinolentus* also has soft, fluty "hwit-hwot".

Habitat. Dense willow (*Salix*) and birch (*Betula*) thickets, grasslands, reedbeds and tall vegetation in ditches and wet meadows; valley and riverine woods of willow, larches (*Larix*) and poplars (*Populus*); also lowland and lower montane dense woodlands of pine (*Pinus*), birch and alder (*Alnus*) with well-developed undergrowth and glades; occasionally in thorn-scrub. In W Mongolia in winter often in sea-buckthorn (*Hippophae*) and occurs even in small green areas in Ulaanbaatar city centre, singing in backyards. To 3400 m.

Food and Feeding. Mostly seeds, berries and buds of plants and bushes, including bird cherry (*Prunus*), honeysuckle (*Lonicera*), guelder-rose (*Viburnum*), elder (*Sambucus*), sea-buckthorn; seeds of wormwood (*Artemisia*), spurflower (*Plectrantus*), buttercup (*Ranunculus*), docks (*Rumex*), burnet (*Sanguisorba*), horehound (*Marrubium*), knotgrass (*Polygonum*), dandelion (*Taraxacum*), beggarticks (*Bidens*), hop (*Humulus*), burdock (*Arctium*), also birch, larch, elm (*Ulmus*); buds and seeds of willow and currants (*Ribes*). Also small invertebrates and larvae, including aphids (Aphidoidea), flies (Diptera), beetles (Coleoptera), moths (Lepidoptera), also spiders (Araneae) and snails (Pulmonata). Nestling diet a mixture of plant and animal food. Forages on the ground or in or under vegetation; also takes seeds from tall grasses, reeds and other vegetation while perching on or clinging to seedheads in agile manner of *Carduelis carduelis*. Singly and in pairs; in non-breeding season immatures form loose flocks of up to 15 individuals.

Breeding. Season May–Aug; one brood, in Ussuriland possibly two. Pair formation mostly from mid-May in breeding area. Displaying male sings actively, and rises up in fluttering song flight and glides to female perched on bush or low tree. Nest a deep, compact cup of dry grasses, plant fibres and down, animal hair and feathers, placed up to 2 m above ground in fork or close to trunk of dwarf birch, willow or larch or in rowan (*Sorbus*), occasionally in bush or clump of long grasses. Clutch 3–6 eggs, deep bluish-green to bright blue with darker spots, lines and patches; incubation by both parents, period 11–12 days; chicks fed and cared for by both parents, nestling period 13–14 days; juveniles form small flocks prior to longer movements in autumn. Nests often suffer predation by Carrion Crows (*Corvus corone*) and shrews (Soricidae).

Movements. Resident and migratory. Juveniles gather in flocks and wander throughout range before undertaking long-distance migration to wintering areas. Nominate race winters from E European Russia E to Transbaikalia S from R Ural, Krasnoyarsk and Minusinsk Depression and S Baikal; those from N part of range move S or SE in mid-Sept/Oct (depending on timing of heavy snowfall) to winter at lower levels, and return to breeding areas in Apr–May; others of this race head W to non-breeding quarters in W & C Siberia, and irregular or scarce S to Ural Valley, W Kazakhstan (S to Uzbekistan border) and, in E, to Dzungarian Alatau and L Alakol region, NE Tajikistan, also in Tien Shan of Xinjiang (NW China); passage migrant in early autumn through Novosibirsk. Small numbers of race *ussuriensis* winter in Amur Valley and Ussuriland, otherwise moves S to NC China (Gansu E to N Hebei), S Korea and S Japan (Honshu and occasionally Shikoku and S Kyushu). Race *sanguinolentus* flies S to N & C Honshu and occasionally Kyushu; on Sakhalin, recorded on autumn passage Sept–Oct and returns in May. Small number of occurrences in W & C Europe considered to relate to escapes from captivity.

Status and Conservation. Not globally threatened. Fairly common to locally common, scarce or rare. Occasionally very common along R Angara (SC Siberia), and fairly common in R Amur valley, Ussuriland and S Sakhalin; rare resident in NE Kazakhstan, locally common in NE & E China, and fairly common in Japan. In E Siberia highest breeding densities 50–70 individuals/km² in lower R Amur floodplain; in S Sakhalin up to 8 pairs along 1 km of river floodplain.

Bibliography. Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Korelov *et al.* (1974), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Nechaev (1991), Panov (1973), Polivanova & Polivanov (1976), Rogacheva (1992), Ryabitsev (2001), Stepanyan (2003), Vaurie (1956a, 1959), Vinter (1976), Wassink & Oreel (2007).

Genus *UROCYNCHRAMUS* Przevalski, 1876

98. Przevalski's Rosefinch

Urocynchramus pylzowi

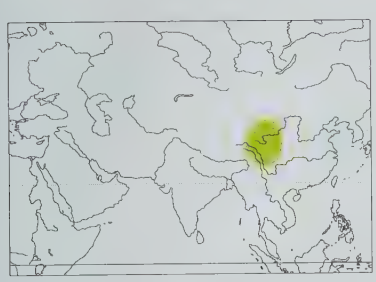
French: Bruselin de Przewalski **Spanish**: Camachuelo de Przewalski
German: Rosenschwanzgimpel
Other common names: Przevalski's Finch, Pink-tailed Rosefinch/Bunting, Rose Bunting

Taxonomy. *Urocynchramus pylzowi* Przevalski, 1876, Tatung River, Nan Shan, north-eastern Qinghai, China.

Similar morphologically to *Uragus*, but differs in bill structure, which (together with horn-like palette and song) is similar to that of Common Reed Bunting (*Emberiza schoeniclus*) and has sometimes been classed as a bunting in family Emberizidae; differs further from other cardueline finches in details of interorbital septum and from all other fringillids and emberizids in possessing a tenth primary, indicating sufficient level of divergence to warrant classification within its own monotypic family, Urocynchramidae. Further, mitochondrial DNA analysis indicates that present species has no phylogenetic relationship with *Uragus* and that it originated much earlier in the passeroid assemblage, and is probably best regarded as a relict member of the earliest finch families; further research required in order to ascertain its true affinities. Monotypic.

Distribution. C & S China (E Qinghai and SW Gansu S to E Xizang and W Sichuan).

Descriptive notes. 15·5–16·5 cm. Medium-sized, slender-billed, short-winged, buffish finch with ten primaries and long, graduated tail. Male has side of lower forehead, lores, supercilium, cheek to chin, throat, breast, upper belly and flanks deep rose-pink (sides of throat and breast may be tipped white in fresh plumage), narrow pale pink eyering; upper forehead to crown buff-brown, becoming greyer on nape, all streaked blackish; upperparts buff or light sandy brown, broadly



streaked blackish, less broadly streaked on rump to tail; central tail dark brown, narrowly edged whitish, outer feathers broadly edged pink or reddish-pink (outermost entirely pink); upperwing dark brown or blackish, median and greater coverts finely edged buff-brown and tipped paler (broadly on greaters), primary coverts edged finely pale buff-brown, flight-feathers edged sandy or warm buff-brown, tertials similar but edged and tipped whitish-buff towards tips; lower flanks and belly white, buffish-brown streaks on flanks, undertail-coverts deep pink; iris dark brown or blackish; upper mandible dark brown, lower mandible pinkish; legs brown or dark brown. Female has head and upperparts as on male; lores and supercilium pale buff, cheek and ear-coverts buffish-brown, finely streaked darker brown, tail brown centrally with pale buff or whitish outer edges, outer three feathers broadly tipped white or whitish and with pale pinkish-orange bases; wings as on male; underparts pale buff or buffish-white, breast sometimes tinged pinkish, flanks sometimes buffish-brown, finely streaked brown on breast and flanks. Juvenile undescribed, possibly similar to female; first-winter male has tail dark brown, edged pink. Voice. Song a short and hurried, chattering "chitri-chitri-chitri-chitri", considered to resemble that of Common Reed Bunting. Otherwise generally silent, but in flight or when alarmed may give clear and ringing "kvuit kvuit".

Habitat. Montane and submontane hillsides with thickets, bushes and scrub, favouring areas of *Potentilla tenuifolia*, also dwarf willows (*Salix*) and rhododendrons (*Rhododendron*); at 3050–5000 m.

Food and Feeding. Diet little known, but mainly small seeds of *Potentilla tenuifolia* and alpine plants. Forages in bushes and on ground, in the open or under vegetation, often near water. Singly and in pairs; in non-breeding season occurs in flocks (some mostly of immatures) of up to c. 15 individuals.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Uncommon or rare. Very poorly known.

Bibliography. Cheng Tsohsin (1987), Clement *et al.* (1993), Domaniewski (1918), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Groth (1998, 2000), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Przevalski (1876), Schäfer (1938), Vaurie (1956a, 1959), Zusi (1978).

Genus *CARPODACUS* Kaup, 1829

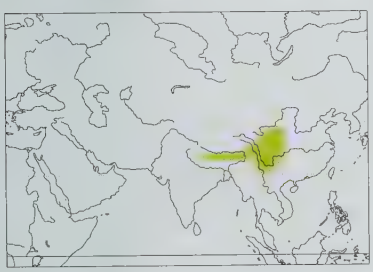
99. Blanford's Rosefinch

Carpodacus rubescens

French: Roselin de Blanford **German**: Blanfordgimpel **Spanish**: Camachuelo de Blanford
Other common names: Crimson Rosefinch, Long-tailed Rosefinch(!)

Taxonomy. *Procarduelis rubescens* Blanford, 1872, Sikkim.
Monotypic.

Distribution. C & E Himalayas from C Nepal E to Bhutan and NE India (E to Arunachal Pradesh) and S China (SE Xizang E to SE Gansu, Sichuan, NW Yunnan and S Shaanxi).



Descriptive notes. 13–15 cm. Medium-sized, slender-billed rosefinch with notched tail. Male has entire head crimson except for lores, often tinged darker on crown and browner on ear-coverts; lower nape and upperparts deep crimson with darker feather bases, rump and uppertail-coverts brighter reddish-crimson; tail dark brown, edged dull crimson; upperwing dark brown, median and greater coverts edged deep crimson and tipped brighter pinkish-red, flight-feathers edged deep crimson to wine-red, tertials edged slightly paler; underparts to flanks and upper belly pinkish-red (with grey feather bases), belly to undertail-coverts ashy grey, often with pale pinkish tips; iris dark brown or black; upper mandible pale horn-coloured, lower mandible yellow; legs light brown or yellowish-brown. Female has forehead to crown and upperparts uniformly olive-brown or tinged reddish-brown, lower back to uppertail-coverts brighter crimson, tail dark brown, edged warm buff-brown; upperwing dark brown, median coverts edged as upperparts and greaters tipped light buffish-brown, flight-feathers finely edged warm brown (paler when worn) and tertials more broadly edged; face and underparts dull buff-brown, often greyer on centre of lower breast to belly and undertail-coverts; bare parts as for male. Juvenile is like female, but lacks reddish tinge above and underparts slightly paler; first-summer male similar to adult, but tinged duller red on head, upperparts browner with blackish bases, edges of scapulars, wing-coverts and flight-feathers warm rufous-brown, tips of greater coverts deep pink, underparts dingy brown, pinkish-red feather tips on lores and chin to belly and flanks. Voice. Song, often given from top of tree, a loud musical warbling, consisting of repeated 3-note phrases of sharp chirping notes, rising and falling in pitch, final note downslured. Calls include short, thin and high-pitched "sip", squeaky "gwee", and a series of short rapid "pitch-ew", "pitch-it, chit-it, chit-ew..." or hard, metallic "ti-tip, tu-tip" and faster "tu-tiptiptip", each of which may also be given individually.

Habitat. Coniferous belt in subalpine zone where mainly in dark spruce (*Picea*) and fir (*Abies*) forests, also mixed coniferous–birch (*Betula*) forest, even on steep slopes and edges of forest clearings. In Nepal, in transition area of Himalayan hemlock (*Tsuga dumosa*) to east Himalayan fir (*Abies spectabilis*) forests with undergrowth of *Rhododendron* and *Betula utilis*. A group seen in *Cryptomeria* plantation at 1800 m in Apr were presumably on their way to higher-lying breeding areas. At 2800–3650 m in SE Tibet, up to 3800 m in Sikkim, 2745–4000 m in Nepal. In winter exclusively in forest areas, in Tibet and Sikkim exceptionally down to 1500 m or even 1370 m, with most records above 2500 m, 2315–3050 m in Nepal; in SE Tibet, in winter, at 2600 m in open pine (*Pinus*) forests.

Food and Feeding. Diet little known; presumably small seeds. Forages on the ground. In pairs in breeding season; in larger flocks of up to 30 individuals in winter.

Breeding. In SE Tibet two males in early Feb with developed gonads, suggesting early onset of breeding; adults in breeding condition and fledged young in Apr. Only known nest, in Gansu, c. 7–8 m up in spruce, on horizontal branch halfway along from trunk; female observed breeding on this nest in late Apr to early May. In captivity: clutch 4–5 eggs, blue with black spots; incubation period 13 days; nestling period 14 days; young independent 30 days after fledging. No other information.

Movements. Partial or altitudinal migrant. Moves to lower levels within breeding range in non-breeding season, most frequently during Jan–Apr.

Status and Conservation. Not globally threatened. Rare to scarce; uncommon in Bhutan. Generally a poorly known species. Extent of breeding range apparently smaller than previously believed.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Ludlow (1951), Ludlow & Kinnear (1937, 1944), MacKinnon & Phillipps (2000), Martens & Eck (1995), Martens & Trautmann (2008c), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Spierenburg (2005), Vaurie (1956a, 1959).

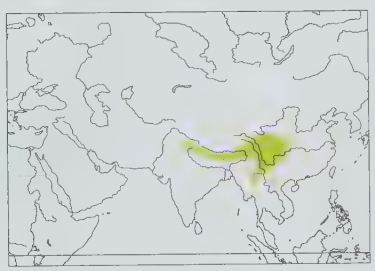
100. Dark-breasted Rosefinch

Carpodacus nipalensis

French: Roselin sombre **German**: Dünnschnabelgimpel **Spanish**: Camachuelo Oscuro
Other common names: Dark/Nepal Rosefinch

Taxonomy. *Carduelis nipalensis* Hodgson, 1836, central and northern Nepal.
Geographical variation largely clinal, plumage becoming darker from W to E. Three subspecies recognized.

Subspecies and Distribution.
C. n. kangrae (Whistler, 1939) – W Himalayas in Kashmir and N India (Himachal Pradesh and Uttarakhand).
C. n. nipalensis (Hodgson, 1836) – C & E Himalayas from W Nepal E to NE India (E to NE Arunachal Pradesh) and SW China (S & SE Xizang).
C. n. intensicolor (Stuart Baker, 1925) – SC China (S Gansu, W Sichuan and NW Yunnan), N Myanmar and NW Vietnam (W Tonkin).



Descriptive notes. 15–16 cm; 20–24 g. Medium-large, dark rosefinch with pointed conical bill and notched tail. Male nominate race has lowermost forehead and lores black (may also have dark around eye), continuing as broad dark maroon eyestripe to side of neck; forehead and forecrown deep vinous-pink, bright pink supercilium behind eye, bright pink (as forehead or slightly paler) on cheek and ear-coverts extending to chin and throat; crown, nape and upperparts dark maroon, indistinctly streaked darker; tail blackish-brown, finely edged dull reddish-brown; upperwing dark brown, tinged crimson, paler or brighter on edges and tips of greater coverts, flight-feathers edged dull crimson, tertials broadly edged slightly paler or pinkish-white; side of lower throat to upper belly and flanks maroon, rest of underparts pinkish or tipped crimson; iris black; bill dark brown, paler flesh-brown base of lower mandible; legs flesh-brown. Female has forehead to crown, nape and upperparts dark brown, broadly but indistinctly streaked darker, rump and uppertail-coverts paler buff-brown, tail dark brown, edged warm buff-brown, wing dark brown, median and greater coverts tipped pale buff-brown, secondaries edged paler brown or buffish, tertials broadly tipped pale buff-brown; face and underparts dull buffish-brown, sometimes poorly defined pale supercilium; belly to undertail-coverts slightly paler; bare parts as for male. Juvenile is like female, but upperparts more uniformly olive-brown; first-winter and first-summer males as adult female, but may show some reddish-brown on upperparts towards end of first summer. Race *kangrae* is similar to nominate, with upperparts browner, female paler and greyer than nominate; *intensicolor* of both sexes is darker than nominate, male with dark reddish-brown upperparts and breastband contrasting with reddish forehead and forecrown and pinkish-red rear supercilium, lower ear-coverts, throat and belly. Voice. Song a repetitive and monotonous chipping note. Calls include plaintive, wailing double whistle, and a twitter like that of a sparrow (*Passer*); alarm a harsh "cha-a-rr".

Habitat. Montane or submontane oak (*Quercus*), fir (*Abies*) and rhododendron (*Rhododendron*) forests, scrub, stunted bushes, grassy slopes and weed patches, patches of *Arundinaria* bamboo, also among rocks in boulderfields, alpine meadows at or above tree-line and ravines; at 3000–4400 m in Himalayas. In non-breeding season occurs in forest clearings and edges, undergrowth and edges of cultivation at lower levels, 1500–2750 in Nepal; in severe weather down to 1200 m in Nepal and Sikkim, occasionally to 900 m in Bhutan.

Food and Feeding. Diet poorly known, mostly small seeds and berries; also takes blossom, pollen and nectar from rhododendron flowerheads (forehead and throat becomes stained with pollen). Actively forages on the ground; shy, usually in or under bushes or low vegetation. In pairs or small flocks; often in larger single-sex pre-breeding flocks of up to 20 individuals (exceptionally to 100), and in mixed-species flocks with *Propyrrhula subhimachala*, *Pyrrhoplectes epauletta* and *Haematospiza sipahi*.

Breeding. Birds in breeding condition in Jun–Aug. No other information.

Movements. Partial or altitudinal migrant. Descends to lower levels in non-breeding season, between Nov and Apr; most movements triggered by severity of winter weather, and in most years remains towards upper limit, but in very severe weather comes lower. Rare non-breeding visitor in E Myanmar and NW Thailand.

Status and Conservation. Not globally threatened. Common or fairly common, but generally rather local; W race *kangrae* generally uncommon. Status in China not well known, but species probably locally not uncommon. Status in N Myanmar and N Vietnam (W Tonkin) uncertain, probably a rare resident.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Diesselhorst (1968), Étchécopar & Hüe (1983), Feijen & Feijen (2008), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), MacKinnon & Phillipps (2000), Martens & Eck (1995), Martens & Trautmann (2008d), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1949, 1956a, 1959), Whistler (1924, 1926).

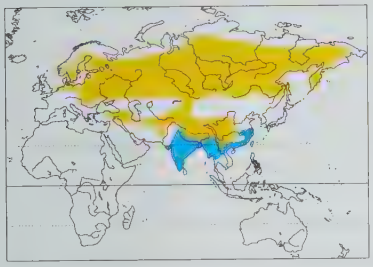

101
ssp erythrinus
ssp roseatus
102
ssp purpureus
ssp californicus
inches 3
cm 8
PLATE 42
103
typical
yellow-breasted
ssp mexicanus
104
ssp amplus
orange-breasted
ssp frontalis
ssp pulcherrimus
105
ssp waltoni
106
107
108
109
ssp edwardsii
ssp rubicundus

101. Common Rosefinch

Carpodacus erythrinus

French: Roselin cramoisi **German**: Karmingimpel **Spanish**: Camachuelo Carminoso
Other common names: Scarlet Rosefinch/Grosbeak, Hodgson's Rosefinch, Scarlet Finch(!)

Taxonomy. *Loxia erythrina* Pallas, 1770, Volga and Samara Rivers, Russia.
Forms a superspecies with *C. purpureus*. Geographical variation weak and, except for race *roseatus*, not well defined; races not always separable when in worn plumage. Five subspecies recognized.
Subspecies and Distribution.
C. e. erythrinus (Pallas, 1770) – breeds N, C & E Europe, W & C Siberia (E to Lena basin and Sayan Mts), NW Mongolia and, in S, from Croatia, Romania and N Ukraine E to N & C Kazakhstan; migrates to N India, lowland Nepal, Bhutan, N Myanmar and NW Thailand.
C. e. grebnitskii Stejneger, 1885 – breeds E Siberia and Russian Far East (Verkhoyanskiy Range and Kolyma basin E to Chukotka and Kamchatka, S to L Baikal area, Amurland and N Ussuriland), N Mongolia, NE China (Inner Mongolia), N Korea and N Sakhalin I; migrates to SE & S China S to N Thailand and N Vietnam.
C. e. kubanensis Laubmann, 1915 – breeds N & E Turkey, Caucasus, N & NE Iran and W & C Turkmenistan; migrates to N India.
C. e. ferghanensis (Kozlova, 1939) – breeds in mountains of E & SE Kazakhstan, Kyrgyzstan and W China (W Xinjiang) S to Afghanistan, NW Himalayas (E to Kashmir) and W Pakistan; migrates to NW India.
C. e. roseatus (Blyth, 1842) – breeds C & E Himalayas from Ladakh E to NE India (probably to Arunachal Pradesh), possibly also N Myanmar, and Tibetan Plateau E to C & S China (Qinghai E to SW Inner Mongolia, Ningxia, Shaanxi, Sichuan, W Guizhou and NW Yunnan); winters India E to Myanmar, NW & C Thailand, N Laos and NW Vietnam (W Tonkin) and S & SE China.



Descriptive notes. 13–15 cm; 19–33 g. Medium-large rosefinch with stubby or bulbous bill and notched tail. Male nominate race breeding has forehead to nape bright scarlet (variable in extent, and often duller or with browner bases showing through); lores dusky grey-brown, sometimes continuing behind eye as brownish eyestripe, cheek and ear-coverts brown or reddish-brown, washed brighter red; upperparts brown, edged paler, and washed bright red or reddish-pink (duller or browner in worn plumage), rump variably pinkish to deep red (depending on age) or with brownish tips, uppertail-coverts brown, washed red; tail brown, feathers broadly edged paler or reddish-brown; upperwing dark brown, median coverts finely edged paler and tipped pale pink or pinkish-buff, tips of greater coverts more uniform brownish-pink and rarely paler (both sets forming wingbars), flight-feathers finely edged pale buff or buffish-brown and tinged pink to light reddish towards tips, tertials more broadly edged pale pink or pinkish-buff; chin and throat to upper breast variable, bright red or duller, and merging with red on face and side of throat (may show dark malar stripe); side of breast and belly buffish-white or washed reddish, flanks slightly browner and streaked or washed reddish, undertail-coverts whitish; iris dark brown or black; bill grey to dark grey-brown with yellowish-brown to pinkish base of lower mandible, or plain dull olive; legs brown or pinkish-brown. Non-breeding male in fresh plumage (winter) has crown dull red to reddish-pink, feathers sometimes with brown bases, and upperparts (including rump) greyer, tips of wing-coverts warm buffish-brown, brightest pink to reddish-orange on side of throat to centre of breast. Female lacks bright red, has head and upperparts light olive-brown, tinged grey, with fine blackish streaks on forehead and crown, face slightly paler, may have short whitish-buff supercilium and subocular crescent, and broad pale buff moustachial stripe bordered by dark brown malar stripe; tail dark brown, finely edged light olive-brown; upperwing dark brown, median and greater coverts edged pale brown and tipped pale buff (forming double wingbar), flight feathers-edged pale olive-brown, more buffish-white on primaries; underparts buffish-white, tinged olive on breast and flanks, and streaked finely darker, belly to undertail-coverts whitish; bare parts much as for male. Juvenile is like female, but tinged buff-brown on head and face and finely streaked darker on forehead and crown, broadly streaked across upperparts, tips of median and greater coverts and edges of flight-feathers buff to warm buff-brown, tertials more broadly edged and tipped pale buff or whitish, underparts buffish and more heavily streaked, bill greyer; first-summer and second-summer male like adult female or slightly browner on head and upperparts (sometimes breeds in this plumage), or may have variable amounts of red on forehead, face and ear-coverts, also reddish feather tips on rump and underparts; adult-like plumage acquired in late summer of second year, forehead to crown deep red, nape and upperparts also tinged red, rump orange, becoming reddish-orange on lower rump, uppertail-coverts brown, tips of upperwing-coverts broadly pinkish-buff, chin to breast as on adult male or variably tinged or mottled with pink, white, yellow or pale orange, side of breast and flanks warm buff-brown and belly pale pink. Races differ mainly in intensity and extent of red on head, upperparts and underparts, but differences obscured in worn plumage and outside breeding season: *grebnitskii* is darker carmine-red than nominate, male has deeper red upperparts overlying dark grey-brown, paler or more pinkish-red underparts (extending to belly and flanks) than *roseatus*, female darker or browner above and below; *kubanensis* male is similar to nominate, but head and breast deeper red, mantle and scapulars brown, tinged reddish, and pinkish-red on underparts extends to upper belly and flanks, female paler and greyer, less olive-tinged, than nominate; *ferghanensis* male has head and upperparts darker brown than previous, less reddish suffusion on upperparts, below is more extensively rose-red on belly and flanks, female also darker or browner; *roseatus* breeding male is deeper red than males of other races, deep or rich carmine on head and upperparts, mantle and scapulars streaked blackish, rump bright carmine-red, red extending down to breast and lightly onto belly and flanks, female darker brown and more heavily streaked on crown, upperparts and underparts.
Voice. Song a regularly and monotonously repeated (in breeding season), slowly rising whistled "weeja-wu-weeeja", "weeech-wu-weecha" or variations, including "tway-tyu-tu-u-ooh", "tiu-wee-tiu", "tsitsewitsa" and "te-te-wee-chew"; in small, isolated local populations, all males sing same song type ("song neighbourhood"); generally silent outside breeding season, but male begins singing in early spring before departure from wintering areas. Call a distinctive, clear and rising "oooeet", "too-ee", "uueet", "dooei" or "djay-ee", or an interrogative "tway"; in flight or when about to fly gives short "zik" or "zlit"; anxiety or alarm note a sharp or harsh "chay-eeee", similar to a note of *Carduelis chloris*.
Habitat. Lowland to montane moist forests, woodlands and thickets of willows (*Salix*), alder (*Alnus*), poplar (*Populus*), tamarisks (*Tamarix*), scrub and bushes in taiga forest edges and clearings, also riverine thickets, reedbeds and patches of bushes in meadows, forest edges, hedges, orchards, cherry (*Prunus*) trees and edges of cultivation; in forest-steppe and higher areas of montane foothills occurs in bracken (*Pteridium*), dwarf willows, juniper (*Juniperus*) and on bush-covered slopes with isolated birch (*Betula*) and firs (*Abies*); breeds even in some city centres, e.g. Ulaanbaatar (Mongolia) and Almaty (Kazakhstan). In Europe breeds mostly below 200 m, but to above 1850 in some parts of range; in Kazakhstan to 2800 m, and in C Asia at 2500–3700 m; in W Himalayas race *ferghanensis* breeds at 2300–3600 m, lower, to 2000 m, in E Afghanistan and to 3900 m (occasionally to 4200 m) in Ladakh; farther E, *roseatus* breeds at 2000–4550 m in montane and submontane junipers along and above tree-line, also in thornbushes on plains, alpine slopes and hillsides to edges of terraced cultivation. In non-breeding season occurs at lower levels (usually below 1500–2000 m) in similar habitat in open areas of foothills, plains, reedbeds and edges of cultivation, principally paddyfields, mustard and sugar cane; on passage occurs in similar habitat, also in coastal woodlands and scrub.
Food and Feeding. Mostly plant and tree seeds, buds, catkins, shoots, leaves, fruit and berries, also nectar; also insects and larvae and other arthropods. Seeds and berries include those of juniper, larch (*Larix*), spruce (*Picea*), pine (*Pinus*), willow, aspen and other poplars, birch, alder, oak (*Quercus*), elm (*Ulmus*), maple (*Acer*), lime (*Tilia*), lilac (*Syringa*), mulberry (*Morus*), hemp (*Cannabis*), knotgrass (*Polygonum*), dock (*Rumex*), buckwheat (*Fagopyrum*), chickweed (*Stellaria*), pearlwort (*Sagina*), campion (*Silene*), buttercup (*Ranunculus*), radish (*Raphanus*), currant (*Ribes*), bramble (*Rubus*), apple (*Malus*), pear (*Pyrus*), cherry, rowan (*Sorbus*), meadowsweet (*Filipendula*), vetchling (*Lathyrus*), crane's-bill (*Geranium*), buckthorn (*Rhamnus*), alder buckthorn (*Frangula*), spurge-laurel (*Daphne*), willowherb (*Epilobium*), bilberry (*Vaccinium*), cow parsley (*Anthriscus*), comfrey (*Symphytum*), speedwell (*Veronica*), plantain (*Plantago*), dandelion (*Taraxacum*), elder (*Sambucus*), guelder-rose (*Viburnum*), raspberry (*Rubus*), snowberry (*Symphoricarpos*), sow-thistle (*Sonchus*), honeysuckle (*Lonicera*), figs (*Ficus*), *Lantana*, *Maesia*, *Trema*, wood-rush (*Luzula*), sedges (*Carex*), grasses and cereals (Gramineae), also bamboo and millet. Sips nectar of *Erythrina*, *Bombax*, *Butea*, *Woodfordia* and from other blossoms (forehead and throat feathers often become stained yellowish). Arthropods taken (mostly in summer) include adult and larval small dragonflies and damselflies (Odonata), bugs (Hemiptera) including aphids (Aphidoidea), moths (Lepidoptera) caddis flies (Trichoptera), flies (Diptera), beetles (Coleoptera), spiders (Araneae) and mites (Acari). Nestlings fed with pulp of regurgitated seeds and insects. Forages on the ground, in grasses and bushes or low herb vegetation; also perches and forages at all levels in trees when feeding on buds or fruit; hops on ground. Removes outer scales from buds, fruit, cereals or flowerheads and eats soft central core; nibbles fresh leaves and conifer needles. Consumes up to 15 buds in 5–10 minutes. Often at edges of roadside and saltpans, taking salt minerals; also takes mortar from walls and urine-soaked earth from around horse stables. Forages singly, in pairs and in small groups; forms larger post-breeding flocks of several family groups, in non-breeding season also larger flocks of 100–200 individuals, and joins mixed-species flocks with other seed-eaters, including other finches, sparrows (*Passer*) and buntings (Emberizidae).
Breeding. Season May–Aug; one brood. Monogamous; occasionally polygamous in areas with apparent excess of immature (brown-plumaged) males; pair-bond endures for single season, exceptionally longer, in one case for up to four successive years (with temporary new partner in third year, before re-pairing with previous partner). Young males sometimes co-operative helpers, assisting in feeding of young. Solitary or loosely colonial. Territory used for courtship and nesting, but most food-gathering done outside (male forages up to 3 km from territory), defended by both sexes, mostly by male, defence gradually declining during fledging period; size of territory variable, c. 1500 m² in Finland, 1600 m² in Urals, 3000 m² in Poland and 1600–3000 m² in S Sweden, exceptionally to 11,050 m². Males arrive in breeding area (often in small flocks) ahead of females, and pairing follows arrival of latter; male sings from regular songposts early in breeding season, and may attract female and subsequently move to different area to breed. In display, partners close together on ground, rock or branch, male adopts posture with head held high, crown feathers raised, wings drooped and slightly quivering, and tail partly raised, and slowly circles female, partners may also take turns in circling each other with head-up posture; male also stands in front of female and swings body slowly from side to side while vibrating drooped wings, he also bows towards female and then throws back head and gives rapid burst of song; other courtship includes bill-touching or head-pecking, mate-guarding (while female feeding) and slow butterfly-like flight with stiff wingbeats by male, also courtship-feeding by male, usually later in season during incubation and brooding of young. Nest built by female, a loose or untidy cup of twigs, plant stems and fibres, grass, flowerheads, plant down, moss, lichens and animal hair, placed low down (usually 1–2 m from ground, exceptionally up to 10 m) in bush, juniper or spruce or willow sapling, well hidden in tangle of foliage or against trunk, occasionally in scrub tangle, rarely on ground. Clutch 4–6 eggs, pale bluish-green with violet-grey blotches and sparse blackish-brown or purplish spots and streaks; incubation by female alone, period 11–14 days; chicks fed and cared for by both parents, nestling period 10–13 days; young leave nest before able to fly, fed by parents for 2 weeks after leaving nest. Breeding success: of 620 eggs in 273 nests in S Finland, 62% hatched and 54% of chicks fledged, average of 3 young per nest or 4·6 per successful nest, most losses due to predation by weasels (Mustelidae) and crows (Corvidae), in same study females deserted easily and presence of Red-backed Shrike (*Lanius collurio*) in nesting area likely to cause desertion; of 246 eggs in 49 clutches in four-year study in Sweden, 67·5% hatched and 60·6% of chicks fledged, average 3 young per nest, most losses due to mustelids, also domestic cats (*Felis catus*); in St Petersburg area (NW Russia), Mecklenburg (NE Germany) and NW Kazakhstan, success rates variable from 2·3 young per successful nest (of 12 nests) to 3·4 young per successful nest (of 214 eggs), and in Kazakhstan study high failure rate of 60–70% due mainly to crows, raptors, mustelids and human interference. Many breed in first year, usually when in immature plumage; breeding by first-years largely dependent on number of older males, sex ratio in population, density and availability of nest-sites. Longevity at least 9 years.
Movements. Migratory and partially migratory. Most movements nocturnal, on spring passage also diurnal, alone, in small flocks (often comprising same-age birds) or up to 200 together, occasionally flocks of several hundred birds. Nominate race entirely migratory, in non-breeding season moves between SE and E from late Jul to early Nov to wintering areas from S Nepal and N India E to N Myanmar and NW Thailand, adults leaving ahead of juveniles. Those from C & E Europe head E to areas N of Caspian Sea before continuing S to SE (joining with birds from W

On following pages: 102. Purple Finch (*Carpodacus purpureus*); 103. Cassin's Finch (*Carpodacus cassinii*); 104. House Finch (*Carpodacus mexicanus*); 105. Beautiful Rosefinch (*Carpodacus pulcherrimus*); 106. Pink-rumped Rosefinch (*Carpodacus eos*); 107. Pink-browed Rosefinch (*Carpodacus rodochroa*); 108. Vinaceous Rosefinch (*Carpodacus vinaceus*); 109. Dark-rumped Rosefinch (*Carpodacus edwardsii*).

Russia and N Kazakhstan) across C Asian deserts; individuals ringed in Scandinavia and NW Europe take route from Norway and Finland through Uzbekistan, and from Kaliningrad (W Russia) to E Turkmenistan; passage S through Altai and NE & E Kazakhstan mostly between mid-Jul and mid-Sept presumably of Siberian breeders; in Tien Shan and Pamir-Alai Mts populations of nominate and race *ferghanensis* converge, and one of the commonest migrants in Aug and early Sept, with high concentrations in valleys, also farther S in Tajikistan large numbers in town parks, gardens and around settlements; also recorded off-passage for up to 7–10 days N of Tien Shan in SE Kazakhstan, before crossing mountain ranges into S Asia, passage mostly over by mid-Sept, and thereafter only small numbers to early Nov; passage of *kubanensis* from E Turkey and Caucasus from end Aug to end Sept/early Oct (single mid-winter record S Turkey), mostly E through N Iran and Afghanistan; locally scarce or rare on passage (mostly singles) E Israel mid-Aug to mid-Oct (more numerous than in winter and on spring passage) and Sinai (NE Egypt), uncommon passage migrant United Arab Emirates late Aug to early Nov, also scattered records in winter to early Mar. Most migrants (of all three races) arrive N Pakistan between Aug and Oct, scarce or absent S Pakistan in autumn but more numerous in spring. Race *grebnitskii* winters from SC China and N Thailand E to N Vietnam; departs from breeding areas later than in W of range, passage through NE Russia and Mongolia from late Aug and early Sept, rare on passage Ussuriland and Japan, and presumably moves through N & C China, with passage recorded NE China mostly during Sept, regular passage migrant mid-Aug to end Oct in Korea; scarce but regular Hong Kong in winter from end Oct, but most present between late Dec and early Mar. S breeding populations of races *ferghanensis*, *kubanensis* and *roseatus* are altitudinal or short-distance migrants, moving locally to foothills and valleys in lowlands of N & C India and E to N Indochina, *kubanensis* possibly also a scarce winter visitor in Nepal; in Bhutan movement of *roseatus* and nominate in Oct–Nov to lower levels, and latter present in small numbers to at least Jan. Returns to breeding areas from late Apr to early Jun, passage through Pakistan, N India and Bhutan mostly Apr to mid-May and first birds in Himalayas and C Asian mountains from mid-Apr; arrives at higher altitudes in late May and Jun, first returns in Caucasus from late Apr and in C Turkey and N Iraq in early May. Passage through Tajikistan from mid-Apr to mid-May, through S Urals mostly during May, and reaches S Finland and St Petersburg area from E or SSE in mid-May, slightly later on Baltic coast of Estonia and at end of May in C Sweden; at W end of European breeding range arrives Austria late May and early Jun; in C Siberia (Tomsk region) and NE Altai passage mid-May to early Jun, and some of *grebnitskii* breeding farthest N arrive on territory in Russian Far East early to middle Jun. On passage occurs regularly (mostly dispersing first-year individuals) in Europe W to Switzerland, British Is and N to Iceland and C Norway, also S to United Arab Emirates, and has wintered in Oman; in E of range occurs on passage in Japan, Commander Is and, less frequently (and mostly in spring), in Aleutian Is and Pribilof Is and W Alaska. Vagrant N to Faeroes and W to Canary Is (Lanzarote), Portugal, islands in Mediterranean and Morocco.

Status and Conservation. Not globally threatened. Common to locally common. Estimated European breeding population between 505,000 and 631,000 pairs, most in Finland and Belarus; up to 50,000 pairs in Turkey and up to 10,000,000 pairs in Russia. Densities of 200 pairs/km² in pine–birch forest in C Siberia, 270 pairs/km² in Kyrgyzstan and 300 pairs/km² in water meadows in Estonia. In N Europe numbers increased since mid-1940s in Fennoscandia and NW Russia, now breeds along White Sea coast and in Murmansk area. In C Europe range expanded since 1930s W to NW Germany, Netherlands and Britain and in S to Slovenia and Austria; increase largely involved first-year birds arriving in autumn (linked to increase in numbers in Scandinavia), with a corresponding increase in numbers returning along same route in spring; first bred in Denmark 1972 and in Austria in 1973, colonized coastal belt of E Germany from 1968, and first bred in W Germany and in Britain in 1982 (then at up to five locations in next ten years); in 1992 unprecedented influx of more than 90 into Britain between mid-May and Jun resulted in widespread breeding by at least eight pairs, but numbers subsequently declined to only occasional breeding. First bred in France in 1985 (increasing to at least 30 pairs by 1993) and Netherlands in 1987 (c. 30–60 pairs by 1994, but only one in 2005); in Switzerland breeding first attempted in 1983, and successfully in 1989, and ten pairs by 1994; Belgium held nine territories in 1994. In E Asia, thought to have bred in N highlands of Korea in 1950s and 1960s, when many breeding-season records, and also several earlier such records; insufficient information on situation in more recent years.

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102. Purple Finch

Carpodacus purpureus

French: Roselin pourpré **German**: Purpurgimpel **Spanish**: Camachuelo Purpúreo

Taxonomy. *Fringilla purpurea* J. F. Gmelin, 1789, South Carolina, USA.

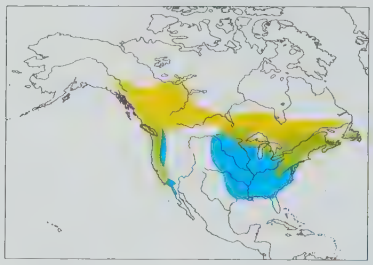
Forms a superspecies with *C. erythrinus*. Proposed races *taverneri* (described from NE Alberta, in W Canada) and *nesophilus* (from Newfoundland, in E Canada) considered clinal variants within nominate race, and *rubidus* (from W Washington, in NW USA) a synonym of *californicus*. Two subspecies recognized.

Subspecies and Distribution.

C. p. purpureus (J. F. Gmelin, 1789) – breeds S Canada (except SW) and NE USA; migrates mostly to SE USA.

C. p. californicus S. F. Baird, 1858 – breeds SW Canada (British Columbia) S along Pacific coast of W USA to California (Cascade Mts and W Sierra Nevada); non-breeding also to SE California, Arizona and extreme NW Mexico (extreme NW Baja California).

Descriptive notes. 13·5–14·5 cm; 17·5–28·4 g. Medium-sized, stoutly built, large-billed rosefinch with notched tail. Male nominate race has forehead to hindcrown deep pink, often tinged purple, becoming deeper and streaked browner on nape and side of neck (side of crown may also be slightly darker); upperparts like nape, heavily streaked dark brown or blackish, lower back and rump unstreaked deep pink, uppertail-coverts grey-brown, edged and tipped pink or reddish; tail dark brown, finely edged pinkish; upperwing dark brown or blackish, median and greater coverts tipped pale pinkish (or pale buff in fresh plumage), flight-feathers edged reddish (buff-brown when worn); chin to breast deep pink, sometimes tinged with mauve, fading to whitish on lower breast and upper belly; flanks dull buff or whitish, lightly smudged or indistinctly streaked pinkish or buff-brown on lower flanks, and belly to undertail-coverts white; iris black; bill dark horn, yellowish-horn cutting edges and lower mandible; legs pale brown. Female lacks pink or red in plumage, has



head and upperparts greyish-brown, tinged warmer buff and finely streaked darker on mantle and scapulars, unstreaked pale brown rump and uppertail-coverts; tail dark brown, broadly edged pale buffish-brown, wing dark brown, coverts finely edged pale brown and tipped pale buffish-brown, flight-feathers finely edged pale buff-brown; lores and broad supercilium pale buff or whitish, supercilium ending abruptly at rear of ear-coverts, cheek and ear-coverts brown (like crown or slightly darker); moustachial area and lower cheek whitish or flecked buff-brown, broad buffish-brown malar finely flecked blackish; white to whitish-buff below, heavily or broadly streaked with olive-brown or blackish arrowheads (may show slight pink tinge on breast in E of range), belly to undertail-coverts unstreaked; bill pale pink, darker on upper mandible in summer. Juvenile is like female, but with warmer buff-brown upperparts and tawny-brown on rump and uppertail-coverts; first-summer male has head and rump washed olive-yellowish, chin and throat unstreaked deep yellow, small dark brown spots on breast (sings and holds territory and possibly breeds in this plumage); moults into adult-like plumage in late summer of second year. Race *californicus* is brighter rose-red or pinkish-red than nominate, usually has weaker supercilium; mantle and back warmer brown and less heavily suffused with crimson, rump darker and side of breast and flanks browner, female has buff (not white) underparts more diffusely streaked, with dark centres obscured by buff-brown edges. Voice. Song, usually by male from regular and prominent perch at top of tree or during display-flight, a rapid, flowing, rising and falling warble of rich, bubbling notes (mostly in pairs), usually repeated several times and interspersed with short imitations of songs of other birds, including Barn Swallow (*Hirundo rustica*), *Carduelis tristis* and Rufous-sided Towhee (*Pipilo erythropthalmus*), and concludes with several high-pitched notes; territorial song (given during breeding season) of E birds a slower series of warbling notes; female has short twittering song, rarely heard and given from nest. Calls varied, but include a sharp or metallic "pik", "tick" or "pink" often uttered in flight, also a musical "char-lee", "chee-wee" or "whit whewe".

Habitat. Open conifer woods and forests, also mixed deciduous and conifer, especially pine–oak (*Pinus–Quercus*) woods and groves, including non-native conifers, edges of bogs, wooded hills, canyons and parks, plantations, orchards, hedgerows and gardens, including in city suburbs.

Food and Feeding. Mostly seeds, buds, shoots, blossom and nectar of trees; also some insects and larvae. Seeds, buds and shoots include those of elm (*Ulmus*), tulip tree (*Liriodendron*), fir (*Abies*), maple (*Acer*), beech (*Fagus*), birch (*Betula*), hornbeam (*Carpinus*), hop-hornbeam (*Ostrya*), sweet gum (*Liquidambar*), sycamore (*Platanus*), ash (*Fraxinus*), juniper (*Juniperus*), mountain ash (*Sorbus*), also buds, flowers, berries and fruit of poplar (*Populus*), apple including crab apple (*Malus*), coralberry (*Symphoricarpos*), barberry (*Berberis*), hackberries (*Celtis*), pear (*Pyrus*), cherries and apricots (*Prunus*), juneberry (*Amelanchier*), cotoneaster (*Cotoneaster*), firethorn (*Pyracanthus*) dogwood (*Cornus*), sumac (*Rhus*), chickweed (*Stellaria*), radish (*Raphanus*), dandelion (*Taraxacum*), ragweed (*Ambrosia*), honeysuckle (*Lonicera*), cocklebur (*Xanthium*), grapes (*Vitis*), strawberries (*Fragaria*), raspberry and blackberries (*Rubus*), pigweed (*Amaranthus*) and goosefoot (*Chenopodium*). Insects and larvae taken include aphids (Aphidoidea), grasshoppers (Orthoptera), moth larvae (Lepidoptera), beetles (Coleoptera) and ants (Formicidae). In some areas takes sunflower (*Helianthus*) seeds, millet (*Panicum*) and hemp (*Cannabis*) at birdtables and feeders. Nestling diet seeds regurgitated by adults. Forages with slow or sluggish actions, on the ground, in bushes and trees. Extracts seeds from fleshy fruits and discards fleshy part; obtains nectar from buds and flowers by crushing base of flower (upper part of flower otherwise undamaged); also pursues and catches insects in flight. Singly, in pairs and in small flocks; in non-breeding season forms larger flocks of up to 200 individuals (occasionally comprising all males, or females and immatures), also joins mixed-species flocks with *Carduelis pinus* and *Carduelis tristis*.

Breeding. Season Apr to early Aug; two broods. Monogamous. Solitary. Displaying male raises crest, fluffs out breast feathers, flutters wings vigorously, with tail held partly raised, while hopping around female and singing loudly, sometimes holds piece of nesting material in bill; may also make bounding flight and, on dropping back to ground, point bill vertically, droop wings and spread tail; female may respond with quivering wings and raising of tail. Nest built entirely by female, comprises twigs, plant fibres, roots, grass and animal hair, usually well hidden or obscured from view 1–18 m above ground along branch of tree, usually conifer, or shrub or in vine, sometimes on ground. Clutch 3–4 eggs, pale greenish-blue with fine blackish or brown spots or scrawled lines; incubation by both partners, mostly by female, period 12–13 days; chicks fed and cared for by both parents, nestling period 13–16 days; young remain within vicinity of nest for up to a week after leaving it. Frequently parasitized by Brown-headed Cowbird (*Molothrus ater*), e.g. 22 (5·9%) of 372 nests in one study contained one or two cowbird eggs (parasite eggs accepted when own eggs present, but nest abandoned if it contains only cowbird eggs), parasitism rates higher in E of range than in W; fledging rate from parasitized nests not significantly different from overall fledging rate. Of 202 nests in one study area, 5 (2·5%) failed completely owing to inclement weather and 62 (31%) lost to predation; most predation of nest contents by Blue Jay (*Cyanocitta cristata*), Florida Scrub-jay (*Aphelocoma coerulescens*), Clark's Nutcracker (*Nucifraga columbiana*), Common Grackle (*Quiscalus quiscula*) and American red squirrel (*Tamiasciurus hudsonicus*). Probably first breeds at 1 year. Maximum recorded longevity 14 years, average lifespan 2 years.

Movements. Resident and migratory. Present within breeding range throughout year from S Manitoba E to S Newfoundland; scale of movement annually variable, largely influenced by availability of food (particularly conifer seeds), and may be erratically locally common in parts of wintering area in one year and rare in following year, or present in large numbers in one area until food supply depleted. Nominate race breeding E of Rocky Mts moves between S and SE late Aug to Dec to wintering grounds in E USA S to C & SE Texas and E along coast to C Florida; evidence from ringing shows wintering birds in NE USA mostly from NC areas of breeding range, those wintering in Arkansas are from 1600–2200 km NE in USA, with smaller numbers from mid-western USA and C Canada; those wintering in S Carolina are from E North America. Race *californicus* makes post-breeding descent to lower altitudes adjacent to breeding range, or moves S to spend Oct–Mar in SE California and mountains of S Arizona S to NW Baja California (extreme NW Mexico). Return movements usually Feb–May, males ahead of females; abundance at sites suggests that routes taken in autumn and spring may differ; moves 12–32 km per day; found up to 640 km offshore in W North Atlantic during autumn migration. Vagrant in Bermuda.

Status and Conservation. Not globally threatened. Common to locally common; often numerous on migration and in wintering areas. Status in Baja California (NW Mexico) unclear; may be scarce resident in Sierra Juárez, otherwise fairly common winter visitor S to Sierra San Pedro Martír. Breeding densities vary from 1·2 pairs in 40 ha of grassland and shrub in Minnesota to 19·5 pairs/ha of spruce plantation in Maine; densities also highest in W & NE coastal breeding populations. In NE USA and S Canada population declined by 50% between 1966 and 1994, and

in N Canada by 67% between 1989 and 1994, largely as a result of competition with *C. mexicanus*; previous declines in population correlated with introduction of House Sparrow (*Passer domesticus*) in parts of range.

Bibliography. Anon. (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Bartleson & Jensen (1955), Belthoff *et al.* (1990), Bent & Austin (1968), Blake (1955, 1962), Clement *et al.* (1993), Collister (1989), Covell (1922), Duvall (1945), Godfrey (1986), Gorbeil (1963), Groskin (1938, 1950), Guillion (1950), Hall (1984a), Howell & Webb (1995), Kennard (1959, 1977), Laskey (1974), Magee (1924, 1936, 1940), Marten & Johnson (1986), McCarthy (2006), Salt (1952), Shedd (1990), Sibley (2000), Small (1994), Thompson (1894), Verner & Willson (1969), Wilbur (1987), Wootton (1987, 1996), Yunick (1983a, 1983b).

103. Cassin's Finch

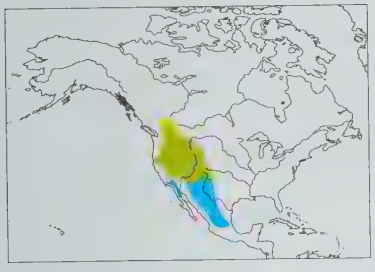
Carpodacus cassinii

French: Roselin de Cassin **German**: Cassingimpel **Spanish**: Camachuelo de Cassin

Taxonomy. *Carpodacus cassinii* S. F. Baird, 1854, near Gemini Peak, Yavapai County, Arizona, USA.

Monotypic.

Distribution. SW Canada (S British Columbia and extreme SW Alberta) and W USA S to extreme NW Mexico (N Baja California); winters S to C Mexico (Coahuila S to Michoacán).



Descriptive notes. 14·5–16·5 cm; 20·4–37·8 g. Medium-large, slender rosefinch with short, spiky crest (erected when alarmed), conical bill and notched tail. Male has forehead to hindcrown bright pinkish-red, becoming pinkish with browner streaks on nape and side of neck; supercilium from eye to rear of ear-coverts pale pink, lores and ear-coverts brown, sometimes a small pale pink or whitish subocular spot, cheek pinkish, finely streaked darker; upperparts like nape, broadly streaked dark brown or blackish, lower back and rump unstreaked deep pink, uppertail-coverts grey-brown, edged and tipped pink or reddish; tail dark brown, finely edged warm brown or pinkish; upperwing dark brown or blackish, median and greater coverts tipped pale pinkish (pale buff in fresh plumage), flight-feathers edged reddish (buff-brown when worn); chin to breast deep pink, sometimes tinged with mauve, fading to whitish on lower breast and upper belly; flanks dull buff or whitish, lightly smudged or indistinctly streaked pinkish or buff-brown on lower flanks, belly to undertail-coverts white; iris dark brown; bill dark greyish, paler horn-coloured cutting edges and lower mandible; legs pale brown or brownish-pink. Female lacks pink and red in plumage, has head and upperparts greyish-brown, tinged warmer buff and finely streaked darker on mantle and scapulars; rump and uppertail-coverts unstreaked pale brown, tail dark brown, broadly edged pale buffish-brown; upperwing-coverts dark brown, finely edged pale brown and tipped pale buffish-brown, flight-feathers finely edged pale buff-brown; lores and broad diffuse supercilium (latter ending abruptly at rear of ear-coverts) pale buff or whitish with dark streaking, cheek and ear-coverts brown (like crown or slightly darker); moustachial area and lower cheeks whitish or flecked buff-brown, broad buffish-brown malar stripe finely flecked blackish; white or whitish-buff below, heavily streaked with olive-brown or blackish arrowheads (may show slight pink tinge on breast in E of range), central belly unstreaked; bill pale pinkish, upper mandible darker in summer. Juvenile is similar to female, has head and upperparts greyish or greyish-olive, streaked blackish, median and greater upperwing-coverts finely edged buffish or pale brown, underparts pale buffish-white, indistinctly streaked dusky grey, finely so on chin and throat; male acquires adult plumage in moult at end of first summer (when 12–14 months old), moult completed before departure to wintering area. Voice. Song, usually from top of tree or in song flight, a rapid series of short syllables, similar to that of both *C. purpureus* and *C. mexicanus*, but more variable and interspersed with longer pauses and imitations of other birds' songs, including *Loxia curvirostra*, *Carduelis pinus*, Western Tanager (*Piranga ludoviciana*), Steller's Jay (*Cyanocitta stelleri*) and *Hesperiphona vespertina*; colonial breeding males have same song themes (including imitated species), differing from those in neighbouring colonies. Call a dry double or triple note, "tidilip"or "tee-dee-yip" or variations, including "giddy-up", "kee-yup", "soo-leep", "cheedly-up", most frequently uttered in flight.

Habitat. Montane and subalpine open, dry, semi-arid conifer forests and woods, including lodgepole pine (*Pinus contorta*), ponderosa pine (*Pinus ponderosa*), fir (*Abies*) and Douglas-fir (*Pseudotsuga*), spruce (*Picea*) and aspen (*Populus*), sometimes in open sagebrush (*Artemisia*) steppe with scattered juniper (*Juniperus*); at 1000–3000 m, mostly above 2400 m in Nevada, and much lower around Pocatello, in Idaho. In non-breeding season occurs in similar habitat at lower levels; unlike *C. purpureus*, only rarely in suburban areas.

Food and Feeding. Mainly seeds and buds of trees; also some insects. Seeds and buds include those of quaking aspen (*Populus tremuloides*) and cottonwoods (*Populus*), pines, fir, Douglas-fir, spruce, also manzanita (*Arctostaphylos*), and at feeding stations sunflower seeds (*Helianthus*). Berries of cotoneaster (*Cotoneaster*), firethorn (*Pyracanthus*) and mulberry (*Morus*) also taken; berries of first two, at least, facilitate production of carotenoid pigments required for plumage development of male. Small numbers of insects taken include budworms (Tortricidae) and other Lepidoptera larvae, principally of Douglas-fir tussock moth (*Orgyia pseudotsuga*). Forages both on the ground and in canopy of trees; removes conifer seeds from opening cones; takes salt from ground. Actions slow, similar to those of *C. purpureus*. In pairs and small flocks in summer; non-breeding males form flocks of up to 50; post-breeding family groups merge into larger group of entire colony, and these apparently stay intact as coherent group throughout winter; also sometimes in mixed flocks with *Carduelis pinus*, *Loxia curvirostra* and *Hesperiphona vespertina*.

Breeding. Season Apr–Jul; one brood. Monogamous; pair-bond possibly maintained for more than single season. Solitary; also loosely colonial, inter-nest distance generally at least 25 m (closer nesting tolerated only when one nest started earlier and egg-laying stage past). Defended territory usually restricted to area around female and radius around nest of c. 15·5 m at height of nest-building and egg-laying, declining through to incubation. Pair formation takes place in nesting area before break-up of winter flocks. Displaying male sings long complex songs during early part of season and guards mate through to brooding of young. Nest built entirely by female, a loose cup of plant roots and fibres, lichens, bark strips, string, feathers and animal hair on a platform of twigs, placed up to 9 m above ground (exceptionally within 1 m of ground in sagebrush) near top of tree, against trunk or on horizontal branch, usually in conifer (mostly lodgepole or ponderosa pine), occasionally in deciduous or fruit tree. Clutch 3–6 eggs, light blue, sparsely spotted or speckled with blackish-brown and purple, sometimes unspotted; incubation by female, period at least 12 days; chicks fed and cared for by both parents, no information on duration of nestling period. Success rate in N Utah study variable, apparently related to population density, in years with high density 50% of 20 nests successfully fledged young, in lower-density years 9 of 14 nests (64%) and 7 of 9 nests (78%) fledged young, early nests more likely to fail than those started later in season because of severe weather; of four nests in sagebrush in Oregon study, 2–3 young fledged from each nest from clutches of 4–5 eggs; nest predation by Grey Jay (*Perisoreus canadensis*) recorded in Colorado. Breeds in first year; all females breed in every year, but proportion of first-year brown-plumaged males does not and forms bachelor flocks. Longevity at least 6 years; estimated average life expectancy 2 years 3 months.

Movements. Resident and migratory. Present throughout year in parts of range, sometimes as far N as S British Columbia. Some make temporary post-breeding dispersal to higher altitude before moving to wintering areas; elsewhere largely an altitudinal migrant, making post-breeding descent to lower levels within breeding range. Adults usually depart between mid-Sept and early Oct, up to two weeks ahead of immatures; non-breeding range extends S to S California, NW Mexico (N Baja California) and interior Mexico S to N Jalisco, Guanajuato and San Luis Potosí, and species is scarce or erratic in deserts of SE California and W Arizona, and in Mexico in N Michoacán and WC Veracruz. Return movement usually begins late Feb or early Mar, with peak early Apr or May. Vagrant in Tres Marias Is (off W Mexico).

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Formerly common or locally common. In second half of 1970s was assessed as being most abundant breeding bird on Hart Mt, in Oregon, where 20–25 pairs/ha in 4·5-ha forest stand of ponderosa pine; in White Mts, in California, the most abundant breeding bird species in zone characterized by bristlecone pine (*Pinus longaeva*) and limber pine (*Pinus flexilus*). Recent rapid decline; between 1996 and 2002 numbers declined by c. 2·3% annually. Global population estimated at fewer than 2,000,000 individuals. Breeding numbers limited either by availability of nest-sites or by numbers of females in population; in some regional populations, males outnumber females throughout year. Total breeding population possibly stable; considerable fluctuations in winter numbers, varying from abundant in some years to scarce or absent in subsequent years, hence significant declines during 1982–1991 in California and Utah and simultaneous increase in Wyoming.

Bibliography. Anon. (1983, 2009i), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Arvey (1938), Balph (1978), Butchart & Stattersfield (2004), Clement *et al.* (1993), Duvall (1945), Godfrey (1986), Groth (1993a, 1994), Hahn (1996), Howell & Webb (1995), Jones & Baylor (1969), Kelly (1921), Kingery & Kingery (1995), Marten & Johnson (1986), Mayr & Short (1970), McCarthy (2006), Mewaldt & King (1985), Orr (1968), Root (1988), Samson (1974, 1976a, 1976b, 1977), Sibley (2000), Small (1994), Sullivan *et al.* (1986).

104. House Finch

Carpodacus mexicanus

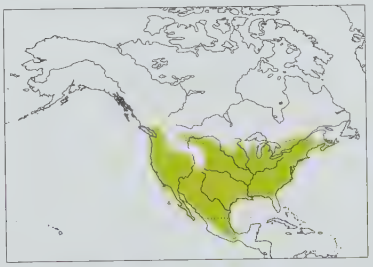
French: Roselin familier **German**: Hausgimpel **Spanish**: Camachuelo Mejicano
Other common names: Common House Finch; McGregor's/San Benito Housefinch (*mcgregori*); Guadalupe House Finch (*amplus*)

Taxonomy. *Fringilla mexicana* Statius Müller, 1776, Valley of Mexico, Mexico.

Geographical variation complex, and considerable variation in body size, bill size and shape, and wing, tail and tarsus lengths; also, degree of saturation of red in male plumage (largely derived from access to carotenoid pigments in food) highly variable both within and among populations (in some populations in Hawaiian Is, where introduced, males lack red); in addition, some populations poorly known and range of variation undescribed. Large races *mcgregori* (extinct) and *amplus* sometimes considered to represent one or perhaps two separate species. Conversely, in SW USA, proposed races *grinnelli* (described from R Scott, NW of Callahan, in California), *solitudinus* (from Fallon, in Nevada), *smithi* (from near Aurora, in NC Colorado) and *anconophila* (from Chinati Mts, in Presidio County, in SW Texas) all commonly synonymized with *frontalis*. Present division of races, based on male plumage and morphological features, may not be sustainable, and entire range of variation within the species requires further research. Eleven extant subspecies currently recognized.

Subspecies and Distribution.

C. m. frontalis (Say, 1823) – SW & extreme SE Canada (Vancouver I, S British Columbia and SW Alberta E, just N of USA border, to SE Ontario and E to S Nova Scotia), USA and NW Mexico.
C. m. clementis Mearns, 1898 – San Clemente I (off SW California) and Los Coronados Is (off extreme NW Baja California).
C. m. amplus Ridgway, 1876 – Guadalupe I (off W Baja California).
C. m. ruberrimus Ridgway, 1887 – S Baja California, in NW Mexico.
C. m. rhodopnus R. T. Moore, 1936 – NW Mexico (C Sinaloa).
C. m. coccineus R. T. Moore, 1939 – SW Mexico.
C. m. potosinus Griscom, 1928 – NC Mexico.
C. m. centralis R. T. Moore, 1937 – C Mexico.
C. m. mexicanus (Statius Müller, 1776) – SC Mexico.
C. m. roseipectus Sharpe, 1888 – S Mexico (Oaxaca Valley).
C. m. griscomi R. T. Moore, 1939 – SC Mexico (Guerrero).
Introduced (*frontalis*) to E North America [mapped, see page 69] and Hawaiian Is.



Descriptive notes. 12·5–15 cm; 17·5–27 g (various races), 15·7–22·5 g (*griscomi*). Relatively small rosefinch with fairly long, notched tail, short, rounded wing and rounded or domed head with short bill and curved culmen. Male nominate race has forehead, forecrown and broad supercilium bright pinkish-red, lores, cheek and ear-coverts grey-brown, heavily tinged pinkish-red, broad pinkish-red moustachial stripe bordered by dusky malar stripe; nape buff-brown, tinged pinkish and indistinctly streaked darker, upperparts streaked dark brown with broad feather fringes pale buff, tinged bright pink; lower back and rump pale pinkish-red, uppertail-coverts brown, tinged reddish-brown; tail dark brown, feathers finely edged paler or warm buff-brown (tinged red or reddish in fresh plumage); upperwing dark brown, median and greater coverts edged pinkish-buff and tipped pale pink or pinkish-white (forming double wingbar), flight-feathers finely edged pale buffish-brown (pale buff tips of secondaries and tertials in worn plumage); chin and throat to side of throat and upper breast bright red, sides of breast buff-brown tinged red and sometimes streaked darker brown, rest of underparts dull whitish-buff with broad dark brown streaks; some individuals have red replaced by pale to bright yellow/orange, some others much brighter red; iris brown or blackish-brown; bill dark grey or blackish, often with most of lower mandible paler grey or yellowish-horn; legs dark brown to flesh-brown.

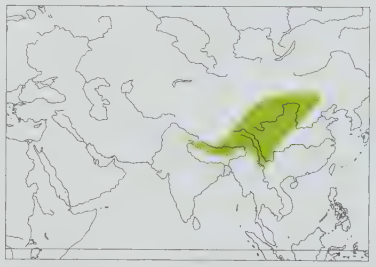
Female lacks red in plumage, has head and upperparts pale grey-brown, finely streaked darker on face, streaked mantle and scapulars with pale fringes, rump unstreaked grey-brown; tail as on male, but lacking reddish in fresh plumage, upperwing-coverts have pale whitish-buff tips; buffish-white below, extensively streaked or lined darker to undertail-coverts. Juvenile is like female, and not always separable in field; young male acquires adult breeding plumage in second winter. Races differ mainly in size, bill shape and size, lengths of wing, tail and tarsus, and extent and intensity of red on male: *frontalis* has wine-red forehead and supercilium not sharply defined, crown and upperparts light brown, spotted deep brown, rump brighter, chin and throat to mid-breast light russet-red, rest of underparts buff or pinkish-buff, streaked brown on flanks (upperparts and underparts brighter in worn plumage), yellow morph has red areas orange; *clementis* resembles previous, but bill larger and culmen curved, wing shorter, tail and legs slightly longer, flank streaks slightly broader; *amplus* is larger than nominate, also large-billed (deeper base of lower mandible), and crimson extends to lower lores and cheek; *centralis* is largest race, similar to nominate, but red below extending to belly and undertail-coverts, slimmer streaks on flanks; *potosinus* is similar to last, but red areas more carmine, wings and tail browner, often little red on crown, nape and back, red below extends to lower centre of breast, streaks narrower; *coccineus* resembles previous, but red more scarlet, upperparts paler drab brown and suffused with scarlet, lower underparts white; *rhodopnus* is smallest (legs slightly longer), most extensively deep carmine-red and least streaked of all races, upperparts and entire underparts (including undertail-coverts) suffused with red both in breeding plumage and when plumage worn; *ruberrimus* is similar to last in breeding plumage, with less extensive but brighter red below, belly and flanks washed or tinged red but broadly streaked, in fresh plumage brighter rosy pink; *griscomi* is like nominate, but in breeding plumage has less buff on flanks, ground colour of undertail-coverts pale pinkish-buff, upperparts with paler grey streaks wider, in non-breeding plumage more buff on lower underparts than when breeding; *roseipectus* has orange-red flush on underparts. Voice. Song, throughout year (except during moult, from late Jul to Oct), mostly in early morning and again in evening, by male in song flight or from perch, a slow, disjointed jumble of hoarse and musical notes, similar to but higher-pitched than those of *C. purpureus* and *C. cassinii* and with downslurred concluding note, "whee-er" or "cheer"; some variation or dialectal areas of song, e.g. in New York (no dialect apparent in California); female may also give simpler version of song. Call "cheep", "cheet" or "vweet", often given in flight or as part of a repeated series, and " fillp" or "fiidllp" from perched bird in longer or more drawn-out version; also sharp "chirp", recalling similar note of House Sparrow (*Passer domesticus*).
Habitat. Semi-dry open brush, canyons and scattered woodlands, edges of dry desert and semi-desert grasslands and chaparral, also farmland and edges of cultivation, orchards, scrub, parks and gardens, including around suburban areas; to c. 2000 m in W of range.
Food and Feeding. Mainly vegetable matter, mostly plant seeds, buds and fruit; also small numbers of insects. Seeds and flowers principally those of napa thistle (*Centaurea melitensis*), black mustard (*Brassica nigra*), wild mustard (*Synapis arvensis*), amaranth (*Amaranthus*), alfilaria (*Erodium*), knotweed (*Polygonum aviculare*), turkey mullein (*Eremocarpus setigerus*) and thistles (*Cirsium*), also a wide variety of other plants, including burweed (*Amsinckia tesselata*), milk thistle (*Mariana mariana*) and poison oak (*Rhus diversiloba*), also blossoms, buds and fruit including of *Prunus* (cherries, plums, peaches, apricots), figs (*Ficus*), pear (*Pyrus*), mulberries (*Morus*), strawberries (*Fragaria*) and blackberries (*Rubus*); race *clementis* known to take fruits also of cactus; in Hawaii (introduced) favours papaya fruit (*Carica papaya*), also banyan (*Ficus*), guava (*Psidium*) and rose-apple (*Eugenia*); seeds of ironwood (*Casuarina*), Formosan koa (*Acacia confusa*), pink tecoma (*Tabebuia pentaphylla*), broad-leaved plantain (*Plantago major*), spear thistle (*Cirsium vulgare*) and beggarticks (*Bidens*) and nectar of African tulip (*Spathodea companulata*) also taken; occasionally sips maple (*Acer*) sap; takes sunflower seeds and peanuts at feeding stations and in gardens. Insects taken are mainly plant lice (Aphididae). Nestlings fed with regurgitated seeds. Forages on the ground, in low vegetation and in trees and bushes. Collects seeds from ground or from seedhead; frequently takes quantities of sodium salt from roadside. Maintenance of plumage characters highly dependent on the taking of foods with specific carotenoid pigments during late summer–early autumn moult. Feeds singly, in pairs, and in small or medium-sized flocks; in late summer juveniles gather in large flocks at common food sources, and later in non-breeding season forms larger flocks of up to several hundreds or thousands.
Breeding. Season mid-Mar to early Aug, also once in mid-winter in California; up to three broods (up to five replacement clutches laid). Monogamous, pair-bond may last for more than single season; females also change partners within and between breeding seasons, including when previous partner still present. Solitary and loosely colonial; pairs often nest less than 1 m apart. Size of territory not well known, mainly area surrounding female and nest. Pair formation takes place before break-up of winter flocks or on return to breeding area, also throughout season as females abandon previous mate and seek new partner; female choice of mate important, preference given to males with brightest plumage, others actively driven away; also, males have preference for brightest coloured females, but age possibly most important factor. Displaying male in slow, stiff-winged butterfly-like song flight climbs slowly to 20–30 m, before gliding back to perch while singing loudly; on ground partners bill-touch often, leading to courtship feeding (continued until brooding of young) and to begging response of female, with drooped wings, head up and giving excited begging calls; mate-guarding of female by male continues from pair formation to incubation. Nest built by female, occasionally assisted by male, mostly of grasses, plant fibres, leaves, roots, string, wool and feathers on platform of twigs, placed up to 5 m above ground under overhanging vegetation in ivy-covered tree, usually conifer, or palm or cactus, rarely in deciduous tree, occasionally in other sites e.g. ivy-covered house, car-park shelter, rock ledge, air vent, street light, hanging basket and disused nest of other bird. Clutch 4–6 eggs, pale blue with fine black or dark purple speckles; incubation by female, fed on nest by male for duration, period usually 13–14 days (exceptionally 12 or 17 days); chicks fed and cared for by both partners, nestling period 12–19 days. Occasionally parasitized by Brown-headed Cowbird (*Molothrus ater*); of 42 nests in study in Ontario, in S Canada, 42% parasitized, but no cowbird chicks fledged (owing to unsuitability of diet provided by hosts). Breeding success: in study of 154 nests in Michigan, in N USA, 85 produced 1–6 young each (mean of 3 per successful nest) and 46% of nests lost to predation; eggs and chicks taken by Blue Jay (*Cyanocitta cristata*), Steller's Jay (*Cyanocitta stelleri*), Clark's Nutcracker (*Nucifraga columbiana*), Common Grackle (*Quiscalus quiscula*), American Crow (*Corvus brachyrhynchos*), domestic cats (*Felis catus*), eastern chipmunks (*Tamias striatus*), fox squirrels (*Sciurus niger*), rats (*Rattus*) and gopher snakes (*Pituophis*) and destroyed by wasps (Hymenoptera). Breeds in first year; all females breed, but up to 40% of males fail to attract mate, male success dependent more on brightness of plumage than on age. Maximum recorded longevity 11 years 7 months.
Movements. Resident, migratory and dispersive. Prior to 1945 those in W of range present in breeding area only between late Mar/early Apr and Sept, subsequently only altitudinal movements to lower levels and plains; occasionally irruptive, wandering nomadically throughout range S to Gulf coast of S Texas and S Sonora, in Mexico. Breeders in NE of range (W to Great Lakes area) move longer distances S & SW to wintering grounds within S parts of breeding range; part of N populations (e.g. in S Michigan) sedentary, numbers lowest Nov–Jan and increasing from mid-Feb to early Apr. Ringing studies indicate that adult females move longer distances on average than do males; some tendency for migrants to show fidelity to wintering areas in subsequent years and to return to natal area, including same nest-site, in following year. Most movements diurnal; direction and distances travelled largely determined by availability of food.
Status and Conservation. Not globally threatened. Common to locally abundant in North America; common in Mexico. North American population currently estimated at c. 21,000,000 birds; natural range occupied much of W half of USA, as well as extreme SW Canada. Large race *mcgregori*, confined to San Benito Is (W of Cedros I), off C Baja California, disappeared probably in 1940s, and certainly by 1964; cause of its extinction seems to have been primarily over-zealous hunting by specimen-collectors. Since end of 19th century, population in W parts of range (mainly California, Idaho, Utah and New Mexico) has declined in numbers, for reasons unknown. In contrast, numbers have significantly increased in introduced range in Hawaiian Is and especially E USA, where growth of as much as 21% per year during period 1965–1979; in E USA, introduced to Long I, New York, around 1940, whence spread fairly slowly at first, but then increasingly rapidly, especially towards W and SW, more slowly towards NW, with first breeding in Canada in 1978, and already approaching range of W population by early 1990s. Main reasons for expansion seem to be high productivity combined with vast expanses of suitable habitat made available through human developments following European colonization; natural W range has also expanded somewhat with similar human developments. It is considered most unlikely that predation affects overall population, and instead that density-dependent factors, such as food, nest-site availability and disease transmission, are probable regulators of population size. Regarded as a pest species in orchards in fruit-growing areas of W USA, where it feeds on growing fruit, but general impact very small; since being introduced in Hawaii in 19th century, its numbers have increased greatly and the species has become a potential threat to grain industry, e.g. up to half of sorghum crop lost to finch depredation. Large numbers trapped and sold as cagebirds in Mexico, but apparently no overall significance to population; species remains abundant in areas such as Chilpancingo, in Guerrero, where trapping has continued for several decades.
Bibliography. Aldrich (1982), Aldrich & Weske (1978), Anon. (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Beal (1907), Belthoff & Gauthreaux (1991), Bergtold (1913), Bitterbaum & Baptista (1979), Bock & Lepthien (1976a), Brown & Brown (1988), Brush & Power (1976), Cant (1962), Cant & Geis (1961), Clement *et al.* (1993), Dawson, Buttemer & Carey (1985), Dawson, Marsh, Buttemer & Carey (1983), Elliot & Arbib (1953), Evenden (1957), Godfrey (1986), Hamilton (1992), Hamner (1963, 1966a, 1966b), Hill (1990, 1991, 1992, 1993a, 1993b, 1993c, 1994a, 1994b, 2002), Hirai (1975), Hooge (1990), Howell & Webb (1995), Jehl (1971), Marten & Johnson (1986), McCarthy (2006), McEntee (1970), Michener & Michener (1931, 1940), Mundinger (1975), Power (1979), van Riper (1976), Sibley (2000), Small (1994), Stangel (1985), Thompson (1960a, 1960b), Tracy *et al.* (2009), Woods (1968).

105. Beautiful Rosefinch

Carpodacus pulcherrimus

French: Roselin superbe **German**: Schmuckgimpel **Spanish**: Camachuelo Bonito
Other common names: Himalayan Beautiful Rosefinch (*pulcherrimus*); Chinese Beautiful Rosefinch (*davidianus*, *waltoni*)

Taxonomy. *Propasser pulcherrimus* F. Moore, 1856, Nepal.
Has been considered probably conspecific with *C. eos*. Recently suggested that races *davidianus* and *waltoni* might represent a separate species, differing from nominate and *argyrophrys* in structure (wing formula and tail shape) and vocalizations, and with apparent lack of intergrades; further research required, including study of affinities with very similar *C. eos*. Four subspecies recognized.
Subspecies and Distribution.
C. p. pulcherrimus (F. Moore, 1856) – C Himalayas from N India (Himachal Pradesh) E to SW China (S Xizang) and (perhaps non-breeding) Bhutan.
C. p. waltoni (Sharpe, 1905) – SW China (SE Xizang) and NE India (N Arunachal Pradesh).
C. p. argyrophrys Berlioz, 1929 – S Mongolia and N & WC China (W Inner Mongolia and Ningxia, S to E Qinghai, NE Xizang, N & W Sichuan and NW Yunnan).
C. p. davidianus A. Milne-Edwards, 1865 – EC China (SE Inner Mongolia, N Hebei, Shanxi and N Shaanxi).



Descriptive notes. 13–15 cm; 17·5–21 g. Medium-sized, slender rosefinch with long tail slightly forked. Male nominate race has lowermost forehead to lores and chin deep crimson, pale lilac-pink supercilium broadening behind eye (variable, appearing paler or greyish-pink or darker at times, depending on angle of light) and fading at rear of ear-coverts; upper forehead to crown and nape streaked broadly dark brown or blackish and pale pinkish-grey or greyish-brown; upperparts like nape or slightly paler grey, streaked broadly darker (with long parallel streaks on sides of mantle and back), rump pale pink, uppertail-coverts brown or dark brown, edged pale rose-pink; tail dark brown, feathers edged paler or warm brown; upperwing dark brown, median and greater coverts edged warmer brown and tipped pale pink, flight-feathers edged paler brown, more buff-brown on secondaries and tertials, latter tipped paler whitish-buff; cheek and ear-coverts to breast deep pink, streaked finely darker and broadly tipped silvery pink on ear-coverts (in fresh plumage), slightly paler pink on throat, side of breast and flanks, side of breast and flanks also finely streaked darker pink; belly to undertail-coverts white or pale pinkish; iris dark brown or black; bill dark brown above, paler below; legs pale flesh-brown. Female lacks pink in plumage; has forehead to crown and upperparts warm buff-brown or sometimes light buffy-grey, streaked heavily blackish-brown (more thinly streaked on forehead to crown), rump and uppertail-coverts unstreaked; face pale brown to greyish-brown, finely streaked darker, short pale buff-brown supercilium over or behind eye ends abruptly over ear-coverts; tail as on male; upperwing-coverts tipped pale buff or yellowish-buff, flight-feathers and tertials broadly edged paler brown, latter broadly tipped pale buffish; chin and throat whitish, becoming buffish-brown and heavily streaked dark brown on underparts, paler or whiter on lower belly; bare parts much as for male. Juvenile, also first-winter and first-summer males, are like adult female; adult-like male plumage acquired in late summer of second year, with upperparts tinged pinkish, bright pink rump, and pinkish suffusion on throat. Race *waltoni* is slightly larger than nominate, upperparts paler sandy brown and finely streaked darker, wing browner with broad pale edges, supercilium and underparts of male brighter reddish-pink (feathers lack dark shaft streaks); *davidianus* has square-tipped tail, deeper reddish-pink forehead and face, long and broad supercilium contrasting with brown crown, and extensively pink underparts; *argyrophrys* male is similar to nominate, but longer-winged and brighter, more vinaceous, with paler streaks on upperparts. Voice. Song either undescribed or very seldom given. Call a soft or subdued "trip", "trilp" or "trillip", a "chillip" like

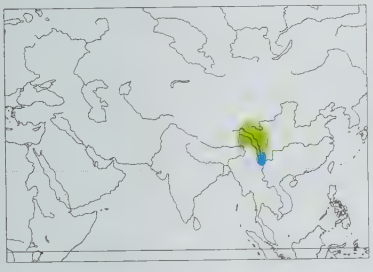
that of a sparrow (*Passer*), and a soft twitter or trill reminiscent of call of Northern Long-tailed Tit (*Aegithalos caudatus*); also a harsh "chaaannn" in flight. Calls of race *davidianus* much more metallic, including shrill "tsink" repeated one or two times, also "tsínk-it" with second syllable higher and softer.
Habitat. Montane and submontane forest edges, rhododendrons (*Rhododendron*), oak (*Quercus*), sea-buckthorn (*Hippophae*), juniper (*Juniperus*) and *Caragana* scrub along or above tree-line, also on sparsely vegetated slopes, valleys and steep hillsides; breeds at c. 3600–4500 m, locally to 4650 m in China. In non-breeding season found in similar habitat at lower levels, also bushes and scrub in forest clearings, edges of cultivation and around human settlements, occasionally in suburban town parks, including centre of Lhasa; down to 2700 m, sometimes lower, 2100 m, but some still present at higher levels, to 3600 m in Sikkim.
Food and Feeding. Variety of small seeds and buds. Forages on the ground and in low vegetation around bushes and in shrubs. Often spends long periods perched motionless in bush; when alarmed raises short crest, and when disturbed by predator freezes until danger passed. Often tame and confiding around human settlements. In pairs and small groups.
Breeding. Season Jun–Sept. Nest a cup mostly of grass, plant fibres, roots, bark strips and animal hair, placed low down in shrub, e.g. juniper. Clutch 4–5 eggs, bluish-green, sparsely and boldly spotted with black; incubation by female alone. No further information.
Movements. Partial altitudinal migrant. Most make post-breeding descent to lower elevations, where present between mid-Oct and late Mar; in non-breeding season may remain at high level until forced by severe weather to move lower.
Status and Conservation. Not globally threatened. Common or locally common in most of range; uncommon in Bhutan, where possibly only a non-breeding visitor.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Spierenburg (2005), Vaurie (1956a, 1959).

106. **Pink-rumped Rosefinch**

Carpodacus eos

French: Roselin de Stresemann **German**: Auroragimpel **Spanish**: Camachuelo Culirrosado
Other common names: Stresemann's Rosefinch

Taxonomy. *Erythrina eos* Stresemann, 1930, Songpan, Sichuan, China.
Has been considered probably conspecific with *C. pulcherrimus*. Monotypic.
Distribution. C & S China (E Xizang, SE Qinghai and W Sichuan); winters also NW Yunnan (Likiang Mts).



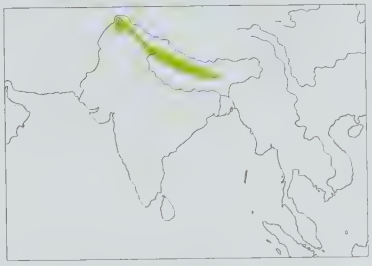
Descriptive notes. 12·5 cm. Medium-sized, slender rosefinch with pointed bill and long, notched tail. Male has forehead to chin deep crimson, usually darker and browner on lores, eyestripe dark reddish-brown, supercilium and ear-coverts pink with some silvery-white tips; upper forehead to crown streaked broadly dark brown or blackish and deep pink; nape and upperparts pale grey-brown, tinged bright or deep pink and streaked broadly blackish, rump and uppertail-coverts unstreaked bright pink, longest coverts tipped brown; tail dark brown; upperwing dark brown, median coverts fringed pinkish, greater coverts edged and tipped pale pink, flight-feathers edged paler brown to buff-brown, tinged pink on tertials; cheek and ear-coverts to breast deep pink or pinkish-crimson, slightly paler pink on rear ear-coverts and side of neck and breast, also silvery-white or pink tips on lower ear-coverts, and sometimes blackish feather bases visible on centre of breast; belly to undertail-coverts white or pale pinkish; iris dark brown or black; bill dark brown to dark horn-brown; legs pale brown. Differs from very similar *C. pulcherrimus* in having deeper pink plumage tones and more extensive pink on rump and uppertail-coverts. Female lacks pink in plumage; has forehead to crown and upperparts pale buff-brown or light tawny, streaked heavily blackish-brown, less heavily streaked on rump; face pale buff or greyish, finely streaked darker, short pale or light buff supercilium from above or behind eye and ending abruptly over ear-coverts; tail as on male; upperwing-coverts tipped pale buff (greater coverts also edged pale buff), flight-feathers and tertials finely edged buff; chin and throat pale buff, rest of underparts buffish-brown, heavily streaked dark brown on breast and flanks, paler or whiter and more thinly streaked on belly and lower flanks; bare parts much as for male. Juvenile is like female, but with warmer buff on head, upperparts and edges of wing-coverts, also edges of tertials broadly pale buff, face and side of neck buff-brown, underparts streaked buffish-brown. Voice. Song undescribed. Calls a sharp or assertive "pink" or "tink" and an emberizid-like "tsip" or "tsick"; occasionally also a thin, rattling "tvitt-itt-itt" and a harsh double note, "pip-rit".
Habitat. Breeds in montane and submontane dry valleys with sparsely vegetated slopes, hillsides and alpine grassland, also forest edges, rhododendrons (*Rhododendron*), sea-buckthorn (*Hippophae*) and juniper (*Juniperus*) scrub, also edges of cultivation; at 3950–4900 m, occasionally higher. In non-breeding season in similar habitat at lower levels.
Food and Feeding. No details of diet; presumably small seeds. Forages on ground, usually around edges of trees or bushes. In pairs and small groups; in non-breeding season occurs in larger numbers, and often in mixed-species flocks with *C. pulcherrimus*.
Breeding. No information.
Movements. Primarily an altitudinal migrant, making post-breeding descent to lower levels within breeding range; some move S to Likiang Mts, in NW Yunnan. Vagrant in NW Thailand.
Status and Conservation. Not globally threatened. Very little-known species. Appears to be rare within its known range. Possibility that it breeds also in mountains in NW Yunnan requires investigation.
Bibliography. Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen (2005), Robson (2000), Vaurie (1959).

107. **Pink-browed Rosefinch**

Carpodacus rodochroa

French: Roselin à sourcils roses **Spanish**: Camachuelo Cejirrosado
German: Rosenbrauengimpel
Other common names: Pink-mantled/Red-mantled(!) Rosefinch

Taxonomy. *Fringilla rodochroa* Vigors, 1831, Simla–Almora district, north-west India.
Name sometimes misspelt "*rhodochroa*". Monotypic.
Distribution. NW & C Himalayas from N Pakistan and Kashmir E to SW China (S Xizang), Nepal and N India (Sikkim).



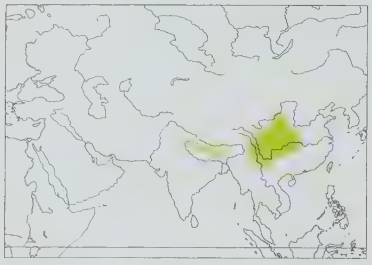
Descriptive notes. 14–15 cm; 16–20 g. Medium-sized, slender rosefinch with prominent face pattern, pointed bill and notched tail. Male has forehead and long supercilium (tapering on side of nape) bright pink (with feather tips pearly or frosted pink in fresh plumage), lores and eyestripe broadly dark red, crown deep reddish-pink and sometimes with mauve tinge, finely streaked blackish, nape and side of neck paler and unstreaked; upperparts reddish-brown, broadly edged bright or deep pink and streaked broadly blackish, upper mantle with paler, more grey-brown fringes; rump unstreaked bright pink, uppertail-coverts duller or browner, washed pink; tail dark brown, feathers finely edged pinkish-brown; upperwing dark brown, median coverts fringed pinkish, greater coverts edged and tipped pale pink, alula and flight-feathers edged paler or warm brown, tertial edges buff-brown with pink tinge; cheek and ear-coverts to throat and upper breast deep pink or pinkish-red, rear ear-coverts with fine paler pink or frosted white tips, slightly tinged mauve on breast, belly and flanks (upper flanks tinged buff-brown), lower belly to undertail-coverts white or pale pinkish; iris black; bill brownish-horn, paler brown edges of upper mandible and base of lower mandible, darker culmen and tip; legs pale brown to brownish-flesh. Female lacks pink in plumage; has forehead pale buffish, crown to upper nape darker greyish-buff, streaked dark brown or blackish, nape and upperparts pale buff-brown, streaked heavily blackish-brown, rump less heavily streaked; face pale buff or buff-brown, upper ear-coverts finely streaked darker, broader streaks on side of neck, thin pale yellow to buffish-yellow supercilium from over lores fading above ear-coverts; tail dark brown, edged paler buff-brown, upperwing-coverts edged warm buff-brown, tipped paler buff, primary coverts and flight-feathers finely edged buff or pale brown, slightly warmer on fringes of tertials; chin and throat pale buff, becoming warmer buffish-brown on breast and flanks, heavily streaked dark brown on lower throat, breast and flanks, paler belly to undertail-coverts with thinner streaks; bare parts much as for male. Juvenile is like female or tinged warmer buffish-brown in fresh plumage; first-summer like juvenile; second-winter male has reddish-brown upperparts, pale pink tips in supercilium, rump and underparts (last often paler), but retains heavy dark streaks on underparts. Voice. Song, from top of shrub or low tree, a series of loud, lilting and upwardly inflected whistles, "toowhi toowhi". Calls include loud "per-lee" or "chew-wee", and a rising, interrogative "sweet" similar to that of *Serinus canaria*.
Habitat. Undergrowth of lower montane and submontane forests, including subalpine areas with sparse scattered trees, dwarf juniper (*Juniperus*), willows (*Salix*), rhododendron (*Rhododendron*) and open grassy slopes with bushes and scrub at edge of tree-line, also edges of mixed deciduous and fir (*Abies*) and birch (*Betula*) and oak (*Quercus*) forests; breeds usually at 2745–4540 m, exceptionally to 5150 m. In non-breeding season in similar habitat at lower levels, including around human settlements and village gardens; generally at 1200–2700 m, possibly higher, to 3000 m, in Nepal and Sikkim, and exceptionally as low as 910 m; in N Pakistan, down to c. 500 m in Margalla Hills and Murree Hills.
Food and Feeding. Diet includes seeds and berries of *Cyathula*, *Viburnum* and *Ziziphus maurtiana*, also grasses (Gramineae) and small herbs. Feeds quietly or unobtrusively on ground, frequently at edges of melting snow patches, under bushes and also at forest edges; hops or shuffles on ground. Fairly tame, but inconspicuous and easily overlooked, taking flight only as last resort. Forages in pairs and in small groups of up to eight individuals; in non-breeding season may form slightly larger loose flocks, often of single sex.
Breeding. Season Jul and Aug. Nest built by female, a compact cup of twigs, dry plant stems, fibres and grass, also birch-bark strips, moss and animal hair, placed up to 2 m above ground in bush, usually juniper, willow, thornbush or bramble (*Rubus*), sometimes on horizontal branch of pine (*Pinus*) sapling. Clutch 4–5 eggs, turquoise-blue, unspotted or finely spotted or lined with black or reddish-brown; incubation by female. No further information.
Movements. Resident and altitudinal migrant. Makes post-breeding descent to lower levels in range (some remaining at higher elevations), returning to higher levels in Mar; small breeding population in N Pakistan augmented by larger numbers of winter visitors, when occurs from early Jan to early Apr down to c. 500 m in Margalla and Murree Hills. Has wandered to extreme SW China (SW Xizang) in Jun. Vagrant in Bhutan and possibly Arunachal Pradesh.
Status and Conservation. Not globally threatened. Common to locally common in most of range. Fairly common in Simla, uncommon in Kashmir; rare in N Pakistan, where discovered breeding in 1984; rare also in SW China; scarce in Nepal and Sikkim.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), David & Gosselin (2002a), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), MacKinnon & Phillipps (2000), Martens & Eck (1995), Meyer de Schauensee (1984), Raja *et al.* (1999), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Vaurie (1949, 1959).

108. **Vinaceous Rosefinch**

Carpodacus vinaceus

French: Roselin vineux **German**: Rubingimpel **Spanish**: Camachuelo Vinoso

Taxonomy. *Carpodacus vinaceus* J. Verreaux, 1870, Ho-pa-tchang, north of Chengdu, Sichuan, China. Two subspecies recognized.
Subspecies and Distribution.
C. v. vinaceus J. Verreaux, 1870 – N India (Uttarakhand) and Nepal, C & S China (S & SW Gansu and S Shaanxi S to SE Xizang, W & N Yunnan, N Guizhou and W Hubei) and N & NE Myanmar.
C. v. formosanus Ogilvie-Grant, 1911 – Taiwan.
Descriptive notes. 13–16 cm; 20·5–23·8 g (*formosanus*). Medium-sized, conical-billed, stoutly built dark rosefinch with notched tail. Male nominate race is almost entirely deep wine-red or dark crimson, indistinctly streaked darker on upperparts; rump paler, deep pink or rich rose-pink; lores blackish, long pale pink supercilium to side of nape, made up of dark crimson background with narrow silvery-pink streaking; tail black, finely edged reddish-crimson, upperwing blackish, median and greater coverts and bases of flight-feathers finely edged reddish, tertials broadly edged pale pinkish-white towards tips (in worn plumage, paler tips reduced or absent); lower face and underparts



like upperparts or very slightly paler, except for dark brown undertail-coverts finely tipped buff; iris black; bill dark horn-brown or blackish; legs dark tan-brown to dark horn-brown. Female has head and upperparts brownish-olive, streaked finely darker on crown, nape and upperparts, unstreaked rump and uppertail-coverts; tail dark brown, finely edged buffish-brown, upperwing dark brown, finely edged olive, tertials brownish-olive, broadly edged dull yellowish-white towards tips (pale tips reduced or absent when worn); face almost plain, but lores to throat often duller or paler, sometimes a narrow indistinct supercilium slightly paler than crown; below, paler and slightly more buff than upperparts, lower throat and breast streaked darker or brown, streaks becoming less distinct on flanks; bill grey-brown, legs dull pink. Juvenile is like female, or slightly warmer brown and less olive on upperparts (may breed in this plumage); immature male has pale pink supercilium at early age. Race *formosanus* is larger than nominate, male in non-breeding season may have breast and belly brown. Voice. Song a simple and distinctive "pee-dee, be do-do". Calls include a hard, assertive "pwit" or "zieh" with whiplash quality and repeated several times, often given prior to song; also a thin high-pitched "tip" or soft "tink", "pink", and emberizid-like "zick".

Habitat. Undergrowth of lower montane and submontane dense mixed or damp bamboo forest, rhododendron (*Rhododendron*) bushes and scrub on otherwise open hillsides; in Nepal, laying female found in barberry (*Berberis*) hedges close to mixed fir–pine (*Abies–Pinus*) forest N of main range. At 1830–3400 m; in Nepal at 3000–3200 m in breeding season, and found at 1065–3050 m in non-breeding season; in China sometimes down to 500 m in E Sichuan (Red Basin) in winter. In Taiwan (race *formosanus*) occurs at 2280–3500 m.

Food and Feeding. Variety of plant and tree seeds. Forages on ground, in low bushes and in dense vegetation; perches on or clings to flowerheads of shrubby plants while extracting seeds; also remains motionless in bush for long periods when not feeding. In pairs and small groups.

Breeding. Female incubating eggs in Jul in Nepal. No other published information.

Movements. Resident and altitudinal migrant. Nominate race moves to lower levels within range in non-breeding season; scarce winter visitor in N India (Uttar Pradesh).

Status and Conservation. Not globally threatened. Uncommon to scarce or rare. Status in Nepal uncertain, possibly scarce resident, but appears rare and local; uncommon in China; scarce to uncommon in Myanmar. Race *formosanus* fairly common in Taiwan. Total breeding area possibly smaller than realized, and divided into three discrete parts; in Nepal and China, the species may be threatened by forest destruction. Conservation status probably merits reassessment, and could be found to be Near-threatened or even Vulnerable.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), MacKinnon & Phillipps (2000), Martens (1972), Martens & Eck (1995), Martens & Trautmann (2008b), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Schäfer (1938), Vaurie (1956a, 1959).

109. **Dark-rumped Rosefinch**

Carpodacus edwardsii

French: Roselin d'Edwards **German**: Edwardsgimpel **Spanish**: Camachuelo de Edwards
Other common names: Large/Edwards's/Pink-throated/Ruddy Rosefinch

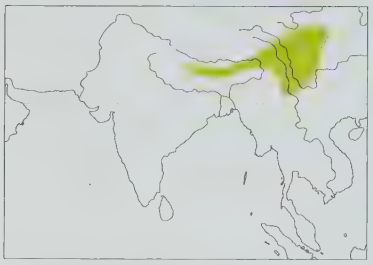
Taxonomy. *Carpodacus edwardsii* J. Verreaux, 1870, Muping [Baoxing], west Sichuan, China. Two subspecies recognized.

Subspecies and Distribution.

C. e. rubicundus (Greenway, 1933) – E Himalayas from C Nepal E to Bhutan and NE India (Arunachal Pradesh), SW China (S & SE Xizang) and N Myanmar.

C. e. edwardsii J. Verreaux, 1870 – CS China (S Gansu S to W & C Sichuan and W & N Yunnan).

Descriptive notes. 16–17 cm; one female 26·5 g. Rather large, large-billed, dark rosefinch with slightly notched tail. Male nominate race has side of lower forehead, upper lores and supercilium



bright pale pink, rest of lores, upper cheek and ear-coverts to side of neck maroon; centre of forehead to crown, nape and upperparts brown, tinged pink, broadly streaked darker, rump and uppertail-coverts unstreaked; tail blackish-brown, edged warm reddish-brown (broadler towards base); upperwing dark brown or blackish, finely edged pinkish-brown (browner when worn), fine paler or brighter pink tips on greater coverts, flight-feathers edged dull crimson, tertials more broadly edged and with broad pale pinkish-white tips; lower cheek and side of foreneck to chin and throat bright pink, finely spotted or tipped whitish or pale pink; breast maroon or dark crimson (finely fringed paler), paler or pinkish-brown on lower breast, belly and flanks, flanks finely streaked black, undertail-coverts brownish-buff; iris black; upper mandible brown, lower mandible paler horn; legs dark flesh-brown. Differs from *C. nipalensis* in paler pink supercilium and side of throat, dark rump, no reddish tinge in upperparts, and no red on forehead and forecrown; from male *C. rodochroa* is larger size, less slim appearance, and darker and duller pink coloration. Female is almost entirely dull buffish-brown; forehead pale buff, finely spotted darker, lores greyish, upper forehead to crown and nape finely streaked blackish, upperparts more broadly streaked, rump and uppertail-coverts paler and uniformly tawny-brown; tail dark brown, edged paler buff-brown, upperwing dark brown, median and greater coverts edged tawny and tipped pale buffish-brown, secondaries edged paler brown or buffish, tertials broadly fringed pale buff to buff-brown; face finely streaked dark brown or blackish, narrow pale buff or yellowish-buff supercilium (may be finely streaked darker) from behind eye to side of nape; chin and throat (to moustachial area) pale whitish-buff, streaked dark brown, streaks extending more broadly onto brownish-buff underparts, lower belly to undertail-coverts slightly paler and more finely streaked; bare parts much as for male. Juvenile is like female, or upperparts slightly duller brown and underparts darker brown (contrasting pale chin and throat), heavily and clearly streaked darker; first-summer male like juvenile, but with pinkish tinge on crown and upperparts, pale pink wash on supercilium and ear-coverts, brownish breast heavily washed deep pink. Race *rubicundus* differs from nominate in having upperparts more heavily washed crimson, heaviest or deepest on crown to mantle, back and rump, less brown belly and undertail-coverts, female darker or duller brown and more heavily streaked. Voice. Song undescribed. Calls a short or abrupt, metallic "twink", "tswii"or "zwiih"; alarm or anxiety note a rasping "che-wee".

Habitat. Undergrowth of montane and submontane juniper (*Juniperus*), dwarf rhododendron (*Rhododendron*) and silver fir (*Abies pindrow*) and birch (*Betula*) forests, also dense bamboo clumps, barberry (*Berberis*) and thorn-scrub and rose (*Rosa*) thickets in river valleys, on open hillsides and in alpine meadows; at 3050–4270 m. In non-breeding season found in similar or more open forests with rhododendron and birch, scrubby hillsides with bamboo clumps, occasionally in dense hemlock (*Tsuga*) forest, at lower levels; 2000–3700 m in Nepal, 2600–3400 m (occasionally down to 1600 m) in Bhutan, and down to 1060 m in W China.

Food and Feeding. Mainly small seeds, including those of grasses (Gramineae) and wild rose, also some fruit, including fallen crab apples (*Malus*); sips nectar from rhododendron flowers. Forages on ground, usually close to cover, rarely at any height in bushes or trees; generally shy or skulking, and quickly dives into cover when disturbed. Singly and in small family groups; in non-breeding season in flocks of up to twelve individuals, and up to 40 together on passage through Bhutan. Shares foraging-habitat preference with Rufous-breasted Accentor (*Prunella strophiata*).

Breeding. No definite information. Thought to breed around Jun–Aug period, nesting in rhododendron bushes in forest.

Movements. Resident and altitudinal migrant. Descends to lower levels between Oct and mid-Apr.

Status and Conservation. Not globally threatened. Uncommon or scarce in most of range. Local and generally uncommon in Nepal, but more numerous in non-breeding season; locally common to scarce in China; locally common in N Myanmar.

Bibliography. Ali & Ripley (1983, 1998), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), David & Gosselin (2002a), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), Ludlow (1951), MacKinnon & Phillipps (2000), Martens & Trautmann (2008c), Meinertzhagen (1927), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Smythies (1986), Spierenburg (2005), Stanford & Mayr (1941), Vaurie (1956a, 1959).

PLATE 43 ➤

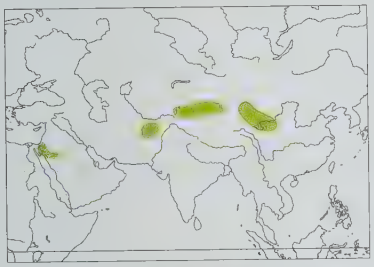

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PLATE 43
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112
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ssp rodopeplus
ssp verreauxii
ssp dubius
ssp blythi
ssp thura
114
ssp rhodochlamys
115
ssp grandis
ssp femininus
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117
ssp rubicilla
ssp severtzovi

110. Pale Rosefinch

Carpodacus synoicus

French: Roselin du Sinaï **German**: Einödgimpel **Spanish**: Camachuelo del Sinai
Other common names: Sinai Rosefinch

Taxonomy. *Pyrrhula synoica* Temminck, 1825, Mount Sinai, north-east Egypt.
Races geographically remote from one another; possibility that they represent separate species may merit investigation. Proposed race *petrae* (described from Petra, in SW Jordan) slightly smaller than nominate, but differences minimal and some overlap in measurements; synonymized with latter. Four subspecies recognized.
Subspecies and Distribution.
C. s. synoicus (Temminck, 1825) – S Israel, NE Egypt (Sinai), SW Jordan and extreme NW Saudi Arabia.
C. s. salimalii (R. Meinertzhagen, 1938) – NC & C Afghanistan (Hindu Kush).
C. s. stoliczkae (Hume, 1874) – W China (SW Xinjiang E to NW Qinghai).
C. s. beicki (Stresemann, 1930) – C China (E Qinghai and SW Gansu).



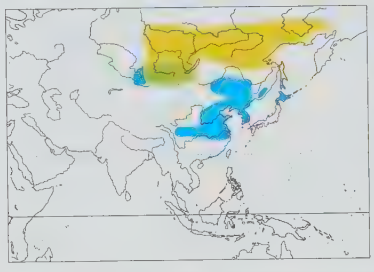
Descriptive notes. 14·5–16 cm; 17–24 g. Medium-large, conical-billed, slender, pale rosefinch with long notched tail. Male nominate race has bright pinkish-crimson lower forehead, lores, supercilium and chin and throat; cheek and ear-coverts paler pinkish-red, lower edge tipped silvery pink; upper forehead to crown pale silvery pink, finely tipped whitish, hindcrown to side of nape and upperparts pale sandy grey, slightly streaked darker, rump and uppertail-coverts bright pink; tail deep sand-brown, more blackish on central feathers, finely edged paler greyish-buff; upperwing-coverts like upperparts or slightly darker, greaters tipped pale buff or buffish-pink in fresh plumage, alula, primary coverts and flight-feathers sandy or light buff-brown, secondaries and tertials broadly edged paler; side of neck to upper breast deep rose-pink, rest of underparts paler pink, side of breast and flanks greyish-white, vent to undertail-coverts whitish or washed buffish; in fresh plumage red on head, face and breast may be concealed by pale greyish tips; in worn plumage pale or silvery tips absent and head more sandy brown, pink on rest of plumage paler or tinged buff, wing browner, fringes of wing and tail feathers bleached whitish, and underparts pale greyish-white to buffish-brown; iris dark brown or hazel-brown; bill pale yellow to greyish-horn, darker tip; legs greyish-horn with pinkish tinge, pinkish-brown to warm brown. Female usually lacks pink (sometimes pink tinge on head and body), is almost entirely sandy grey, tinged brown, streaked darker on crown and upperparts, rump unstreaked pale grey; tail deep sand-brown, outer feathers edged paler greyish-buff, tips of median and greater coverts and edges of flight-feathers pale sandy brown; face warm brown or paler sand-brown, chin and underparts greyish-buff to greyish-white (may be tinged pink when fresh), chin to breast and flanks finely streaked darker. Juvenile is like female (often indistinguishable), or warmer buff-brown on head, nape and upperparts, paler grey, tinged sandy, on upperparts, with median and greater upperwing-coverts dull dark grey, tipped creamy buff-brown, underparts pale buff-brown (with whitish feather bases), faintly streaked dusky on breast and flanks (more extensively streaked buffish in worn plumage), bill dull brown; first-summer male like adult female, but greater coverts, primary coverts, flight-feathers and tail feathers retained from juvenile plumage, upperparts slightly warmer brown, sometimes pink tinge on head and upperparts (may breed in this plumage); full adult plumage acquired in second winter. Race *salimalii* is largest race, with thinner or more slender bill, greyer mantle and back with only slight (if any) trace of pink, rose-pink on underparts extends to vent, undertail-coverts white; *stoliczkae* is smaller than nominate, male upperparts paler or light sandy, and pink on underparts paler and less extensive; *beicki* has shorter and more conical bill, male has pronounced whitish brow from upper forehead to over ear-coverts, and hindcrown and upperparts plain grey-brown and lacking pink except on rump (not reaching uppertail-coverts). Voice. Song a melodious and varied musical jumble, including buzzing notes. Calls include a short "trizp", often given in flight, and an emberizid-like "tieu" and softer version, "pleu", also a short "chig", "chi" or "zick" given from ground and in flight; also a longer "chip chip-chee chir chip"or "chip chee cheer chip" like call of a sparrow (*Passer*), and high-pitched and metallic "tsweet" or "tweet"; calls of female softer than those of male.
Habitat. Dry, barren and treeless mountains, hillside and valley scrub, edges of stony and rocky sandstone deserts, wadis, steep cliffs, gorges and narrow valleys of foothills almost without vegetation; in C & E Asia occurs at edges of cultivated areas on dry hillsides, also usually close to water supply in streams or springs; in non-breeding season source of water is central to home range. Breeds at 1000–2000 m in Negev Desert (S Israel), NE Egypt (Sinai) and SW Jordan, at 2600–3050 m in Afghanistan, and to 3500 m in W & C China; generally lower, locally down to sea-level, in non-breeding season.
Food and Feeding. Mostly seeds, buds, shoots and leaves. Details of diet not well known, but in Middle East takes seeds of yellow bugloss (*Alkanna orientalis*), spurge (*Euphorbia*), *Ochradenus baccatus*, *Hammada scoparia*, mulberry (*Morus*) and figs (*Ficus*); also seeds of grasses (Gramineae) and occasionally cereals. Nestlings fed with regurgitated seeds. Forages on the ground; occasionally forages and perches in bushes, e.g. wormwood *Artemisia*, and on posts. Singly and in pairs, also in post-breeding groups of up to c. 12–15, probably related individuals; in non-breeding season in larger flocks of up to 200, and in company with Common Rock-sparrows (*Petronia petronia*) and Spanish Sparrows (*Passer hispaniolensis*); flocks of non-breeding females and immature males occur throughout year. In both summer and winter regularly flies long distances to find water; in Sinai regularly attend pools in remote mountain monastery garden.
Breeding. Season late Mar to Jul; two broods in Middle East. Monogamous. Solitary and loosely colonial. Territorial; territory small, mostly of only tens of square metres. Pair formation takes place in late winter, before break-up of winter flocks. Display not well known, but one male in S Jordan displayed in upright posture (similar to aggression display), with head raised and bill pointed vertically, and breast feathers ruffled, while giving buzzing calls; in second study, female circled male on ground while giving begging calls, leading to copulation. Nest a large cup of plant stems, stalks and fibres, twigs, leaves, animal hair and fur, placed c. 50 cm inside crevice in rock or sheer cliff face; nest-site often used in successive years, with new nest built on top of previous one. Clutch 4–5 eggs, pale blue to bluish-green, finely spotted with brownish-black; incubation possibly by both parents (male has brood patch), period 13–14 days; nestling period 14–16 days. Probably breeds in first year.
Movements. Resident and altitudinal migrant. Largely sedentary in Afghanistan and China. In Middle East sedentary in mild winters, or makes short-distance movement to lower levels, including plains and coastal areas, in non-breeding season; also wanders in search of foraging areas. In S Israel descends to wadis and coastal scrub around Eilat and E Negev Desert in Oct–Nov, returning to higher ground in Feb–Mar.
Status and Conservation. Not globally threatened. Scarce to uncommon or locally common. Probably most numerous in mountains of Jordan, Sinai and NW Saudi Arabia; scarce in Afghanistan, and probably locally common, but little known, in China. In Dana Reserve, in S Jordan, 500–1000 pairs 1996; densities of 6–8 pairs/km² and 15–20 pairs in 1·2-km transect in S Jordan. In S Israel, considerable annual variation in numbers.
Bibliography. Andrews (1995), Andrews *et al.* (1999), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Étchécopar & Hüe (1967, 1983), Fu Tongsheng *et al.* (1998), Goodman & Meininger (1989), Hollom *et al.* (1988), Hüe & Étchécopar (1970), MacKinnon & Phillipps (2000), Martens & Trautmann (2008g), Meyer de Schauensee (1984), Paludan (1959), Porter *et al.* (1996), Rasmussen & Anderton (2005a, 2005b), Shirihai (1996), Snow & Perrins (1998), Vaurie (1949, 1959).

111. Pallas's Rosefinch

Carpodacus roseus

French: Roselin rose **German**: Rosengimpel **Spanish**: Camachuelo de Pallas
Other common names: Siberian Rosefinch, Pallas's Rosy-finch

Taxonomy. *Fringilla rosea* Pallas, 1776, Uda and Selenga Rivers, Transbaikalia, Siberia.
Two subspecies recognized.
Subspecies and Distribution.
C. r. roseus (Pallas, 1776) – breeds C & E Siberia from middle R Yenisey and R Nizhnyaya Tunguska E to upper R Lena, Yakutia and Kolymskiy Range, S to NE Kazakhstan, Altai, Tannu-Ola, Sayan Mts, N Mongolia and S Sea of Okhotsk coast; migrates mainly to C Siberia (Tomsk region), E Mongolia, NE & EC China (E from Gansu, S to Jiangsu) and Korea.
C. r. portenkoi Browning, 1988 – breeds N Sakhalin I; migrates to S Sakhalin and S to S Korea and N Japan (Hokkaido).



Descriptive notes. 16–17·5 cm; 21–35 g. Medium-sized to large, slender rosefinch with long, notched tail. Male nominate race has head and face to upper nape deep pink or pinkish-red, broadly (almost entirely) tipped silvery white on forehead to crown and brighter or deeper red on lores to eye; lower nape and upper mantle grey, streaked darker, rest of upperparts rich rosy pink, boldly streaked dark grey and feathers edged brown, lower back to rump and uppertail-coverts rich deep pink, centres of tail-coverts streaked dark or blackish; tail blackish-brown, outer feathers broadly edged pale pink; upperwing dark brown, coverts edged pale pink, medians broadly tipped white and greaters more narrowly tipped pale pinkish or buffish-white (forming double wingbar), flight-feathers finely edged pale buff or pale pink, outer edges of primaries rich brown, tertials broadly edged pale buff-brown; cheek and ear-coverts to side of throat deep pink, finely tipped silvery white (in fresh plumage), rest of throat and breast deep reddish-pink (sometimes with blackish tips), lower breast, belly and flanks white or pale pink, flanks sometimes tipped greyer, undertail-coverts whitish with pink wash; iris black; bill brown above, pale yellow or greyish-horn below; legs reddish-brown. Female has head and face pale brown, forehead to crown tinged bright tawny or light orange, streaked darker on crown and nape, plain face (cheek may be tinged as forehead) finely streaked on ear-coverts, slightly paler and fairly indistinct supercilium; upperparts like crown, but more heavily or broadly streaked blackish, lower back to rump pinkish or orange-red, finely streaked brown, uppertail-coverts browner, tail dark brown, edged paler or tinged pink; upperwing dark brown, coverts edged paler buff-brown and tipped pale buff or whitish, secondaries edged paler brown and tertials more broadly so; chin and throat pale peach-buff or pinkish, side of throat (to moustachial area) to breast warm buffish or light orange-buff, narrowly streaked dark brown, rest of underparts pale buff, streaked darker; bill dark brown or blackish in winter. Juvenile is like female but duller, lacks brighter buff tones on head and face, upperpart feathers edged paler grey, rump pale or whitish-buff; first-winter male has orange-brown of head and breast often concealed by broad buff-brown tips, grey mantle feathers edged or tinged pinkish, lower back and rump variably whitish-pink to pale orange, tips of wing-coverts and edges of tertials pale buff; first-summer male similar to adult female, but more prominently pink or orange-pink on forehead to crown, rump and face to breast, acquires full adult plumage Aug–Oct of second winter (some individuals not in full breeding plumage until later into second summer); first-winter female like adult, but generally brown or dull brown and more heavily streaked above and below, tinged orange on forehead, breast and rump. Race *portenkoi* has crown, rump and underparts darker crimson, mantle and back streaked blackish with grey feather edges, and flight-feathers finely edged whitish to pale brown, subadult male and female greyer above and deeper red or purple-red than nominate. Voice. Call a short "fee", or soft "tsiiin" or "chiiin", also a subdued single or double whistle, "chee-chee", and a fairly loud metallic "tsuiii" and an emberizid-like "dzih" and "chek-chek". Song, usually in display-flight or from within canopy of tree, similar to call, but includes rising and falling notes and repeated phrases, fairly soft and usually audible for only short distance.
Habitat. Breeds in lowland and montane taiga with Siberian pine (*Pinus sibirica*), larch (*Larix*) and birch (*Betula*), also fir (*Abies*) and spruce (*Picea*) forests and alpine meadows, shrubby thickets and undergrowth of sparsely vegetated hillsides; in Altai favours areas of Siberian dwarf pines (*Pinus pumila*), and in Sayan Mts found in upper levels of Siberian pine forests; to 3030 m. In non-breeding season occurs in similar habitat in lowland areas between 1500 m and 2500 m, including open deciduous woods and thickets with bushy undergrowth, dwarf pine and aspens (*Populus*) along river valleys, often at edges of cultivation, occasionally in parks and gardens.

On following pages: 112. Three-banded Rosefinch (*Carpodacus trifasciatus*); 113. Spot-winged Rosefinch (*Carpodacus rodopeplus*); 114. White-browed Rosefinch (*Carpodacus thura*); 115. Red-mantled Rosefinch (*Carpodacus rhodochlamys*); 116. Streaked Rosefinch (*Carpodacus rubicilloides*); 117. Great Rosefinch (*Carpodacus rubicilla*).

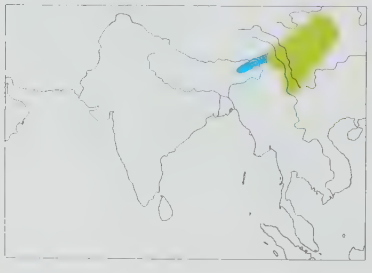
Food and Feeding. Mostly a variety of seeds, also buds, shoots and occasionally berries, including those of Siberian dwarf pine (*Pinus pumila*), crowberry (*Empetrum*), bilberry (*Vaccinium*), rowan (*Sorbus*), berries and buds of honeysuckle (*Lonicera*), buds of lilac (*Syringa*), also seeds of sedges (*Carex*), grasses (Gramineae), knotgrass (*Polygonum*), elecampane (*Inula*) and spurflower (*Plectranus*); in C Siberia feeds on seeds of Siberian pine and larch. Also invertebrates, mainly in summer, including caterpillars (Lepidoptera), beetles (Coleoptera), flies (Diptera), ants (Formicidae), aphids (Aphidoidea), grasshoppers (Orthoptera) and spiders (Araneae). Nestlings fed with insects, from third day also milky substance of crushed seeds. Forages on the ground, in bushes and in trees; picks seeds from fallen cones. In pairs and small flocks; on passage and in non-breeding season found in larger flocks of up to 100 individuals, and in mixed-species flocks with *Fringilla montifringilla*, sparrows (*Passer*) and buntings (Emberizidae).
Breeding. Season May–Aug; possibly two broods. Monogamous. Occasionally loosely colonial. Territorial. Male performs song flight, with slowly fluttering wings and spread tail, over trees and bushes. Nest a large, deep cup of twigs, grass, plant fibres and roots, lichens, animal hair and feathers, usually 1–6 m from ground and well hidden in dense part of conifer, usually larch and close to or against trunk, occasionally up to 2·5 m out on branch. Clutch 4–5 eggs, light blue to blue with reddish-grey to black spots and lines, some entirely without spots; incubation by female fed on nest by male, period 14–15 days; chicks fed and cared for by both parents, nestling period c. 15 days. On Sakhalin I, nests often preyed on by Carrion Crow (*Corvus corone*).
Movements. Migratory and partly nomadic; in C Siberia degree of movement determined by annual variations in cone crop of Siberian pine. Some thought to be resident on Sakhalin I. Otherwise, those breeding in N & C parts of range move S during late Sept–Nov to wintering grounds in Ussuriland, E Mongolia, NE China and Korea; small numbers move W & SW to W Siberia, occasionally to W of Urals; those in NE Kazakhstan (small numbers breed W Altai) move short distance S to S Altai (possibly only in years of heaviest snowfall) between Dec and mid-Mar; irregular in winter Korea, sometimes more numerous on passage, most records Jan–Feb (also regular in small numbers mid-summer). Return movements N in late Mar and Apr, passage along middle R Yenisey from early Apr, mostly flocks of 20–30 birds. Uncommon or scarce on passage (both spring and autumn) at Beidahe, on Gulf of Bohai (E China); scarce or irregular in Japan, mainly Hokkaido and also N & C Honshu, from early Nov to mid-Apr, with some passage in mid-Oct and mid-Apr to mid-May. Accidental or rare S Japan and islands in East China Sea. Vagrant in European Russia, S Ukraine and S Kazakhstan. Occurrences in Hong Kong, and in W Europe (Denmark, Netherlands, British Is, Switzerland) considered to originate from captivity.
Status and Conservation. Not globally threatened. Scarce to locally common. Scarce at S extremities of range, e.g. only few pairs breeding in Kazakhstan; probably breeds in N Korea, where regular in mid-summer, but breeding as yet unproven. Breeding densities of 20 individuals/km² in taiga of C Siberia, and 2–3 pairs along 1 km of larch taiga in N Sakhalin.
Bibliography. Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Brazil (1991), Browning (1976, 1988), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Korelov *et al.* (1974), MacKinnon & Phillipps (2000), Martens & Trautmann (2008k), Meyer de Schauensee (1984), Nechaev (1991), Rogacheva, E.V. *et al.* (1991), Rogacheva, H. (1992), Ryabitsev (2001), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1959), Wassink & Oreel (2007).

112. Three-banded Rosefinch

Carpodacus trifasciatus

French: Roselin à trois bandes **German**: Bindengimpel **Spanish**: Camachuelo Tribarrado

Taxonomy. *Carpodacus trifasciatus* J. Verreaux, 1870, Paohing = Muping [Baoxing], west Sichuan, China.
Monotypic.
Distribution. Breeds SC China from S Gansu and S Shaanxi S to E Xizang, NW Yunnan and W Sichuan; non-breeding also SE Xizang, possibly also NE Indian Subcontinent.



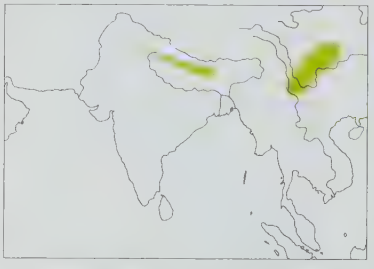
Descriptive notes. 17–19·5 cm. Large and large-billed, robust rosefinch with broad wingbars and long tail. Male has white forehead edged light crimson, crown to nape and side of neck deep crimson, finely or lightly streaked (dark feather bases); lores, cheek and upper ear-coverts black, suffused with crimson, lower ear-coverts crimson, cheek finely spotted and ear-coverts finely streaked white; mantle, back and scapulars dark carmine or crimson, streaked black (upper mantle sometimes grey), outer scapulars broadly tipped white (forming broad band), rump and uppertail-coverts unstreaked crimson, longest coverts dark grey; tail and upperwing black, median and greater coverts broadly tipped pinkish-white or white (forming two broad wingbars), tertials broadly edged and tipped white; chin and throat blackish, tipped buff or finely white (usually only on side of throat), breast and flanks deep crimson, tipped blackish, side of breast (beside bend of wing) pale grey, rest of underparts white; iris brown; bill greenish-yellow to yellowish-horn, culmen and tip darker horn; legs dark brown or reddish-brown. Female has forehead to nape, face and upperparts light olive-brown, streaked blackish or greyish on mantle, outer scapulars broadly edged yellowish-buff or whitish; tail and wing much as on male, median and greater coverts dark grey, broadly tipped yellowish-buff or fawn, tertials broadly edged and tipped whitish or yellowish-white; chin and throat whitish or dull yellowish, sometimes indistinct dark olive malar stripe, breast and flanks light olive-buff, tinged yellow and indistinctly streaked duller, side of breast pale grey, lower flanks washed paler buff, belly to undertail-coverts pale greyish or white; bill brownish-horn above, yellowish-brown below. Juvenile is like female, but slightly duller or browner; first-winter male has outer scapulars yellowish-white, tips of median coverts light orange-yellow, greaters tipped yellow, rump olive or light reddish-brown, face darker (similar to adult male) with whitish tips on ear-coverts, breast and flanks warm rust-brown, bill as adult female but more yellow at base of both mandibles; first-summer male darker brown crown and upperparts except for greyish mantle, tips of median and greater coverts pale buff or whitish-buff, side of breast and flanks pale greyish or greyish-white, streaked blackish. Voice. No information; generally silent. Captive individuals gave weak and high-pitched calls.
Habitat. Found in undergrowth and thickets of conifer forest, juniper (*Juniperus*) thickets, spruce (*Picea*), locally thickets of birch (*Betula*) and willow (*Salix*) e.g. in S Gansu, between c. 2100 m (occasionally lower) and 3050 m. In winter at lower level, down to 1800 m, at edges of cultivation, orchards, hedges, bushes, particularly cotoneaster (*Cotoneaster*) bushes, areas with crab apples (*Malus*) and open cereal fields.
Food and Feeding. Mainly seeds, also some fruit, including crab apples and cotoneaster berries; also willow buds on migration to breeding grounds. Forages on the ground and in bushes; generally sluggish or slow-moving when on ground. Often spends long periods perched motionless in undergrowth or bushes. In pairs and small groups.
Breeding. No confirmed information. Unconfirmed report, based on information from 1925: nest cup-shaped, made of roots and twigs, lined with grasses, rootlets, hair and wool, placed low down in bush or fairly high up in conifer; 3–5 eggs, blue with brown markings.
Movements. Resident, partial migrant and altitudinal migrant. In non-breeding season moves to lower levels, including foothills and valleys, but some remain at high altitudes until forced to move by severe weather; winters mostly within breeding range, also S to SE Xizang. Return movements from mid-Mar. Recorded as a vagrant in NE India (Arunachal Pradesh) and Bhutan, where possibly a scarce or local visitor to some N valleys.
Status and Conservation. Not globally threatened. Uncommon to scarce; locally common in non-breeding season in S China. Area occupied during breeding season apparently much smaller in extent than previously believed. If this is true, the species' conservation status may merit reassessment, perhaps as Near-threatened or even Vulnerable.
Bibliography. Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Ludlow (1951), MacKinnon & Phillipps (2000), Martens & Trautmann (2008m), Meyer de Schauensee (1984), Ottaviani (2008), Rasmussen & Anderton (2005a, 2005b), Spierenburg (2005), Vaurie (1959).

113. Spot-winged Rosefinch

Carpodacus rodopeplus

French: Roselin à ailes tachetées **German**: Fleckengimpel **Spanish**: Camachuelo Alimoteado
Other common names: Spotted Rosefinch; Sharpe's Rosefinch (*verreauxii*)

Taxonomy. *Fringilla rodopepla* Vigors, 1831, Simla–Almora district, north-west India.
Name sometimes spelt, erroneously, as "*rhodopeplus*". Has been suggested that race *verreauxii* might represent a separate species, on basis of size, bill size, plumage and vocalizations; further research, including analysis of mitochondrial DNA, required before such treatment considered justified. Two subspecies recognized.
Subspecies and Distribution.
C. r. rodopeplus (Vigors, 1831) – Himalayas of N India (W Uttarakhand), Nepal and SW China (S Xizang).
C. r. verreauxii (David & Oustalet, 1877) – S China (NE Yunnan and SW Sichuan) and NE Myanmar.



Descriptive notes. 15–17 cm; one bird 23 g. Medium-large, large-billed rosefinch with long and slightly notched tail. Male nominate race has forehead to nape maroon, slightly brighter on nape and side of neck, pale pink supercilium (some feathers tipped finely white) from above lores and tapering over ear-coverts; lores and face dark crimson; upperparts maroon, broadly streaked blackish, outer edges of lower scapulars broadly streaked pale pink, sometimes (along with outermost mantle feathers) forming pale pink lines, lower back and rump deep red, tipped pale pink; tail dark brown, feathers finely edged crimson; upperwing black or blackish-brown, coverts edged crimson, tips of median and greater coverts spotted pale or bright pink, flight-feathers finely edged crimson, tertials broadly edged and tipped pale pink; chin and throat to side of neck pale pinkish-red, finely tipped pale pink, underparts deep pink, darker reddish-brown tips on side of breast and flanks, lower flanks tinged brown and undertail-coverts tipped browner; iris brownish-black; bill dark brown, slightly paler brown lower mandible; legs flesh-brown to pale greyish. Female has head and upperparts brown or olive-brown, broadly streaked dark brown on crown, mantle and scapulars, feathers fringed yellowish-buff; rump unstreaked plain brown, uppertail-coverts slightly duller, tail dark brown, edged paler buff-brown (broadly at base); upperwing dark brown, coverts finely edged paler and tipped pale buff, flight-feathers finely edged warm brown, tertials broadly edged pale whitish-buff towards tips; long and broad pale buff supercilium from over lores to side of nape, lores to ear-coverts dark brown, lower face paler and streaked finely blackish; almost entirely warm buff-brown below, paler on chin and throat, heavily streaked blackish on lower throat and breast to upper flanks, undertail-coverts pale buff-brown; bare parts much as for male. Juvenile resembles female. Race *verreauxii* smaller, slimmer and smaller-billed, male has narrower and paler pink supercilium, browner mantle and back streaked black and broadly edged pinkish, rump extensively pale pink, underparts paler pink, female like nominate or slightly greyer and more boldly streaked on upperparts, including rump. Voice. Generally silent, song undescribed; occasionally gives far-carrying "chirp" or disyllabic and upslurred "churr-weee"; race *verreauxii* has short, sharp or piercing, metallic "spink spink".
Habitat. Found in summer months in rhododendron (*Rhododendron*) scrub, *Caragana*, barberry (*Berberis*) and rose (*Rosa*) thickets, bamboo and bushes in alpine meadows and on grassy slopes above tree-line or along edges of conifer forests; at 3000–4600 m. At other times in lower-level mixed forest, bamboo thickets, grassy hillsides with bushes and scrub; at 2000–3050 m.
Food and Feeding. Diet not well known, mostly small seeds and rose hips. Forages on ground and in bushes, and often perches in the open on tops of bushes and trees; otherwise shy and retiring.
Breeding. Season possibly Jul–Aug. No other information.
Movements. Resident and altitudinal migrant. In non-breeding season some move to lower levels; race *verreauxi* a rare or scarce visitor to Arunachal Pradesh, in NE India.
Status and Conservation. Not globally threatened. Locally common to scarce. Rare in India; rare in most of Chinese range, and uncommon in N Yunnan; uncommon resident in NE Myanmar, but possibly only a non-breeding visitor. The distributional area of this species appears to be much smaller than was previously believed.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Diesselhorst (1968), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), King *et al.* (1975), MacKinnon & Phillipps (2000), Martens & Eck (1995), Martens & Trautmann (2008a), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Sangha & Naoroji (2007), Vaurie (1959).

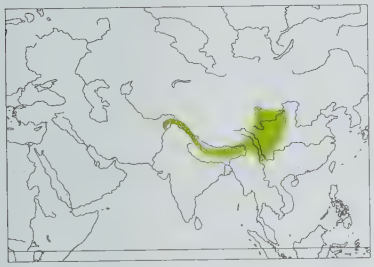
114. White-browed Rosefinch

Carpodacus thura

French: Roselin de Thura **German**: Weißbrauengimpel **Spanish**: Camachuelo de Thura

Other common names: (Mlle) Thura's Rosefinch; Himalayan White-browed Rosefinch (*thura*); Chinese White-browed Rosefinch (*dubius*)

Taxonomy. *Carpodacus thura* Bonaparte and Schlegel, 1850, Nepal.
Has been suggested that *dubius* represents a separate species, differing from other races in biometrics (bill, wing and tail), plumage and vocalizations, and with apparent lack of intergrades with others; although elevation to species rank possibly justified, further research, including analysis of mitochondrial DNA, required before such treatment considered warranted. Race *blythi* apparently intergrades with nominate to unknown extent in N India–W Nepal. Proposed race *charmensis* (described from Kyimpu Le La at c. 4000 m, between Chayul and Charme, on SE Tibetan Plateau) synonymized with *femininus*. Five subspecies recognized.
Subspecies and Distribution.
C. t. blythi (Biddulph, 1882) – NE Afghanistan and N Pakistan E in Himalayas to W Nepal.
C. t. thura Bonaparte & Schlegel, 1850 – E Himalayas from Nepal E to NE India (Arunachal Pradesh) and SW China (extreme SE Xizang).
C. t. dubius Przevalski, 1876 – WC China (NE & E Qinghai, Gansu, Ningxia S to E Xizang).
C. t. deserticolor (Stegmann, 1931) – C China (NC & NE Qinghai).
C. t. femininus Rippon, 1906 – S China (extreme SE Qinghai S to S & SE Xizang, NW Yunnan and W Sichuan).

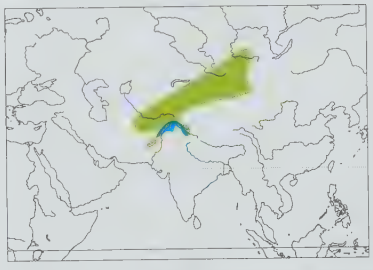


Descriptive notes. 17–18 cm; 24–36 g. Medium-sized, conical-billed, slender rosefinch with long and slightly notched tail. Male nominate race has forehead and supercilium deep pink or bright pinkish-red, supercilium tapering and becoming whiter on side of nape, fine white or pale pink feather tips on upper edge of forehead and supercilium; lowermost forehead, lores and cheek deep crimson, broad eyestripe from eye to side of nape dark brown; upper forehead to side of nape and upperparts brown, tinged grey, broadly streaked blackish, rump and uppertail-coverts deep pink, longest coverts with dark brown centres; tail black, finely edged brown; upperwing dark brown or blackish-brown, median coverts tipped pale whitish-pink, greater coverts edged brown to warm brown and tipped pale whitish-buff, flight-feathers edged pale or dull pink, tertials more broadly fringed pale buffish; ear-coverts and side of neck to underparts bright pink, finely streaked silvery white on rear ear-coverts, lower side of neck, chin and throat; flanks tinged brownish and often finely streaked darker, undertail-coverts white; in worn plumage, white tips on face, chin and throat and pale tips on median and greater coverts reduced or absent, and dark streaks on upperparts duller or less distinct; iris dark brown or black; bill brown or brownish-horn; legs flesh-grey to dark brown. Female has lower forehead pale buffish-brown, upper forehead to nape and upperparts brown or olive-brown, broadly streaked blackish, rump bright yellow with blackish feather centres, uppertail-coverts duller, tail black, feathers broadly edged pale brown at base; upperwing blackish-brown, finely edged paler brown and tipped pale buffish-brown (double wingbar), flight-feathers finely edged paler brown, tertials broadly edged pale buffish-brown; long, broad creamy-buff to brownish supercilium becoming pale buff or whitish towards rear and tapering over rear ear-coverts; broad dark brown or blackish eyestripe from eye to rear ear-coverts; lores, cheek and ear-coverts buffish-white, spotted or heavily streaked blackish; chin and throat to breast rusty buff or gingery brown, heavily streaked blackish-brown, streaks extending onto pale buff or whiter rest of underparts, lower flanks washed warm buff, undertail-coverts yellowish-white, finely streaked darker; bare parts much as for male. Juvenile is like female; first-winter and first-summer males have lower back and rump rich buff or reddish-brown, tips of greater coverts pale brown, chin to breast deeper warm rufous or orange-brown than adult female (breeds in this plumage). Races differ mainly in intensity of brown on upperparts and of pink on rump and underparts: *blythi* male has upperparts paler than nominate, underparts duller pink or tinged purple or lavender, female has buff (not whitish) supercilium, buff-brown chin to breast streaked darker; *dubius* is smaller-billed, with shorter legs, wing and tail, male has upperparts light brown, heavily streaked darker brown, forehead and side of crown pale or frosted pink, lores deep crimson, cheek and ear-coverts deep pink, silvery-white tips on side of neck, throat and centre of upper breast, female chin to breast pale whitish-buff, heavily streaked dark brown or blackish; *femininus* male is similar to previous, but upperparts more heavily streaked and underparts more heavily tinged purple-pink with heavier streaks, female like nominate, but supercilium entirely buffish-white, tips of wing-coverts and underparts whiter, lacking warm brown tinge, and breast heavily streaked darker; *deserticolor* is similar to *dubius*, but slightly larger and paler. Voice. Song of nominate rarely heard, from top of tall tree, mid-Jun to end Jul, a short series of loud, short whistles followed by 3–4 short warbled notes and then several longer whistles, transliterated as "drit-drit-drit-drit, quip-quip-quip-quip, dreep-dreep-dreep-dreep"; race *dubius* has short and monotonous song, "skréél churt-churt" (commonly heard in S Gansu from top of tree or from rocks in forest or open area close to forest); race *femininus* has short song "pew-pew-pew chi-chit" followed by several bleating or nasal or tin-trumpetlike notes slightly ascending "naaar naar nah nah nah" with last note trailing off, bleating notes sometimes given alone as call between pair members. Call a soft "wid", used for contact by partners or family groups, also a hoarse or sharp buzzing "deep-deep-deep-de-de-de-de" and more prolonged and bleating "veh ve ve ve ve ve ve", and loud rapid piping "pupupipipipi" usually given from ground, also loud "pwit-pwit" in flight; race *blythi* has loud sharp whistling "pwit-pwit" note, similar to that of Eurasian Nuthatch (*Sitta europaea*); calls of race *dubius* distinctly faster and slightly wavering in pitch, also a single staccato "quink".
Habitat. Breeds in undergrowth along forest edges and in clearings, also treeless boulder-covered slopes and ridges mostly above tree-line with creeping juniper (*Juniperus communis*) and dwarf willow (*Salix denticulata*), alpine meadows, dwarf rhododendrons (*Rhododendron*), bamboo, and birch (*Betula*), juniper and barberry (*Berberis*) scrub above tree-line, also in open fir (*Abies*) forest often admixed with rhododendron; in S Gansu (China) also in closed spruce–birch (*Picea–Betula*) forest; at 2400–3330 m in Afghanistan, 2400–3950 m in N Pakistan, 3050-3360 m in Kashmir, 3800–4200 m in N India and Nepal, 3000–4200 m in Bhutan, and from at least 2800 m (in Gansu) up to 4600 m in Xizang and W & C China. In non-breeding season found in similar habitat and open hillsides with scrub, mostly at lower levels, down to 2400–3800 m, exceptionally down to 1900 m (in Bhutan).
Food and Feeding. Variety of seeds, buds and shoots of alpine and subalpine herbs and shrubs, also some berries, including barberries, and blackberries and raspberries (*Rubus*), and juniper berries. Forages on the ground and in low bushes; hops and walks on ground; perches in bushes and trees. Usually tame and approachable. In pairs and in small, loose flocks; in non-breeding season often in single-sex flocks of up to 15 individuals, comprising mostly males or immature males, and may associate with other finches, including *C. edwardsii* and *Mycerobas carnipes*.
Breeding. Poorly known. Season late Jun to Aug. Loosely colonial; territorial, with rather small territory size. Nest a large shallow cup of grass, dry leaves, moss, plant stems, seedpods and animal hair, placed low down in juniper, dwarf willow or thorn bush. Clutch 3–4 eggs, pale greenish-blue, sparsely spotted with black. Some breed in first summer. No further information.
Movements. Resident and altitudinal migrant. Part of population descends short distances in non-breeding season, between Oct and Mar, but many remain at high altitudes throughout even severe winters; in Qinghai (China) moves down into valleys during hard winters. Race *blythi* a vagrant in Ladakh, mostly in spring.
Status and Conservation. Not globally threatened. Common to locally common in much of range; scarce resident in N Pakistan, and uncommon or scarce in NE India (Arunachal Pradesh). In Bhutan, locally the commonest wintering rosefinch.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Choudhury (2006), Clement *et al.* (1993), Diesselhorst (1968), Étchécopar & Hüe (1983), Feijen & Feijen (2008), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Ludlow (1951), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Martens & Trautmann (2008f), Meyer de Schauensee (1984), Pfister (2004), Rasmussen (2005), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Spierenburg (2005), Vaurie (1949, 1956a, 1959).

115. Red-mantled Rosefinch
Carpodacus rhodochlamys

French: Roselin à dos rouge **German**: Rosenmantelgimpel **Spanish**: Camachuelo Dorsirrojo
Other common names: Pinkish-backed Rosefinch (*rhodochlamys*); Blyth's/Himalayan Rosefinch (*grandis*)

Taxonomy. *Pyrrhula* (*Corythus*) *rhodochlamys* J. F. Brandt, 1843, Tarbagatay, Kazakhstan.
Has been suggested that race *grandis* merits full species rank, differing from others morphologically (bill and tail, wing formula), in plumage characters and in some vocalizations, but position of intermediate *kotschubeii* unclear; further research required. Three subspecies currently recognized.
Subspecies & Distribution.
C. r. rhodochlamys (J. F. Brandt, 1843) – E & SE Kazakhstan (Tien Shan, Dzhungarian Alatau, Tarbagatay and W & S Altai), S Siberia (Tuva, Tannu-Ola), NW China (NW Xinjiang) and W Mongolia.
C. r. kotschubeii Zarudny, 1913 – E Uzbekistan, E Turkmenistan, S Kyrgyzstan and Tajikistan (E to Alai Mts, S to N Pamir Mts).
C. r. grandis Blyth, 1849 – NW & NE Afghanistan, W & NC Pakistan and W Himalayas E to N India (E to N Himachal Pradesh).



Descriptive notes. 15–18 cm (nominate and *kotschubeii*), 18–20 cm (*grandis*); 18–38 g. Large and large-billed, stout rosefinch. Male nominate race has lower forehead and long supercilium (ending abruptly on side of nape) bright pink, tips of supercilium pearly or silky white, lores and eyestripe broadly dark crimson, upper forehead to crown dark crimson, finely streaked blackish, paler and less clearly streaked on nape and side of neck; upperparts bright reddish-brown, broadly streaked darker or blackish, rump unstreaked bright pink, uppertail-coverts brown, edged bright reddish-pink; tail blackish-brown; upperwing dark brown, median coverts edged pale brown and fringed pinkish-red, greater coverts fringed pale pink, alula and flight-feathers edged paler or tinged pinkish, tertials broadly edged pale pinkish-brown and tipped slightly paler; cheek, ear-coverts and side of neck to upper breast deep pink or pinkish-red, fine paler pink or frosted white tips on face to chin and side of throat; rest of underparts deep reddish-pink, paler on undertail-coverts, flanks tinged buff-brown; iris brown or dark brown; bill brown, yellowish or yellowish-horn base of lower mandible; legs pale brown or flesh-brown. Female has pale grey or grey-brown head and upperparts, finely streaked darker on crown to upper nape, more broadly or prominently streaked on upperparts, including rump and uppertail-coverts (rump may also be tinged light pink), face pale buff or buff-brown, finely streaked darker; tail dark brown, edged paler buff-brown, upperwing-coverts edged pale grey-brown and tipped paler buff, primary coverts and flight-feathers finely edged buff or pale greyish-buff, more broadly so on fringes of tertials; pale creamy-buff below, heavily streaked dark brown on lower throat, breast and flanks, paler streaks on belly to undertail-coverts. Juvenile and first-winter resemble adult female; adult plumage acquired after first summer. Race *grandis* is larger than nominate, has slightly longer, slimmer bill, longer wing and shorter tail, upperparts browner with less heavy blackish streaks, rump variably paler or duller pink with brown feather bases, face and underparts darker, mauve-pink or wine-red, forecrown brown lacking silky-white tips, tips more prominent at rear of supercilium and ear-coverts, female greyish and heavily streaked, head slightly paler than nominate, usually conspicuous whitish supercilium extending over ear-coverts and finely streaked dark brown; *kotschubeii* is intermediate in size and plumage between previous and nominate, lacks red band on forehead, and crown and upperparts (including rump) more heavily washed with red. Voice. Song, from top of tall tree, a feeble series of short, wheezing "chirp" and "twit" notes interspersed with occasional squeaky whistles; nominate race reported as having also a subdued warbling subsong. Call a single plaintive wheezing or buzzing whistle, "kwee" or "sqwee", or upslurred "jeeaweet" or "cheeyou-cheefew", and short or abrupt "wir"; a soft twittering note in flight; call of race *grandis* an upslurred and then downslurred and fading "skweeeuuu".
Habitat. Submontane and montane conifer forest, mostly juniper (*Juniperus*), fir (*Abies*), cedar (*Cedrus*) and spruce (*Picea*), also mixed deciduous forests and woods, with understorey of *Caragana*, barberries (*Berberis*), honeysuckle (*Lonicera*) and rose (*Rosa*) and other berry-bearing bushes in alpine meadows and boulderfields; in W Himalayas breeds in blue pine (*Pinus wallachiana*) and Himalayan poplar (*Populus ciliata*) above 2700 m, in Afghanistan preference for *Pinus gerardiana* forest; at 1500–2900 m in Tien Shan, 2500–3800 m in Himalayas, and 2520–4900 m elsewhere. In non-breeding season found in similar habitat at lower levels in foothills and valleys, at 2200–2600 m, occasionally down to 1200 m; in willows (*Salix*), thorn bushes, scrub, edges of cultivation, including orchards, olive (*Olea*) groves and gardens.
Food and Feeding. Mainly seeds, buds and berries of bushes and trees, including wild rose, wild olive, honeysuckle, *Caragana*, juniper, sea-buckthorn (*Hippophae*) and barberry; also takes seeds of dandelion (*Taraxacum*). Forages in berry-bearing bushes, junipers and low vegetation, and on ground; generally shy or secretive, but occasionally tame and confiding. In pairs and small groups.
Breeding. Season May–Jul. Nest a cup of grass, soft juniper bark strips, plant fibres and animal hair, placed low down within 2 m of ground in bush, often in rose or fruit bush, e.g. gooseberry (*Ribes uva-crispa*), or barberry. Clutch 4–6 eggs, pale blue with sparse brown spots; incubation by both sexes. Male first breeds in immature plumage. No further information.

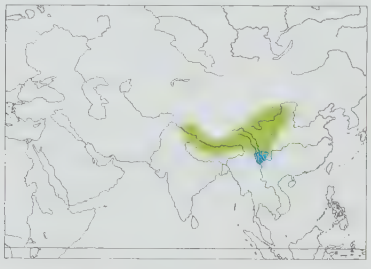
Movements. Partial migrant and altitudinal migrant. Makes post-breeding descent to lower levels, possibly only when forced lower by severe weather. Nominate race also moves W to Tashkent (Uzbekistan) and E to Lop Nor and the Bogdo Ola Shan (Xinjiang), in NW China. Race *grandis* winters to lower levels in WC Pakistan around Quetta, Punjab Salt Range, Kalla Chitta and Margalla Hills; returns to breeding areas in Mar. Vagrant in Ladakh, mostly during Jun–Sept.
Status and Conservation. Not globally threatened. Locally common in S of range; scarce to rare elsewhere.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Ayé & Schweizer (2006), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gavrilov (1999), Grimmett *et al.* (1998), Hüe & Étchécopar (1970), Ivanov (1969), Koelz (1937), Korelov *et al.* (1974), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Paludan (1959), Pfister (2004), Rasmussen (2005), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Stepanyan (2003), Vaurie (1949, 1956a, 1959), Wassink & Oreel (2007), Whistler (1945), Zarudnyi (1913).

116. Streaked Rosefinch

Carpodacus rubicilloides

French: Roselin strié **German**: Gebirgsgimpel **Spanish**: Camachuelo Estriado
Other common names: Eastern/Streaked Great Rosefinch, Crimson-eared Rosefinch

Taxonomy. *Carpodacus rubicilloides* Przevalski, 1876, Gansu, China.
Geographical variation weak and largely clinal, plumage becoming darker from W to E. Two subspecies recognized.
Subspecies and Distribution.
C. r. lucifer R. Meinertzhagen & A. Meinertzhagen, 1926 – S Tibetan Plateau (SW & S Xizang) and Himalayas from E Kashmir, Ladakh and NW India (N Himachal Pradesh) E to N Nepal and N Bhutan.
C. r. rubicilloides Przevalski, 1876 – E Tibetan Plateau E to C & S China (Qinghai and E & NE Xizang E to Gansu and W Sichuan); winters S to S Sichuan & N Yunnan.



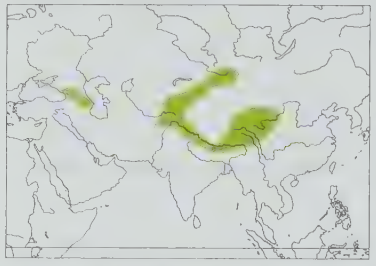
Descriptive notes. 19–20 cm; 38–43·8 g. Large, large-billed and stout rosefinch with slightly notched tail. Male nominate race has lower forehead, lores to slightly behind eye, cheek and chin blood-red, rest of face bright red; upper forehead to crown brighter strawberry-red, finely streaked white, hindcrown to nape and upperparts pale to medium brown, streaked darker (heavily so on upperparts), hindcrown and side of neck tinged pink or reddish-pink, rump and uppertail-coverts deep pink, latter with dark brown feather centres; tail blackish-brown, finely edged buffish-brown, outermost feather with narrow whitish outer edge; upperwing dark brown, median coverts fringed paler brown, greaters also edged pale brown and tipped light buff or pinkish, flight-feathers finely edged pale buff, tertials more broadly edged paler buff or whitish towards tips; throat and underparts bright pinkish-red with whitish feather centres, fine white tips on throat to side of upper breast; belly and flanks slightly paler and with larger white feather centres, undertail-coverts whitish, tipped pink; iris brown or dark brown; upper mandible dark horn, lower mandible paler yellowish-horn; legs dark brown. Female has head and upperparts cold grey-brown, streaked dark brown or blackish, finely streaked on crown and face and narrowly streaked on rump, narrow pale pinkish eyering; upperwing-coverts paler or greyer brown and tipped slightly paler, secondaries edged pale buff and tertials fringed slightly paler; throat and underparts pale whitish-buff, heavily streaked dark olive or olive-brown to lower breast and flanks; bill uniformly dark horn. Juvenile resembles female, but less heavily streaked on upperparts. Race *lucifer* is slightly larger and paler, and less intensely red in fresh plumage, than nominate. Voice. Song a slowly descending "tsee-tsee-soo-soo-soo", usually repeated several times. Call a loud "sink", "pink" or "twink", not unlike similar note of *Fringilla coelebs*; also a soft "sip", and a soft or melancholy "dooid-dooid" like that of *Pyrrhula pyrrhula*.
Habitat. Montane arid, dry alpine plateaux above tree-line, rocky screes and slopes with sparse scrubby vegetation including dwarf juniper (*Juniperus*), willow (*Salix*), sea-buckthorn (*Hippophae*) and *Caragana* bushes; occurs at 3700–5200 m. In non-breeding season found in valleys and lower-level thickets of thorn-scrub and *Caragana* scrub, occasionally around villages or settlements; down to 2800 m (sometimes to 2440 m) in Nepal and to 2200 m in SW China, rarely still as high as 5000 m in Xizang.
Food and Feeding. Mostly small seeds of juniper, sea-buckthorn and *Caragana*. Forages in bushes, in low trees, amongst rocks, and in alpine grassland, usually close to bushy or scrubby areas. Generally shy and retiring on ground, though occasionally approachable; flicks wings and tail when alarmed. In pairs; occasionally in mixed flocks with *C. rubicilla* and *Mycerobas carnipes*.
Breeding. Poorly known. Season late Jun to Aug. Nest a large cup of twigs, dry grasses, plant fibres, roots and animal hair or wool, well hidden deep in bush, mostly thorn bush e.g. *Caragana*; or up to 3 m (occasionally 4·5 m) from ground in low willow. Clutch 3–5 eggs, deep blue, thinly and sparsely spotted darker; incubation by female alone, and nestlings fed and cared for by both parents; no information on duration of incubation and nestling periods. Male possibly starts to breed in first year.
Movements. Resident, partial migrant and altitudinal migrant. Majority descend to lower levels within range from Oct, returning to higher elevations mid-Apr to May; a few may remain at higher altitudes even in mid-winter. Some migrate short distance S in China, to S Sichuan and N Yunnan.
Status and Conservation. Not globally threatened. Common to locally common. Locally common in Himalayas; less common in China.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Ludlow (1951), MacKinnon & Phillipps (2000), Martens & Trautmann (2008i), Meyer de Schauensee (1984), Pfister (2004), Rasmussen & Anderton (2005a, 2005b), Spierenburg (2005), Vaurie (1949, 1956a, 1959).

117. Great Rosefinch

Carpodacus rubicilla

French: Roselin tacheté **German**: Berggimpel **Spanish**: Camachuelo Grande
Other common names: Spot-crowned Rosefinch; Caucasian Great Rosefinch (*rubicilla*); Spotted Great/Severtzov's Rosefinch (E races)

Taxonomy. *Loxia rubicilla* Güldenstädt, 1775, Caucasus.
Taxonomy uncertain. Race *severtzovi* (with *kobdensis* and *diabolicus*) sometimes treated as a separate species on grounds of differences in plumage, breeding habitat and apparently vocalizations; nominate race, geographically isolated from others, may be more closely related to *C. rubicilloides*. Birds from WC Himalayas (Chitral E to Nepal and adjacent S Tibetan Plateau) proposed as race *eblis* (described from Puga, in E Kashmir), purportedly larger and slightly darker red than those from farther W in Himalayas, but differences may be clinal; further research required, including study of variation of *diabolicus* and birds from NW India. Four subspecies recognized.
Subspecies and Distribution.
C. r. rubicilla (Güldenstädt, 1775) – C & E Caucasus of SW Russia, N Georgia and N Azerbaijan.
C. r. diabolicus (Koelz, 1939) – NE Afghanistan, W Pamirs and Alai Mts.
C. r. kobdensis (Sushkin, 1925) – SE Russia (Tuva, Russian Altai and Sayan Mts) and W Mongolia S to NW China (N Xinjiang); in winter also E Kazakhstan.
C. r. severtzovi Sharpe, 1886 – E & SE Kazakhstan (C Tien Shan, Dzhungarian Alatau), E Kyrgyzstan (E Pamirs), SW & WC China (W & SW Xinjiang, S & E Xizang and Qinghai, possibly also N Gansu), and from N Pakistan (Chitral E to Gilgit) and Ladakh E to N Nepal and NE India (Sikkim); in winter also W & S Tajikistan.



Descriptive notes. 19–21 cm; 40–48·5 g. Large, stout rosefinch with large, conical bill and slightly notched tail. Male nominate race has lowermost forehead/base of upper mandible and lores to behind eye dark crimson, rest of face deep red, finely spotted or streaked white (white absent in worn plumage); upper forehead to crown bright strawberry-red, finely streaked white, hindcrown to nape and upperparts bright red or crimson, feathers fringed browner and with blackish shaft streaks on upperparts; rump deep pink, uppertail-coverts brown, edged pale pink; tail blackish-brown, feathers finely edged browner or buffish-brown, outermost with white outer edge; upperwing blackish-brown, median and greater coverts like back, greaters also tipped pale pink, flight-feathers finely edged pale buff, tertials more broadly edged paler buff or whitish at tips; below, deep red to crimson with whitish feather centres, fine white tips on throat to side of upper breast; belly and flanks slightly paler with larger white centres, undertail-coverts whitish, tinged pink, with dark central shaft streaks; iris dark brown; upper mandible dark horn-yellow, lower mandible paler or greyer; legs dark brown. Female has head and upperparts grey-brown, streaked dark brown or blackish, finely streaked on crown, slightly paler on unstreaked lower back and rump, uppertail-coverts dark-centred; tail blackish-brown, outer feathers finely edged whitish, upperwing-coverts broadly pale grey-brown (with slightly darker centres), flight-feathers edged paler brown, secondaries edged paler buff and tertials fringed slightly paler; lores and face browner than crown and finely streaked darker, underparts buffish, broadly streaked dark olive or olive-brown to lower breast, upper belly and flanks, belly to undertail-coverts whiter and more finely streaked; bare parts much as for male. Juvenile resembles female, but paler or more sepia-brown or sandy brown and streaks browner and narrower, upperparts slightly more buffish-grey, breast and belly dull creamy or whitish with faint streaks, greater upperwing-coverts have pale grey or creamy-buff fringe, bill uniformly pale grey-horn; first-winter and first-summer males brown and like adult female, but tail and wing feathers (including greater coverts and tertials) retained from juvenile plumage, with pale greyish or creamy-buff fringe at tips of greater coverts (absent in worn plumage) and generally fewer or no streaks on belly (holds territory, but not known to breed in this plumage); second-winter male red or deep pink below, but may have upperparts like juvenile. Races differ mainly in intensity of pink or red in male plumage and in size (lengths of wing, tail and bill): *severtzovi* is slightly smaller and paler than nominate, male face to throat and breast mostly rose-red or purplish-pink with large white spots (feathers with fine red edges), crown to nape spotted finely whitish, upperparts sandy brown to grey-brown, indistinctly streaked darker except for rose-pink rump, bill yellow or dusky yellow with greyer tip, female head and upperparts paler sandy grey, narrowly streaked darker, underparts pale creamy white with shaft streaks, mainly on flanks; *diabolicus* is intermediate between nominate and previous, male head and underparts mostly dark carmine-red, white spots on head and throat smaller, bill on average slightly longer; *kobdensis* is like last, but male slightly darker (closer to nominate), with large white spots on head and throat, female like nominate or slightly browner on upperparts, with rump yellowish, also slightly paler below than nominate. Voice. Male's advertising song, from ground or top of rock during breeding season (at least to mid-Aug), a flowing series of loud intermittent whistles, "tiu" or "fyu-fyu-fyu-fyu-fyu" or variably "vi-fyu-fyu-fyu-fyu-vi-tyuv-yuvyuvy uvyuvyuv-tsi", often fading or descending towards end or with final flourish, and may include shrill whistles and short imitated calls of nearby species, e.g. ripple call of *Serinus pusillus*; also a soft subsong of short and varied twittering notes, usually audible only at close range; race *severtzovi* has slight variation of upslurred and then downslurred notes, "chu-weet chiew chiew chu-chu-chu-chu", or a series of brief interrogative whistles, "twee-twee twe-cho-chush-u", falling in volume, also a low, mournful "weeep" or drawn-out mournful "weea" and several soft chuckling notes. Contact call between partners or within flock a repeated whistled "tooey tooey"; other calls include soft "dyuit" or "tui" similar in tone to call of *Pyrrhula pyrrhula*, and "pink" or "pingk" like *Fringilla coelebs* call, alarm calls include "chek", "chik", "chvi", "chvik" and "chev-chev"; race *severtzovi* also has harsh rasping "jink", and in flight a short soft "jeweet" whistle and a series of short twittering notes.
Habitat. Alpine and subalpine areas with stunted and sparse vegetation, montane and submontane plateaux, usually above rhododendron (*Rhododendron*) zone, in barren, desolate and windswept hillsides, around rock faces and valleys with occasional dwarf birch (*Betula*), juniper (*Juniperus*) and willow (*Salix*) thickets, boulder-strewn and rock-strewn screes, also edges of glaciers and ice-fields, alpine meadows, and open fields at edges of cultivation; in W Sayan Mts breeds in Siberian pine (*Pinus sibirica*) and dwarf birch scrub; breeds at 2500–3500 m in Caucasus and 3330–5000 m in Himalayas and C Asia. Habitat differs slightly from that of *C. rubicilloides*, which prefers sparser bushy vegetation at slightly lower altitudes; the two occur together during breeding season in W Nepal and region of Mt Everest. In non-breeding season found at lower levels in similar habitat, including *Caragana* scrub and *Viburnum*, sea-buckthorn (*Hippophae*) and barberry (*Berberis*) thickets in mountain ravines, edges of villages in foothills and riverine thickets; regular on outskirts of Almaty (Kazakhstan) and around Tashkent (Uzbekistan), and in S Tajikistan occurs in willow and poplar (*Populus*) woods; in Tajikistan and Nepal also feeds around haystacks and rubbish dumps at edge of villages and settlements, and in S Tibetan Plateau occurs in parks in Lhasa; in winter usually in upper valleys above 2000 m, exceptionally (following heavy snowfall) down to 1000 m, in Caucasus, descends to 900–1200 m in W Tien Shan (SE Kazakhstan), race *kobdensis* down to 1400 m and in C & N Altai to 900 m, occasionally to 500 m, *severtzovi* usually down to 2650 m (possibly exceptionally down to 1500 m) in Himalayas; many (mostly adult males) remain at high

altitude unless weather particularly severe, up to 3600 m in Tien Shan, above 3600 m in Pamirs, to 4500 m in Xizang and at 3660–5000 m in Nepal.

Food and Feeding. Mostly seeds, buds, shoots and flowers of small alpine plants, occasionally berries and small insects. Seeds and buds include those of *Caragana* bushes, juniper, bistort and knotweed (*Polygonum*), black locust (*Robinia pseudoacacia*), mountain sorrel (*Oxyria*), fumitory (*Corydalis*), buttercup (*Ranunculus*), rose (*Rosa*), *Sibbaldia semiglabra*, mouse-ear (*Cerastium*), sandwort (*Minuartia*), catchfly (*Silene*), saxifrage (*Saxifraga*), cinquefoil (*Potentilla*), milk-vetch (*Astragalus*), lyme grass (*Elymus*), avens (*Dryas*), vetch (*Vicia*), sea-buckthorn, barberry, hawthorn (*Crataegus*), primrose (*Primula*), forget-me-not (*Myosotis*), speedwell (*Veronica*), honeysuckle (*Lonicera*), lousewort (*Pedicularis*), bellflower (*Campanula*), dandelion (*Taraxacum*), goat's-beard (*Tragopogon*), also grasses (Gramineae) and sedges (*Carex*). Insects and larvae taken include grasshoppers (Orthoptera), flies (Diptera) and beetles (Coleoptera). Nestling diet includes unripe dandelion seeds, grasshoppers and beetles. Makes daily descent of up to 2 km in early morning to feeding areas, returning to higher areas later in day. Forages on the ground between rocks, often at edges of snow patches, on cliffs and ledges in alpine vegetation, and in winter also in stunted low bushes and at edges of woodlands; also at waste dumps in Pamirs and Mongolia. Collects seeds from plants and flowerheads and from snow on ground, bites through seedpods of Leguminosae and picks out seeds from split case; swallows whole ovary and stamens of *Ranunculus* flowers; crushes berries of sea-buckthorn in bill, discards pulp and consumes only seed. Forages most often in pairs or small groups when breeding; in non-breeding season forms larger flocks of up to 150 individuals, often comprising females and immature males, occasionally with other finches, including *C. erythrinus*, *C. rubicilloides* and *Leucosticte brandti*.

Breeding. Season late May to end Aug; generally single-brooded, in Caucasus probably more than one brood. Monogamous; pair-bond strong, possibly endures for more than single breeding season. Possibly sometimes co-operative; second male (often immature) often present with pair and tolerated through breeding season. Solitary, occasionally loosely colonial. Apparently, territory very large or species non-territorial. Pair formation takes place during late winter and before break-up of winter flocks. Courtship involves sudden aerial chasing of female by male, often in haphazard or zigzag pattern, before landing on ground or rock and male giving loud song; displaying male has upright posture with head and bill pointed upwards, breast and belly feathers ruffled and tail slightly raised while bounding left and right in front of female on ground, also bobbing and bowing movements of male to female, also wings drooped or flicked out from body and tail held almost vertical. Nest built by female, mostly from thin twigs, plants stalks and root fibres, grass, moss, animal hair, wool and feathers, placed in crevice in rock face or in low bush on cliff face, exceptionally in deserted building. Clutch 4–5 eggs (race *kobdensis* 3–4), deep sky-blue or tinged greenish, sparsely spotted, lined or blotched with black; incubation by female alone, period up to 16 days; chicks fed and cared for by both parents, mostly by female, nestling period c. 17 days; young fed by parents for up to 3 weeks after leaving nest. Few data on breeding success; in Caucasus nests preyed on by Yellow-billed Chough (*Pyrrhocorax graculus*) and stoats (Mustelidae).

Movements. Resident and altitudinal migrant. In Oct–Mar non-breeding season moves short-distances to lower levels within range, travelling up to 50–60 km in severe winters. In SE Kazakhstan (W Tien Shan) often remains at low elevations until mid-May; also regularly occurs in lower Zeravshan, in W Tajikistan, where occasionally remains to end Apr, and in Shakhdara valley, in S Tajikistan. Many adult males remain all year at high elevations. Nominate race recorded as vagrant in Crimea.

Status and Conservation. Not globally threatened. Common to locally common in much of range; uncommon in N India and W China. Status in Kazakhstan unclear; recorded throughout year in Tien Shan and Dzhungarian Alatau, where possibly rare resident, but breeding not confirmed, and more numerous in winter. Caucasus breeding population possibly between 500 and 1500 pairs; has declined in recent years owing to habitat destruction. Reported occurrence in E Turkey in 1910 and in 1940s now considered unproven.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena, Guillén *et al.* (2001), Arnaiz-Villena, Moscoso *et al.* (2007), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), David & Gosselin (2002a), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Glanzner (2009), Grimmett *et al.* (1998), Hagemeijer & Blair (1997), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Kirwan *et al.* (2008), Koelz (1937), Lang *et al.* (2007), Loskot (1991, 1994), MacKinnon & Phillipps (2000), Martens & Eck (1995), Martens & Trautmann (2008b), Meyer de Schauensee (1984), Neufeldt (1986), Pfister (2004), Rasmussen (2005), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Rogacheva (1992), Roselaar (1995), Singh Sangha & Naoroji (2004), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1949, 1959), Wassink & Oreel (2007).



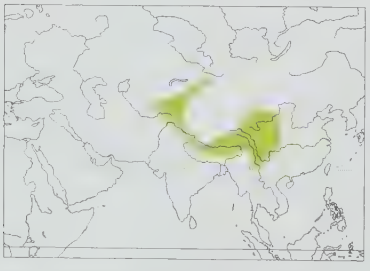
Genus *PYRRHOSPIZA* Blyth, 1845

118. Red-fronted Rosefinch

Pyrrhospiza punicea

French: Roselin à gorge rouge **German**: Felsengimpel **Spanish**: Camachuelo Frentirrojo
Other common names: Red-breasted/Rose-breasted/Red-faced Rosefinch

Taxonomy. *Pyrrhospiza punicea* Blyth, 1845, Nepal.
Genus often subsumed in *Carpodacus*, but differs in bill shape and structure, size (longer wing and tail), tail shape (less deeply notched) and foot details (strong, with curved claws), and not sexually mature until adult plumage acquired. Races intergrade widely in overlap areas; proposed race *szetchuanus* (described from N Sichuan), on average only slightly darker than *longirostris*, is synonymized with latter. Five subspecies recognized.
Subspecies and Distribution.
P. p. humii Sharpe, 1888 – SE Kazakhstan, Kyrgyzstan and Tajikistan (Tien Shan and Pamir-Alai Mts) S to Himalayas of N Pakistan, Ladakh and N India (Uttarakhand).
P. p. kilianensis (Vaurie, 1956) – extreme W China (mountains at W & S fringe of Tarim Basin, in W Xinjiang) S to NE Ladakh.
P. p. punicea Blyth, 1845 – C & E Himalayas from Nepal E to NE India (Arunachal Pradesh) and SW China (S Xizang).
P. p. longirostris Przevalski, 1876 – C China (E Qinghai E to S Gansu and N & W Sichuan).
P. p. sikangensis (Vaurie, 1956) – CS China (SW Sichuan and NW Yunnan).



Descriptive notes. 20 cm; 42–51 g. Large rosefinch with curved culmen and ridged lower mandible, strong feet and slightly notched tail. Male nominate race breeding has forehead and short supercilium (to above ear-coverts), cheek and most of ear-coverts to breast bright red or crimson, fine silvery-white feather tips on lower face, chin and throat; lores and eyestripe dark brown; crown to nape grey-brown, finely streaked darker, upperparts the same but heavily streaked darker, lower back unstreaked, rump bright pink, uppertail-coverts brown; tail feathers dark brown, edged paler brown; upperwing dark brown or blackish, coverts finely edged paler or buffish in worn plumage, flight-feathers narrowly edged pale buff-brown, tertials slightly more broadly so; side of breast (beside bend of wing) pale greyish, rest of underparts below breast pale grey-brown, streaked blackish, undertail-coverts tinged pinkish; iris brown; bill brown, darker tip; legs brown. Non-breeding male in fresh plumage (winter) has feathers of forehead, rump and breast tipped brown, and fine pale tips on face and throat absent. Female has head and upperparts dull grey-brown, broadly streaked blackish, slightly paler on unstreaked rump (may be paler, buffish or yellowish); tail as on male; upperwing-coverts dark brown, thinly edged pale brown and tipped paler buff, flight-feathers edged pale buff-brown, tertials more broadly edged paler buff; chin to breast pale yellowish-buff, lower breast, belly and flanks warm buffish, all broadly streaked dark brown, lower belly to undertail-coverts paler. Juvenile is like female, but browner and heavily streaked darker above and below, rump grey-brown, and usually lacks warm buff tinge on lower breast, belly and flanks (not recorded as breeding in this plumage); first-winter and first-summer have throat to breast buff, becoming yellow (female) or olive-yellow (male) in second winter; second-summer female (and some males) with rump yellow, second-summer male also pink or reddish-pink on chin, side of throat and belly. Races differ mainly in size and in intensity of plumage colour: *humii* is slightly larger and paler or less heavily crimson than nominate, upperparts less heavily streaked, underparts paler brown, female similar to nominate but rump more concolorous with rest of upperparts; *kilianensis* is similar to previous, but larger, with thinner red band across forehead and browner forecrown to crown, female rump and uppertail-coverts bright yellow and with brown or buff-brown lower throat and breast edged and tipped yellow; *longirostris* is largest race, slightly longer-billed, male paler and brighter or more intensely red than others, sometimes a wide band of red on forehead and over eyes (not present on all individuals); *sikangensis* is intermediate in size and in colour intensity between preceding race and nominate, male darker, more heavily streaked and with red frontal band on average broader than nominate, female with paler underparts, especially from chin to breast. Voice. Song, from top of rock or on ground, given infrequently throughout year, a short "twiddle-le-de" and a variable series of louder, more melodious and plaintive downslurred whistles, "see-e chit chit tew tew tu tu" or "whi chi chittur-chittur", repeated after short pause; also a series of call notes rapidly run together as "tututututew". Call a fairly loud, cheery whistle, "are-you-quite-ready?", reminiscent of a bulbul (Pycnonotidae) call in tone and quality; drier rising "je-jee-jeer" or "dzhee-oo, dzhee-oo" continuously without variation, possibly as alarm or anxiety note; also a grating "ma-a-a-u" and "chirp" or "jeelp" given in flight.
Habitat. Breeds on montane plateaux well above tree-line (almost to limit of vegetation), on steep rocky slopes, boulderfields, rocky screes, cliffs and edges of glaciers with occasional patches of alpine heath, boggy patches and scrub, creeping juniper (*Juniperus*) and *Caragana* thickets and bushes, also alpine meadows with dwarf juniper or rhododendrons (*Rhododendron*); in Himalayas and China at 3300–5700 m (the highest breeding passerine) and in Tien Shan 3700–4800 m. In winter occurs in similar treeless or scrubby habitat and birch (*Betula*) scrub in valleys at lower altitudes, down to 2700–3000 m, in severe winters occasionally to 2400 m and very exceptionally to 1500 m.
Food and Feeding. Largely seeds, buds, flowerheads, petals and berries, including those of roses (*Rosa*), *Caragana* and alpine plants. Forages on the ground in the open or under bushes, often at edge of melting snow. Uses powerful bill to dig into snow and earth between rocks and stones; also perches on tops of bushes, especially early on sunny mornings. Alert, but generally tame and approachable; flies strongly, but rarely far, when disturbed. Singly, in pairs and in small family groups of up to six individuals, possibly slightly more in non-breeding season.
Breeding. Season late May to Aug. Monogamous. Solitary. Nest a thick or bulky cup of coarse grass, plant fibres, roots and animal hair, placed on rocky ledge or low down at base of stunted bush. Clutch 3–5 eggs, white to blue or bluish-green, sparsely spotted blackish. No further information.
Movements. Resident and partial short-distance altitudinal migrant. In non-breeding season part of population descends to lower levels; considerable numbers remain at high altitudes throughout, moving only during periods of severe weather and then no farther than lower limit of breeding range.
Status and Conservation. Not globally threatened. Locally common to uncommon in most of range. Rare resident in SE Kazakhstan; status in W Tien Shan uncertain, possibly only occasional summer visitor. Scarce in N Pakistan and Kashmir, and local or rare in Ladakh. Nowhere very numerous, and red (adult) males often outnumbered by females and immatures.
Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Martens & Trautmann (2008j), Meyer de Schauensee (1984), Pfister (2001, 2004), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Spierenburg (2005), Stepanyan (2003), Vaurie (1949, 1956a, 1959), Wassink & Oreel (2007).

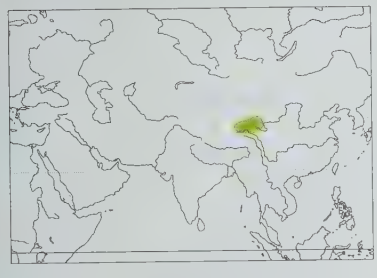
Genus *KOZLOWIA* Bianchi, 1907

119. **Roborovski's Rosefinch**

Kozlowia roborowskii

French: Roselin de Roborowski **Spanish**: Camachuelo de Roborowski
German: Roborowskigimpel
Other common names: Tibet(an)/Tsinghai Rosefinch

Taxonomy. *Leucosticte roborowskii* Przevalski, 1887, Burhan Budai Shan, central Qinghai, China. Genus sometimes subsumed in *Carpodacus*. Monotypic.
Distribution. WC China (C & SW Qinghai and NE Xizang).



Descriptive notes. 17–18 cm. Large, long-winged and short-legged rosefinch with domed head and thin, pointed bill. Male has forehead to crown and face deep red or crimson (may appear blackish), feathers finely tipped lighter red on side of head, cheek and ear-coverts; nape greyish-pink, upperparts grey or grey-brown, feathers tipped light crimson, more broadly tipped on mantle, back and scapulars (forming broadly barred or scaled pattern), rump and uppertail-coverts pale pink; tail dark brown, base of outer feathers finely edged pinkish; upperwing dark brown, median and greater coverts fringed light pink, tips of greaters whitish, primaries and outer secondaries finely edged light pink, inner secondaries and tertials edged pale buff or whitish; chin and throat black (merging with deep red on lower face) with fine white tips or spots, breast to belly and flanks pale pink with whiter feather bases, belly to undertail-coverts very pale pink; iris black; bill bright or pale yellow, tip dark horn; legs dark brown. Female has head pale buffish-brown, finely streaked darker on forehead to crown and face, cheek slightly paler buff, lores dark grey, sometimes a fairly indistinct buffish supercilium; upperparts like crown or slightly warmer brown or tawny-brown, heavily streaked dark brown, rump and uppertail-coverts unstreaked; tail dark brown, edged paler buff-brown or warm buff; upperwing dark brown, median and greater coverts edged paler buff-brown and finely tipped pale buff, secondaries edged pale brown, tertials more broadly edged pale buff-brown; chin and throat whitish, side of lower throat to breast warm buffish-brown, narrowly streaked dark brown, rest of underparts pale buff, streaked darker; bare parts much as for male. Juvenile only recently observed, two individuals, very like female, but bill horn-yellow, one with darker face and more ochreous general coloration (even slightly pinkish on back) probably young male. Voice. Generally silent, but has short and plaintive whistle, often given as a longer trill.
Habitat. Desolate, montane rocky steppes, barren alpine meadows of argillate-slate mountains and stony plateaux and glacier edges, at 4500–5400 m. Usually in areas shunned by all other species, but occasionally forages in same habitat as Black-winged Snowfinch (*Montifringilla adamsi*) and *Leucosticte brandti*.
Food and Feeding. Diet little known; seeds and fragments of alpine grasses and flowers, including lousewort (*Pedicularis*), recorded as taken. Forages on the ground among sparse vegetation; hops and shuffles on ground. Singly, in pairs and in small family groups.
Breeding. Female with two fledglings seen towards end Aug, indicating nesting probably late Jul/early Aug. Male, on seeing a female with grass blades in bill, immediately flew and landed near her, ran along ground and gathered tuft of rootlets, partly opened wings, then suddenly flew to a position in front of watching female, and, still holding rootlets in bill, advanced towards her, his wings opened and backswept and tail slightly raised, showing his pink rump and belly, finally stopping in same posture but in centre of small patch of snow, which provided different contrast with his plumage colours; no vocalizations heard. Both young fledglings closely followed parent and copied her feeding actions, pecking at same types of foodplant (fragments of alpine herbs). No other information.
Movements. Resident; in non-breeding season may move to lower altitude during prolonged periods of extremely severe weather.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Qinghai–Tibetan Plateau Secondary Area. Poorly known. Probably locally not uncommon, but inhabits terrain that is difficult to survey. Was previously thought to be rare, but in 1990s and, especially, since 2000 found to be present in small numbers at several localities, notably Er La Pass (C Qinghai).
Bibliography. Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Neufeldt & Vietinghoff-Scheel (1978), Otani (1995), Ottaviani (2008), Thorpe & Allen (1996), Vaurie (1959).

PLATE 45


inches 3
cm 8
120
ssp enucleator
121
ssp leucura
122
ssp curvirostra
123
ssp himalayensis
ssp tianschanica
ssp poliogyna
124
125
126
127

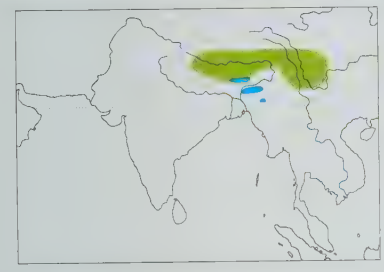
Genus *PROPYRRHULA* Hodgson, 1844

120. Crimson-browed Finch

Propyrrhula subhimachala

French: Durbec à tête rouge **German**: Rhododendrongimpel **Spanish**: Camachuelo Cejirrojo
Other common names: Red-headed Finch/Rosefinch, Juniper Finch

Taxonomy. *Corythus subhimachalus* Hodgson, 1836, northern and central Nepal.
Has sometimes been placed in genus *Pinicola*, but probably more closely related to *Carpodacus*; further study required. Monotypic.
Distribution. Breeds in Himalayas from C Nepal E to N Bhutan and NE India (Arunachal Pradesh), S & SW China (S & SE Xixang E to S Sichuan and NW Yunnan) and N Myanmar; winters also S Bhutan and NE India (S Assam, Meghalaya and Manipur).



Descriptive notes. 19–20 cm; 44–50 g. Large, stout and long tailed finch with large stubby bill. Male has forehead and supercilium to just behind eye bright red, lores greyish, ear-coverts olive-brown tinged reddish, lower cheek bright crimson, this extending as bright crimson spots (with darker crimson fringes) to chin, throat and breast; crown to nape and upperparts brown or olive-brown, tinged reddish-brown, finely streaked darker or blackish, rump and uppertail-coverts deep red or crimson, longest uppertail-coverts duller reddish; tail dark brown, narrowly edged bright red or reddish-brown (broadly at base of outer feathers); upperwing dark brown or blackish, median and greater coverts edged light reddish-brown (browner when worn), alula and primary coverts narrowly fringed dull crimson, primaries edged dull reddish-brown, secondaries edged olive-brown, tertials broadly edged pale reddish-brown; lower breast and flanks tinged or streaked buffish-brown, rest of underparts pale dull grey; iris black; upper mandible blackish-brown, lower mandible paler or yellowish-horn; legs dark brown. Female has forehead and supercilium to just behind eye yellow, tinged olive (becoming orange with age), brightest on forehead; crown to nape and upperparts light greenish-olive, streaked darker or blackish, lower back, rump and uppertail-coverts olive-yellow; tail dark brown, narrowly edged yellow or light yellowish-greenish (broadly at base of outer feathers); upperwing dark brown or blackish, median and greater coverts narrowly edged olive-green and tipped yellow, flight-feathers finely edged yellow or olive-yellow, tertials more broadly fringed the same; lores to ear-coverts greyish, rest of face and side of neck slightly paler grey (may also extend to nape); chin and throat pale grey, finely streaked dark grey, breast olive-yellow (may appear as spots, with fringes often darker) or light orange, rest of underparts greyish, belly to undertail-coverts paler; bare parts much as for male. Juvenile and first-winter are like female, but duller greenish-yellow on breast; first-summer and second-winter males have forehead and breast orange or centre of breast pinkish with darker tips, rump and some tips of greater coverts orange; second-summer male like adult, but forehead often brown, breast mottled yellowish with red tips (often extending to throat), and retains olive-yellow edges of flight-feathers and tail. Voice. Song poorly known, a loud, melodious and shrill series of varied warbling notes, may include "ter-ter-tee" or "terp, terp, tee" phrase. Otherwise generally silent, except for melodic chirp like that of a sparrow (*Passer*).
Habitat. Inhabits montane and submontane areas of juniper (*Juniperus*) and dwarf rhododendron (*Rhododendron*) scrub at or above the tree-line, also dwarf willows (*Salix*) and light or scattered conifers and junipers; breeds at 3200–4200 m. In non-breeding season in similar habitat at lower levels, including thick undergrowth of deciduous and fir (*Abies*) forests, mostly in range 1800–3650 m.
Food and Feeding. Mainly variety of seeds, flowers and berries, including those of pine (*Pinus*) and other conifers; berries include those of *Viburnum* and barberry (*Berberis*), buds and fruit include those of rose (*Rosa*) and crab apple (*Malus*). Forages at all levels in bushes and low trees, undergrowth and on the ground. Shy and unobtrusive, and generally slow-moving; frequently overlooked in rhododendrons and undergrowth. Singly and in pairs; in non-breeding season also in small flocks of up to twelve individuals, occasionally in single-sex flocks.
Breeding. In breeding condition in Aug. Some males breed in subadult plumage. No further details available.
Movements. Resident, partial short-distance migrant and altitudinal migrant. Some descend in late autumn to lower levels within range; a few move to hills in S parts of NE India.
Status and Conservation. Not globally threatened. Uncommon to locally more common. Rare in Assam.
Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), Ludlow (1951), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1956a, 1959).

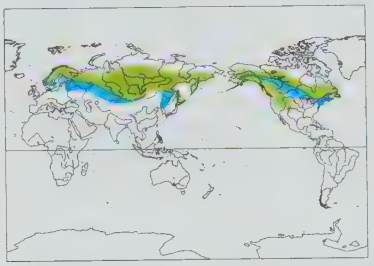
Genus *PINICOLA* Vieillot, 1808

121. Pine Grosbeak

Pinicola enucleator

French: Durbec des sapins **German**: Hakengimpel **Spanish**: Camachuelo Picogrueso
Other common names: Pine Rosefinch

Taxonomy. *Loxia enucleator* Linnaeus, 1758, Sweden.
Despite some morphological similarities to *Carpodacus*, bill structure and mitochondrial DNA indicate closer relationship to *Pyrrhula*. Proposed North American races *alascensis* (described from Nushagak, in Alaska) and *eschatosa* (from Harry's River, in Newfoundland) considered synonymous with *leucura*. Nine subspecies recognized.
Subspecies and Distribution.
P. e. enucleator (Linnaeus, 1758) – breeds from Scandinavia (S Norway and C & N Sweden) E to C Siberia; winters S to S Sweden and SW Siberia.
P. e. pacata Bangs, 1913 – breeds E Siberia (E of R Yenisey and Sayan Mts) E to Kolyma Basin and Sea of Okhotsk, S to C Altai, NE Kazakhstan, N Mongolia and Stanovoy Mts; winters S to NE China (Heilongjiang and Liaoning).
P. e. kamtschatkensis (Dybowski, 1883) – breeds NE Russia (Anadyrland S to N Sea of Okhotsk and Kamchatka); winters S to NE China (Heilongjiang & Liaoning).
P. e. sakhalinensis Buturlin, 1915 – Sakhalin I, Kuril Is and N Japan (Hokkaido).
P. e. flammula Homeyer, 1880 – breeds Alaska Peninsula and Kodiak I S along coast to W Canada (NW British Columbia); winters S to C British Columbia, occasionally to Vancouver I.
P. e. leucura (Statius Müller, 1776) – breeds W & C Alaska, and in broad band E through C Canada to Quebec, Newfoundland and Nova Scotia; winters S to S Canada and NE USA.
P. e. carlottae A. C. Brooks, 1922 – Queen Charlotte Is, off W Canada.
P. e. montana Ridgway, 1898 – SW Canada (N British Columbia) S to WC USA (S to E Arizona and N & W New Mexico).
P. e. californica Price, 1897 – E California (Sierra Nevada).



Descriptive notes. 18·5–25·5 cm; 42–77 g. Large, long-tailed finch with large, stout, conical hook-tipped bill. Male nominate race has forehead to crown, nape and upperparts deep pink to reddish-pink (sometimes brown tips on hindcrown, nape and upperparts), or mantle and back predominantly grey with blackish tips; lower back and rump bright pink, uppertail-coverts dark grey, edged pink or pale pink; tail black, finely edged pink or pale pink; upperwing blackish, median and greater coverts tipped pinkish-white (more broadly and also along distal edges on greaters, forming double wingbar), flight-feathers finely edged pale pink or whitish, broadly on fringes of tertials; lores to beneath eye blackish, face as upperparts but may show greyish moustachial stripe and lower border of ear-coverts; chin whitish, throat and underparts like upperparts or slightly paler, with whitish bases, more visibly so on belly and flanks; lower belly to undertail-coverts whitish or tipped pink; iris dark brown or black; bill dark grey or blackish, paler or pinkish base of lower mandible; legs dark brown to blackish. Female lacks pink; has forehead to nape, side of neck, face and mantle variably pale olive-yellow or yellowish-green (may be tinged darker orange), scapulars, lower back and rump pale grey, darker feather tips on mantle and scapulars, uppertail-coverts like head or with dark grey or greyish-buff centres; tail dark brown, edged light olive-brown, wing as on male, edged finely white on primaries and more broadly so on secondaries and tertials; lores to area below eye pale grey, passing to grey of chin, throat and side of throat; breast and flanks olive-yellow or yellowish-brown, belly and lower flanks to undertail-coverts pale grey; bare parts much as for male. Juvenile is like female but greyer, head tinged yellow or olive-yellow, rump dull yellowish-brown, tips of upperwing-coverts broadly pale buff, edges of tertials also buffish, and ear-coverts, throat and breast buffish; first-winter male also like female, except that forehead to nape, tips of ear-coverts, side of neck, mantle and upper back grey, tinged russet or rust-brown, rump dull yellowish to orange with grey tips, becoming deep pink with darker tips in first summer, when wing-coverts tipped white, underparts as on adult female, but paler or duller and tinged orange-buff, flanks grey. Races differ mainly in size, in length, depth and width of bill, and in intensity of male plumage coloration, North American races larger than nominate and with bill shorter, broader and deeper and wing and tail blacker: *pacata* is like nominate in size, bill shorter but stout or more swollen and more laterally compressed at tip, male often tinged purple and throat to belly with contrasting pale feather centres, female brighter and yellower; *kamtschatkensis* resembles previous, but shorter and narrower bill deeper at base and more blunt-tipped, with pronounced hooked tip, male mantle and back with distinct dusky centres (less distinct on female and immature male) and bright, dark red mottling (lacking greyish) on breast and flanks; *sakhalinensis* is like last, but bill 3–4 mm longer (bill similar to nominate); *leucura* male has blacker (less brown) wing and tail, distinct dusky centres on mantle and back, and breast and flanks pink to pinkish-red with greyish mottling reduced or lacking, female variable, W of Hudson Bay has olive-yellow restricted to head, short whitish supercilium arching over eye, larger pale subocular crescent and plain grey chin to breast, (first-winter birds similar to adult female, but head rich orange to rufous-orange), birds in W Alaska larger and shorter-billed, E birds smaller and darker; *flammula* is larger-billed than previous, male predominantly orange, female more yellowish, male breast and flanks bright dark red with little or no greyish mottling; *carlottae* is smallest and darkest race, male with distinct dusky centres on mantle and back and dark red breast and flanks; *montana* resembles *leucura*, but smaller (size increases clinally N–S, largest individuals c. 15% smaller), male mantle and back with distinct dusky centres, dark red breast mottled grey and flanks predominantly grey; *californica* is like last, but smaller-billed and longer-tailed, male breast dull red, mottled greyish, and flanks mostly grey. Voice. Song, from prominent perch at top of shrub or tree, mid-Mar to mid-Aug (occasionally mid-Oct or Nov), a loud, varied, musical warble including high, clear flute-like notes and melodious trills, "fillip illy dilly didalidoo", followed by harsh twanging note and includes imitations of calls and songs of other species in vicinity; in Europe similar to song of Woodlark (*Lullua arborea*) and in N America to those of *Carpodacus purpureus* or *Pheucticus* grosbeaks; female sings occasionally or rarely, generally softer subsong type. Contact call a fluty "teu-teu-teu" or "tee-tee-tew" and more strident "pee-lee-ju" with middle note highest, occasionally longer "tiu tiu-tiu tiu-tiu tiu-tiu"; also variety of quiet twitters when foraging in flock, a short, subdued muscial trill "pui pui pui" usually given in flight, and a rasping "carec", "crrru" or drawn-out "ca-r-a-a-r"; alarm or anxiety note a sharp "chee-vli"; juvenile has clear bell-like "tee-klee". In W of Nearctic range local variations or modulations in vocalizations occur, principally in coastal Alaska, W British Columbia, Rocky Mts and California, where call drier or husky "quid quid quid" or "quidip quidip" and lacks whistle; individuals flock and roost assortatively according to variations in calls.
Habitat. Lowland, lower montane and subarctic conifer forests and woods, including larch (*Larix*), spruce (*Picea*), cedar (*Cedrus*) and fir (*Abies*), also along tree-line of N taiga, where occurs mostly in Siberian pine (*Pinus sibirica*) and mature *Polytrichum–Pinus sibirica* forests, in E Siberia also

On following pages: 122. Scarlet Finch (*Haematospiza sipahi*); 123. Red Crossbill (*Loxia curvirostra*); 124. Scottish Crossbill (*Loxia scotica*); 125. Parrot Crossbill (*Loxia pytyopsittacus*); 126. Two-barred Crossbill (*Loxia leucoptera*); 127. Hispaniolan Crossbill (*Loxia megaplaga*).

in Siberian dwarf pine (*Pinus pumila*) near timber-line; also in mixed deciduous and conifer with alder thickets (*Alnus*) and birch (*Betula*), in light or open forest, often along forest edge, on hillsides, in clearings and in damp or marshy areas with willows (*Salix*), poplars (*Populus*) and junipers (*Juniperus*). In non-breeding season more widely in deciduous woods, willow thickets and copses in valleys and woodland patches at edges of cultivation, including orchards, also mixed scrub, parks and suburban gardens. To 1250 m in Kamchatka, to 1600–2000 m in Altai; in USA, at 1800–3100 m in California and above 3000 m in Rocky Mts of Colorado.

Food and Feeding. Mostly seeds, buds, shoots and small fruits, also some invertebrates. Seeds and shoots include those of juniper, larch, spruce, pine, aspen and other poplars, willow, birch, alder, elm (*Ulmus*), maple (*Acer*), ash (*Fraxinus*), dogwood (*Cornus*), rose (*Rosa*), rowan (*Sorbus*), apple (*Malus*); berries include those of cherry (*Prunus*), blackberry and raspberry (*Rubus*), rose, crowberry (*Empetrum*), bearberry (*Arctostaphylos*), snowberry (*Symphoricarpos*), cranberry (*Viburnum*), bilberry (*Vaccinium*), mugwort (*Artemisia*); also grasses (Gramineae), oats (*Avena*), sedges (Cyperaceae), rushes (*Juncus*) and moss (Musci). Invertebrates taken include grasshoppers (Orthoptera), aphids (Aphidoidea) and other bugs (Hemiptera), Lepidopteran larvae, flies (Diptera), craneflies (Tipulidae), sawflies and ants (Hymenoptera), beetles (Coleoptera), spiders (Araneae), mites (Acari) and snails (Pulmonata). In parts of range (e.g. W USA) takes sunflower seeds (*Helianthus*) at feeders. Nestling diet mostly regurgitated seed pulp and insects. Forages at all levels in berry-bearing trees, bushes, low vegetation, and on the ground, where it walks and hops; stays hidden in foliage when disturbed, and often remains motionless for long periods between foraging bouts. Generally tame and confiding, also unobtrusive; flicks wings and tail when agitated. Skilful and agile when foraging along branches and thin twigs to reach outermost buds and shoots; uses hooked bill tip to assist in climbing among thin branches, and often stretches out from perch to grasp buds and needles of conifers; peels off and discards outer sticky scales of buds and cones and skin of berries, crushes seeds and consumes only pulp and soft core of buds and berries. Also makes short jumps or clumsy flight in pursuit of aerial insects. Forages singly and in pairs; in non-breeding season in small flocks, and in larger numbers during periodic irruptions; in Russia often in mixed flocks with *Loxia* and *Pyrrhula* species, and in W USA often in association with flocks of Bohemian Waxwing (*Bombycilla garrulus*).

Breeding. Season May–Jul; one brood. Monogamous. Solitary. Territory large, c. 400 m in diameter in North American studies, advertised by male singing loudly from tops of trees; frequently tolerates intrusion by conspecifics, and only core area of territory around nest and nesting female well defended. Pair formation takes place before break-up of winter flocks; arrives in breeding area and takes up territory early May. Displaying male in upright stance circles female, his plumage sleeked, head held high, breast feathers ruffled, wings held out from body and quivering and slightly drooped, tail slightly raised and partly fanned and occasionally flicked and body swayed from side to side; female responds in crouching position and mating follows; male also courtship-feeds female as part of display and through to chick-brooding stage. Nest built by female, a deep untidy or loose cup mostly of juniper, spruce, birch or pine twigs, occasionally with plant fibres, pine needles, grass, lichen filaments, moss, animal hair and feathers, placed 2–6 m from ground close to or against trunk of tree, occasionally up to 2 m from trunk on branch, usually in pine, spruce, juniper or birch, and usually well hidden in densest part of tree. Clutch 3–4 eggs, pale green-blue with pale violet-grey blotches and variable black or blackish-purple spots; incubation by female, period 13–14 days; chicks fed and cared for by both parents, nestling period 14–18 days; young dependent on parents for 21 days after leaving nest. Breeding success: in study in Finland, 89% of 55 eggs hatched and 39% of 23 clutches produced fledged young, 30% suffered predation at egg stage and 17% at nestling stage, main predators crows (Corvidae), in particular Siberian Jay (*Perisoreus infaustus*). First breeds in first year. Maximum recorded longevity 9 years 9 months.

Movements. Resident and partial migrant; occasionally irruptive. Scale of movements largely dependent on availability of food: in some years very few migrate or move only short distances (c. 100 km from breeding range); in other years, when food supply limited, makes longer movements within the range or slightly farther in late Sept–Oct, returning late Feb to mid-Mar. Nominate race moves S to S Scandinavia, Baltic countries and W European Russia, occasionally reaching Poland and Germany, and exceptionally farther W to C & W Europe and S to Switzerland. Irregular irruptions into S Scandinavia mostly of Russian breeders, occurring in small flocks of up to c. 50 individuals, more rarely in hundreds or thousands, between end Oct and early Dec, numbers dwindling through to early Mar; in 1956 influx of more than 10,000 into N & C Sweden, with very few in S or in Norway, and larger influx in 1976 more widespread throughout Scandinavia (16,400 flew W on single day in Stockholm region) and smaller numbers reaching Estonia and Poland. Annual in fluctuating numbers in St Petersburg region (NW Russia) and regular in small-scale invasions in Moscow area, mostly of birds from Urals; in NC Russia moves S, occasionally reaching Tomsk, W Siberia, NW & C Kazakhstan (and less frequently NE); in C & E Siberia largely sedentary, including in subalpine areas, but some may make short-distance movements, e.g. in S L Baikal area numbers increase at start of winter; farther E, a passage migrant in small numbers in Ussuriland, moving S to NE China and of Sea of Okhotsk coast; breeding birds on Sakhalin move to S part of the island and may cross Sea of Japan to W Honshu; in Kuril Is and N Japan moves to lower levels or reaches S to Honshu; generally scarce in winter in NE China. In America, the great majority migrate S from N breeding areas in Canada and Alaska; race *leucura* moves S to S Canada and extreme N USA (S to C Oregon, Minnesota, Wisconsin, N Ohio, Pennsylvania and Maryland); *flammula* moves S to Washington, Oregon and NW Idaho; *montana* winters from SE British Columbia S to SE Oregon, W Nebraska and SW New Mexico. Irruptive pattern similar to that in W Europe (except for sedentary birds in W mountains and coastal forests), at intervals of 5–25 years (but less frequent than in 19th century); most frequently recorded E of Rocky Mts and occasionally S as far as Texas. Erratic visitor or vagrant N to Northwest Territories (Canada) and Greenland and in S to Bermuda; throughout C & S Europe W to Britain, Denmark and Netherlands, S to Spain and Italy; in E of range vagrant in SC China (Sichuan), and race *kamtschatkensis* recorded as vagrant in Pribilof Is.

Status and Conservation. Not globally threatened. Common to locally common or seasonally common; uncommon to rare throughout most of American range. Estimated European breeding population between 36,000 and 60,000 pairs, most in Finnish Lapland; up to a further 100,000 pairs in Russia. Highest breeding densities in E Asian part of range, 23·5 pairs/km² in Kamchatka, with 7 pairs/km² in birch forest and 6·4 pairs/km² in alder forest; in N Finland, 0·4 pairs/km² in pine forest and 1·3–2·9 pairs/km² in uniform deciduous forest. Some contraction in range in C Finland in latter part of 20th century, possibly the result of large-scale deforestation, balanced by S expansion of range in Norway. In Alaska, significant expansion of range since mid-1980s into alder thickets up to 700 km beyond limit of trees.

Bibliography. Adkisson (1981, 1999), Arnaiz-Villena *et al.* (2001), Bent & Austin (1968), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), David & Gosselin (2002b), Dementiev *et al.* (1954, 1970), Drovetski *et al.* (2010), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Glutz von Blotzheim & Bauer (1997), Godfrey (1986), Grenquist (1947), Hagemeijer & Blair (1997), MacKinnon & Phillipps (2000), Malmberg (1949), Marten & Johnson (1986), McCarthy (2006), Meyer de Schauensee (1984), Naggatz (2009, 2010), Pulliainen (1974, 1979), Pyle *et al.* (1997), Ray (1912), Reigh (1981), Rogacheva (1992), Ryabitsev (2001), Sibley (2000), Small (1994), Snow & Perrins (1998), Stepanyan (2003), Svärdson (1957), Taylor (1979), Vaurie (1956a, 1959), Wassink & Oreel (2007).

Genus *HAEMATOSPIZA* Blyth, 1845

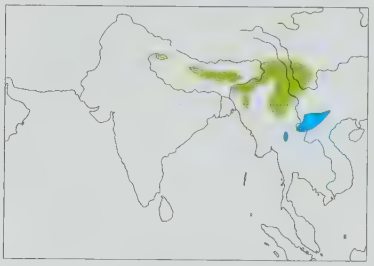
122. Scarlet Finch

Haematospiza sipahi

French: Cipaye écarlate **German**: Scharlachgimpel **Spanish**: Camachuelo Escarlata

Taxonomy. *Corythus sipahi* Hodgson, 1836, Nepal.
Monotypic.

Distribution. Uttarakhand, and C Nepal E to Bhutan and NE India (E Arunachal Pradesh, and Assam S to Meghalaya and Lushai Hills), S & SE China (SE Xizang and W & S Yunnan) and W & NE Myanmar; in winter also NW Thailand, N Laos and NW Vietnam (W Tonkin).



Descriptive notes. 18–19 cm; 38–42·5 g. Medium-sized to large, large-billed and thickset finch with short wings and tail. Male has entire head, upperparts and underparts bright scarlet, lower forehead and lores slightly dusky; tail black, outer feathers finely edged bright scarlet at bases; upperwing black with edged bright scarlet edging, fine on remiges, broadly on tertials, broad edges and tips of median and greater coverts also bright scarlet; undertail-coverts have broad blackish bases finely tipped red; iris deep brown, variable; upper mandible pinkish to crimson, tinged brown, lower mandible yellowish or pale buffish-horn; legs pinkish-brown. Female has forehead to crown and nape dull olive-yellow, mottled or barred darker olive to olive-brown; upperparts dull olive, tinged paler green or olive-yellow on mantle, all feathers with fine black shaft streaks and dull greenish-olive fringes, giving scaly look, rump bright yellow, uppertail-coverts olive with yellowish fringes; tail dark brown, outer feathers finely edged olive at bases; upperwing blackish with olive fringes, median and greater coverts edged olive and broadly tipped pale buff, flight-feathers edged brownish, tertials broadly fringed pale buff-brown; lores and cheek pale yellowish-buff, ear-coverts darker or olive, streaked buffish; underparts pale grey or whitish, heavily barred or mottled darker and with blackish streaks or chevrons; bare parts much as for male. Juvenile and first-winter female resemble adult female; first-summer male has warm rufous or light orange tinge on crown, throat and breast, orange rump patch and warm orange-buff edges of flight-feathers; subadult male brightest scarlet, fading with age, but may retain olive-yellow edges of flight-feathers. Voice. Song a clear and liquid, upslurred "par-ree-reeeeeee". Call a loud "too-eee", "pleeau" or "kwee-i-iu" and slightly longer "chew-we-auh".

Habitat. Breeds in open montane fir (*Abies*) and broadleaf forests, mainly along edges and clearings, at 1400–3550 m; to 3850 m in Sikkim after breeding. In non-breeding season occurs more widely in undergrowth and edges of bamboo and broadleaf forests, mainly in oak (*Quercus*); down to 600 m in Sikkim and 400 m in Bhutan.

Food and Feeding. Variety of seeds, buds, berries, and occasionally small insects. Plants exploited include raspberry (*Rubus idaeus*), roseleaf bramble (*Rubus rosifolius*), *Erythrina indica*, nettle (*Urtica*), *Polygonum*, several species of Euphorbiaceae, and elm (*Ulmus*). Forages high in trees, where often perches conspicuously at end of dead branch; also low down in bushes, shrubs and on ground. Singly, in pairs and in scattered flocks of up to 40 individuals; in non-breeding season often in single-sex flocks.

Breeding. Season May–Jul. Nest a large or bulky cup of twigs, plant fibres, roots and grasses, placed 7–12 m above ground in fork of tree. Clutch 4 eggs, blue with small reddish-brown blotches. No further information.

Movements. Not well known. Partial or altitudinal migrant. Moves between Nov and mid-May to lower levels in Nepal, Sikkim and in Bhutan, and more widely E to NE Myanmar; may initially move higher, to 3850 m in Sikkim, before making descent. Rare winter visitor, mostly above 1200 m, in NW Thailand; recorded mostly in winter months (but status uncertain) also in N Laos and W Tonkin.

Status and Conservation. Not globally threatened. Generally uncommon to scarce; fairly common in W & C parts of range. Precise extent of breeding range in Himalayas poorly known; may reach W in India to N Uttar Pradesh, where has been reported infrequently.

Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1959).

Genus *LOXIA* Linnaeus, 1758

123. Red Crossbill

Loxia curvirostra

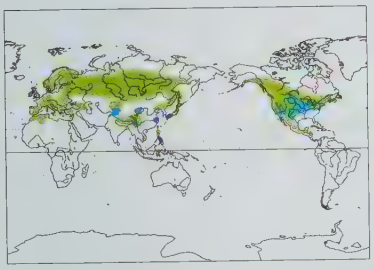
French: Bec-croisé des sapins **German**: Fichtenkreuzschnabel **Spanish**: Piquituerto Común
Other common names: Common Crossbill; South Hills Crossbill ("*L. sinesciuris*")

Taxonomy. *Loxia curvirostra* Linnaeus, 1758, Sweden.
Forms a species group with *L. scotica* and *L. pytyopsittacus*, and all have sometimes been considered conspecific. Taxonomy highly complicated and largely unresolved, requires much further study; recent genetic studies indicate limited differences between the three in Europe, indicating that they are not in total reproductive isolation, but extent of hybridization slight, and differences in bill size and in flight and excitement calls considered sufficient to restrict widespread interbreeding. Has apparently hybridized too with *Carduelis pinus*. In W Palearctic, geographical variation rather slight and clinal (nominate race becomes paler, brighter and larger from W to E, and within Europe brighter from N to S), and some races intergrade with others across wide areas, also considerable degree of individual variation; some races listed below possibly synonymous with more widespread ones, e.g. *guillemardi* perhaps better merged with nominate; further, several named races, e.g. *hispana* (described from near Murcia, in SE Spain), *mariae* (from Crimea), *vasvarii* (NW Turkey), *caucasia*

(Caucasus) and *ermaki* (N Altai), proposed on basis of very slight differences or show intermediate characters; conversely, some other populations possibly merit subspecific recognition. Situation in E Palearctic and S Asia not yet investigated. In North America, numerous attempts made to classify populations of this species N of Mexican border into discrete races, with distinct and non-overlapping breeding ranges; described races *reai* (from Idaho) and *vividior* (from Colorado) may merit recognition, but present position complicated by identification of eight discrete types of flight call (across USA and W Canada) allied to other distinctive vocal characteristics (detectable through sonagrams) and morphological differences (mainly bill size or shape, and plumage colour) which may form basis for reproductive isolation of these taxa variously considered "cryptic species" or "pseudospecies"; studies reveal that crossbills appear to preserve their identity through specialization on particular species of conifer; in 2009, a newly discovered form from Idaho was proposed as a species, "*L. sinesciuris*" (see page 447), on basis of small morphological and vocal differences developed largely because of absence of competition for pine (*Pinus*) cones from squirrels (Sciuridae). Similar work in W Europe identified six vocal types, with some degree of assortative breeding and considerable overlap in area; in more recent study in W Mediterranean, however, a further six vocal types were described, thus placing some doubt on taxonomic value of these types. Further research required, especially as multiple vocal types now known to exist within crossbill populations, and adaptation to respective resource may be more appropriate explanation. Race *pusilla* has sometimes been listed as "*percna*". Nineteen subspecies currently recognized.

Subspecies and Distribution.

L. c. curvirostra Linnaeus, 1758 – W, C & N Europe from British Is and Scandinavia E through Siberia to E Russia (N Amurland), S to N Spain, C Italy, Greece, Belarus, N Ukraine, N Kazakhstan, Sayan Mts and N Mongolia.
L. c. balearica (Homeyer, 1862) – C & S Spain and Balearic Is.
L. c. corsicana Tschusi, 1912 – Corsica.
L. c. poliogyna Whitaker, 1898 – NE Morocco, N Algeria and N Tunisia; also (possibly this race) S Italy and Sicily.
L. c. guillemardi Madarász, 1903 – E Balkans, Turkey, Cyprus, S Ukraine and Caucasus.
L. c. japonica Ridgway, 1884 – extreme SE Russia (Ussuriland), Sakhaklin I, S Kuril Is, N & C Japan (Hokkaido, N, C & W Honshu), NE & E China (Inner Mongolia and Heilongjiang S to Jiangsu) and N Korea; winters S to EC China (S Shaanxi E to Jiangsu) and S Japan.
L. c. altaiensis Sushkin, 1925 – NE Kazakhstan, S Russia (C & S Altai Mts, Sayan Mts, and Tuva) and W & N Mongolia.
L. c. tianschanica Laubmann, 1927 – SE Kazakhstan S to Tajikistan, and NW China (NW Xinjiang); winters to NW & N China.
L. c. himalayensis Blyth, 1845 – Himalayas from N India (Himachal Pradesh) E to Bhutan, S Tibetan Plateau (S & E Xizang) and S China (S Qinghai and Gansu S to NW Yunnan and W Sichuan); winters S to N Myanmar.
L. c. meridionalis Robinson & Kloss, 1919 – S Vietnam (S Annam).
L. c. luzoniensis Ogilvie-Grant, 1894 – N & W Luzon (Cordillera Mts and Zambales Mts), in N Philippines.
L. c. sitkensis Grinnell, 1909 – S & SE Alaska, coastal W Canada and W USA (S to NW California); winters S to S Canada and SW USA.
L. c. bendirei Ridgway, 1884 – SW Canada (S Yukon and C British Columbia E to SW Saskatchewan) and NW USA (S to Wyoming); winters S to S USA.
L. c. minor (C. L. Brehm, 1846) – SE Canada (Ontario E to Nova Scotia) and NE USA; winters S to EC USA.
L. c. pusilla Gloger, 1834 – E Canada (Newfoundland); winters S to NE USA.
L. c. benti Griscom, 1937 – C Rocky Mts, in WC USA.
L. c. grinnelli Griscom, 1937 – California and Nevada, in SW USA; occasionally winters S to Arizona and NW Mexico.
L. c. stricklandi Ridgway, 1885 – S USA (Arizona and New Mexico) S to S Mexico, possibly also Belize.
L. c. mesamericana Griscom, 1937 – Guatemala and Belize S to N Nicaragua.



Descriptive notes. 14–20 cm; 23–53 g. Medium-large finch with large head, plump body, short legs and short, forked tail; distinctive large broad-based bill with pointed mandibles crossed at tip (to right or left). Male nominate race has forehead to crown, nape and upperparts brick-red (variable, bright red to deep orange) with dusky-brown mottling, scapulars browner, washed variably orange-red to brick-red, rump bright pink or reddish-pink, uppertail-coverts brown, fringed reddish-brown; tail dark brown or blackish, finely edged reddish-brown; upperwing blackish or blackish-brown, median and greater coverts finely edged pinkish to reddish-brown, flight-feathers finely edged buffish to pink or reddish-brown in fresh plumage (exceptionally, white to pale buff or sandy tips on median and/or greater coverts, forming wingbars, also tertials tipped with same colour); lores to eye dusky, eyestripe and rear of ear-coverts grey to grey-brown, rest of face brick-red (sometimes a paler pinkish-red supercilium); throat and underparts almost entirely red or orange-red, mottled darker on breast and tinged greyish on flanks, centre of belly to undertail-coverts off-white or washed pinkish and with dark grey feather centres or tips; in worn plumage, head and upperparts brighter red, lacking dusky mottling, wing and tail more uniformly blackish, with fringes reduced or absent; iris dark brown or black; bill grey to greyish-horn, paler or yellowish cutting edges; legs brown or dark brown. Female lacks red in plumage; has bright olive-green to greenish-grey head and upperparts mottled or streaked darker on crown, face darker olive or tinged greyer except for poorly defined pale green supercilium, nape also paler green than crown; mantle and back with dusky feather bases and scapulars slightly darker olive-green, rump bright yellowish-green, uppertail-coverts the same with dark olive centres; tail and wing as on male, but finely edged dull greenish-olive (rarely, with whitish-buff tips on wing-coverts and edges of tertials); below, olive-yellow, sometimes tinged with green or with greyer feather bases visible, belly to undertail-coverts whitish with dusky spots and shaft streaks; in worn plumage, head and upperparts brighter green, rump and uppertail-coverts tinged golden or bronze-yellow, and underparts yellower with dusky-greyish streaks on throat; bare parts much as for male. Juvenile has forehead to nape and upperparts broadly streaked olive-brown or blackish and off-white to pale buff (juvenile male may have crown tipped olive), mantle and scapulars slightly darker, olive-green (male) or brown (female), rump yellowish or yellowish-green and narrowly streaked darker (or browner on male), uppertail-coverts dark brown, longest coverts fringed olive or olive-grey, tail and wing as on female but all wing-coverts finely tipped buff (may show narrow and diffuse or occasionally well-defined pale grey-green, whitish-yellow or off-white tips forming narrow wingbars), edges and tips of tertials buffish, tips of tail feathers more pointed than on adult, face grey-brown with fine dark streaks, rear ear-coverts often dark-barred, supercilium and small subocular spot pale buff, finely spotted darker, underparts off-white to buffish-yellow, heavily (except lower flanks and belly) streaked blackish-brown; first-winter and first-summer males variably greenish-yellow to yellowish-orange or orange-red, mottled darker, with grey-brown centres most prominent on head, upper mantle and breast to belly and flanks, retains juvenile wing (including outer coverts with narrow whitish tips) and tail (feathers with green to olive-green fringes), and some streaks on underparts, but edges and streaks usually lost by first summer (in worn plumage becomes brighter, bright orange to golden-yellow with tinges of yellow or orange-scarlet, with reduced dusky centres on body, and wing and tail feathers heavily worn or abraded); first-winter and first-summer females like adult female, but with buff tips of (mostly outer) greater coverts and slight streaks on upperparts and underparts, retains juvenile wing and tail feathers (green to olive-green fringes reduce with wear and become heavily abraded); adult plumage acquired in first complete moult in late second winter or second summer, when some individuals up to 18 months old. Races differ mainly in size, in bill size, and in intensity of adult plumage coloration and extent of red or green: *poliogyna* has slightly shorter and deeper-based bill and shorter wing than nominate, male predominantly orange to pinkish-red, mottled grey on head and upperparts, rump bright rose-pink, face and wing-coverts grey-brown, edges of remiges and tail feathers pale salmon-pink, female head and body grey (olive lacking or greatly reduced) and rump pale grey-green, underparts greyish with green tinge on breast; *balearica* is slightly smaller and smaller-billed, female paler and greyer than nominate (intermediates in C & S Spain slightly larger, and red areas on male and green of female deeper and more extensive); *corsicana* has bill larger (on average longer, deeper and broader) than nominate, male duller or slightly darker red than nominate, female greyer and less olive on crown, mantle and back, juvenile more broadly streaked; *guillemardi* is slightly larger, with bill slightly bigger, male has darker grey feather bases on head and body, upperparts slightly paler red, upperparts and underparts heavily tinged yellow or light orange, female crown and mantle dark grey and green more restricted; *himalayensis* is smaller than nominate, smaller-billed (but larger-billed in S Tibet and Sikkim) and slimmer, also darkest race, male dark cherry-red or brownish-red, female sooty grey with brown or olive tinge; *altaiensis* has thinner or more slender bill than nominate, otherwise similar but darker, male blood-red, especially upperparts and ear-coverts, female dark olive or grey-brown, with ear-coverts brown; *tianschanica* has bill like last, both sexes paler, male mostly yellow or greenish-yellow above and below (brown and red males very rare), female also more yellowish except for bright yellow rump; *japonica* has bill shorter and more slender than nominate, both sexes paler and brighter, male bright scarlet-red with less brown mottling on feather centres or bases, vent and undertail-coverts of both sexes usually white; *meridionalis* is large-billed, smaller than nominate, male head and body deep blood-red or rich scarlet, upperparts mottled or streaked darker, wings and tail uniformly dark brown; *luzoniensis* is like previous in size, male mostly dull dark pink or pinkish-red, crown, rump and uppertail-coverts brownish-red, throat to belly dull orange, rest of underparts white, blackish centres on undertail-coverts, female upperparts mostly greyish-brown, rump dull yellow, underparts brown-grey, tinged yellow; *sitkensis* is small, with stubby bill; *pusilla* is largest N American race, male darker than others; *minor* is smaller and paler than previous, with slender bill; *bendirei* is like last, but slightly larger, wing and bill longer, male brighter scarlet and grey tones darker; *benti* and *grinnelli* similar to previous or slightly smaller with bill medium-large, male red plumage variable but paler on average; *stricklandi* is slightly larger than other North American races (except *pusilla*) with large bill, male variable in reddish tones but averaging rather deep or less orange; *mesamericana* medium in size with stout bill, red male generally darker or duskier than other races. VOICE. Most frequent call hard high-pitched "chip" or "chip chip", given with varying emphasis as "jip jip", "dyip-dyip"or "glipp glip", may be sharp or sudden and explosive in delivery and occasionally given in prolonged series in excitable manner, especially when about to take flight, alarmed or surprised by a predator; contact note during foraging a soft "chip", "dyip" or "tip"; calls very similar to those of *L. scotica* and *L. pytyopsittacus*, but generally higher-pitched, though some overlap in timbre and pitch. (At least eight discrete types of flight call identified in North America, and at least twelve discrete types of call note in Europe.) Song, throughout year (mostly during pair formation and start of breeding), usually from top of tall tree, usually conifer, also in display-flight, a long and loud series of call notes running into "cheeree-cheeree-choop-chip-chip-chip-cheedlee-cheeree", sometimes interspersed with light twitter or trilling "tyi ti ti ti..." and a fluty musical warbling. Both sexes also have soft twittering subsong during feeding, a rising and falling excited trill, a loud "jee" and a rattling "zeeerrr", similar to some notes of *Carduelis chloris*, and often concluding with a series of soft "chip chip" call notes.

Habitat. Lowland to submontane conifer forests and woodlands. In Palearctic, N populations mostly in taiga forests of spruce (*Picea*) and S breeders (S Britain S to Mediterranean region) in pines (*Pinus*), including Scots pine (*Pinus sylvestris*), race *guillemardi* in black pine (*Pinus nigra*) and *corsicana* in cultivated subspecies *larico* of latter; also larch (*Larix*), cedar (*Cedrus*), also alder (*Alnus*) and birch (*Betula*), and in North America also in hemlock (*Tsuga*) and Douglas-fir (*Pseudotsuga*); in N Africa breeds mostly in Aleppo pine (*Pinus halepensis*), less commonly in maritime pine (*Pinus pinaster*), almond (*Prunus dulcis*), walnut (*Juglans*), poplar (*Populus*), hornbeam (*Carpinus*), beech (*Fagus*), oak (*Quercus*) and hazel (*Corylus*); in Himalayas mostly in high-altitude hemlocks, spruce, fir (*Abies*) and pine forests at 2400–4000 m. On passage and in non-breeding season occurs in pine and deciduous trees in coastal woodlands, parks and gardens, including in suburban areas and city centres, also exceptionally along tideline. In Palearctic occurs from sea-level to 4500 m, in N Africa breeds mostly at 600–2200 m, in Philippines above 1000 m, and in China to 3100 m in Tien Shan, and to 4200 m; in Colorado, USA, mainly above 3000 m, in Mexico breeds at 900–3500 m, 800–2700 m in Guatemala, and from sea-level to c. 900 m in Belize, Nicaragua and Honduras.

Food and Feeding. Mainly seeds, buds and shoots of trees and plants; also some insects and larvae, and other invertebrates. Seeds and buds include those of juniper (*Juniperus*), hemlock, fir, Douglas-fir, pine, larch, spruce, mainly Norway spruce (*Picea abies*), poplar, walnut, birch, alder, hornbeam, hazel, beech, oak, elm (*Ulmus*), mulberry (*Morus*), apple (*Malus*), plum (*Prunus*), maple (*Acer*), lime (*Tilia*), ash (*Fraxinus*), elder (*Sambucus*), hawthorn (*Crataegus*), rowan (*Sorbus*), bramble (*Rubus*), buckthorn (*Rhamnus*), sea-buckthorn (*Hippophae*), mistletoe (*Viscum*), sorrel and docks (*Rumex*), orache (*Atriplex*), yellow horned-poppy (*Glaucium*), campion (*Silene*), cabbage (*Brassica*), evening-primrose (*Oenothera*), ivy (*Hedera*), hogweed (*Heracleum*), heather (*Calluna*), bilberry (*Vaccinium*), crowberry (*Empetrum*), thrift (*Armeria*), plantain (*Plantago*), guelder-rose (*Viburnum*), honeysuckle (*Lonicera*), teasel (*Dipsacus*), daisy (*Bellis*), ragwort (*Senecio*), burdock (*Arctium*), thistles (*Carduus*, *Cirsium*), knapweed (*Centaurea*), goat's-beard (*Tragopogon*), sow-thistle (*Sonchus*), dandelion (*Taraxacum*), hawkbit (*Leontodon*), sunflower (*Helianthus*), sedges (Cyperaceae) including cottongrass (*Eriophorum*), grasses (Gramineae) and cereals, mostly oats (*Avena*) and wheat (*Triticum*). In NW Russia study average daily intake 2100 spruce seeds (average 5·9 g); in study in Germany took between 4000 and 5000 larch seeds daily, and in Pyrenees estimated daily food intake 5–9·5 g. Small invertebrates taken include aphids (Aphidoidea) and other bugs (Hemiptera), moths (Lepidoptera), flies (Diptera), beetles (Coleoptera), spiders (Araneae) and slugs (Pulmonata). Nestlings fed mainly with regurgitated conifer and pine seeds, occasionally with insect larvae. Forages actively, perching on or hanging upside-down from

cones (both green and ripe) to extract seeds; clambers among thin branches, using bill to grab branches or cones; also walks sideways to reach cone, hangs and stretches acrobatically from slender branch to reach cones. Also breaks off cone (frequently in larches and up to same size as the bird itself) by biting through stalk, and holds cone under foot or against underside of branch while extracting seeds; bill tips inserted between scales of cone and turned, and seed extracted with upper mandible or tongue. Large-billed individuals show apparent preference for mature Scots pine with rounded canopy and high densities of small cones; races *balearica* and *poliogyna* feed principally on seeds of Aleppo pine. Will feed also on fallen cones or seeds on ground, where it hops in ungainly manner; spruce seeds formed in green cones from late Jun and seeds dropped in following Apr–May, after which it switches to open pine cones in Apr–Jul. Seeds of berries usually crushed in base of bill. Insects taken from trees, branches or beneath bark or in rotting fruit, e.g. apples. Infrequently visits birdtables and feeders, where it takes fallen peanuts and sunflower seeds. Makes frequent journeys to drink at pools or puddles. Usually in pairs or small, loose groups in breeding season; in post-breeding period, on passage and in non-breeding season frequently in larger flocks of several hundred individuals, and during irruptions in thousands; mixes with *Carduelis spinus*, *L. pytyopsittacus* and, less frequently, *L. leucoptera*, in America also in flocks with Mountain Chickadee (*Poecile gambeli*) and Red-breasted Nuthatch (*Sitta canadensis*).

Breeding. Season determined largely by food abundance, in N & C Europe Aug–Apr/May but most in Jan–May (breeding recorded all months except Sept in Switzerland), in Scandinavia mid-Jan to mid-May, and in N Russia Feb to mid-May (occasionally Aug–Oct), Mar to early Nov in Cyprus and Dec–Jan in Philippines; will breed at any time of year in Indian Subcontinent, and in most months in North America; 2–4 broods, and may breed continuously for up to nine months; in years of reduction or failure of pine crop may not breed at all. Monogamous; pair bond lasts for only single breeding season. Solitary or loosely colonial. Territory used for nesting only; limits poorly defined, and only occasionally defended against conspecifics. Pair formation usually between late autumn and early spring within winter flocks. Display includes rising, circular song flight by pair, bill touching, "bill scissoring" and courtship feeding; in full display, male approaches female, his wings drooped, exposing rump, flanks ruffled, and sways body while calling "wheeoo". Sexual chases of female by male around or through trees, and courtship feeding of female by male from nest-site selection through to chick-brooding stage. Nest built by female, accompanied by male, mostly a deep cup of conifer twigs, bark or rotting wood strips, plant fibres, grass, moss, lichens, animal hair and feathers, placed 3–35 m above ground, usually beneath outermost foliage close to crown of tall conifer, usually close to trunk in spruce or along branch of pine. Clutch 3–4 eggs (exceptionally up to 6), creamy or bluish-white, sparsely marked with fine dark purple specks, spots or scrawls; incubation by female, period 14–16 days; chicks fed and cared for by both parents, nestlings period 20–25 days; young fed by parents for up to 6 weeks after fledging, apparently also beg from parents when fully independent and able to feed themselves. Breeding success variable, depends largely on food supply for young, weather, and overnight temperatures during autumn/winter nesting; nest failures also recorded as due to lack of brooding of eggs or young overnight when temperatures below freezing; in Netherlands study 1975–1980 average success of 52 pairs between 2·6 and 3·2 fledged young per successful pair, in 1984 only 18% of 156 pairs successful owing to late start of breeding in Apr and early exhaustion of conifer seeds (causing desertion of eggs and young); average success in NW Russia 2·9 young per nest, in N Italy 3·3 per successful nest, in N Scotland 38% of eggs result in flying young, and in Colorado (USA) 76% of 33 eggs hatched and 33% of young fledged (1 fledged young per nest overall); main predators crows (Corvidae) and squirrels (*Sciurus*), in Russia mainly Siberian Jay (*Perisoreus infaustus*); in Germany, and doubtless elsewhere, early nests more successful owing to lower activity rate of main predators Eurasian red squirrel (*Sciurus vulgaris*) and Eurasian Jay (*Garrulus glandarius*). First breeds in first year, including in autumn of year in which hatched in spring and when both partners in juvenile plumage. Maximum recorded longevity 7 years, in captivity 8 years.

Movements. Resident and partial migrant, also frequently irruptive and nomadic in non-breeding season. Island races sedentary. Diurnal migrant, flocks passing along lines of hills or mountain ridges, also along coasts and at headlands, e.g. crossing North Sea to reach E coast of Britain. S breeding populations largely sedentary or disperse short distances to new foraging areas; scale of movement and numbers involved usually determined by availability of food within range. In W Palearctic nominate race periodically irruptive (irregular cycle of 1–11 years, total of 78 irruptions between 1800 and 2000), making mass movement in years when poor spruce and pine crop coincides with high population level and then moving farther from Scandinavia and Russia between W and S through Baltic into C & S Europe and E to Kazakhstan in search of food; in such years passage through British Is (variably into Scotland from irruption in Scandinavia or farther S along E & S coast of England by birds originating farther E in N Russia) and France in summer, mostly Jun–Aug or mid-Sept, and reaching S Spain and Mediterranean, and exceptionally N to Greenland, Iceland (fairly regularly in irruptions and has bred) and Faeroes, and W & S to Madeira and NW Africa (E to Tunisia), in irruption years numerous between May and Sept (following breeding) in wintering areas, e.g. between 500,000 and 1,500,000 birds (including local population) in Scotland in winter 1990–1991 following irruption, and frequently remains to breed in Dec–Feb; return movements NE to within normal range gradual during following year (mostly from Mar onwards), when juveniles accompany adults; moving between N and E. Evidence from ringing indicates that individuals breed in localities up to 2950 km from their natal sites and at widely separated localities (up to 3170 km) in subsequent years, and not all irruptions originate from same region. Recoveries of ringed birds from Germany show wide scatter of movements to E, C & S Europe, including more than 2340 km SW to Spain, but significant number in Russia (including movements exceeding 2000 km and up to 3780 km) to 62° E in W Siberia. In C Turkey and Cyprus, where local breeders largely resident, becomes more numerous in autumn and winter, especially in irruption years; in Israel fairly scarce or rare, but occasionally present in irruption years, and some remaining to breed for up to four years following initial arrival. Race *tianschanica* largely sedentary, but makes local altitudinal movements to foothills, when occurs on outskirts of Almaty in winter; *himalayensis* mostly sedentary or descends to lower levels (to 1500 m) in mid-winter, but scale and duration of movements not well known, reaches S Yunnan and N Myanmar, and occurs throughout year in Bhutan (most numerous Apr–Sept, but in varying abundance, and population apparently irruptive on three-year cycle). In E of range nominate race winters S to N China (Qinghai) and breeders in N China move E sporadically to Hebei and Liaoning; *japonica* winters in C & E China and Korea (irregularly Nov–Mar), and in Japan occasional or uncommon in winter to Hokkaido and N Honshu, more frequent farther S both on passage and in winter. Movements in North America similarly erratic and irruptive, frequently abundant as breeding species in some years followed by years of absence, also frequently occurs beyond usual range; most movements coincide with shortage or failure of pine and larch crops, most irruptions May–Jun or between late Aug and Oct, return movements N in late winter or early spring; race *pusilla* wanders in winter S to Nova Scotia and W to Ontario, Wisconsin and Illinois, exceptionally as far W as Minnesota or S along Atlantic coast to E USA (occasionally reaching Virginia and Georgia), *minor* occurs W in winter (and possibly occasionally breeds) to Saskatchewan and Manitoba, also winters to S or SE and reaches Georgia and N Florida, race *benderi* winters from SE Alaska S to Baja California and Guadeloupe Is (where may have bred) and E to W Texas and Kansas; *bentzi* disperses widely W to Oregon, S to S California and SE Texas, E to Michigan and N to North Dakota, irregularly reaching Saskatchewan; *grinnelli* winters occasionally to coastal California, SE Arizona and NW Mexico; race *sitkensis* winters throughout C & S Canada E to New Brunswick and NE USA, reaching Virginia and South Carolina.

Status and Conservation. Not globally threatened. Common to locally common, erratically or occasionally irruptive and abundant; some populations apparently cyclic in abundance; uncommon to rare in Belize and Guatemala. Estimated European breeding population between 1,000,000 and 1,600,000 pairs, most of which are in Scandinavia, and a further 1,000,000 pairs in Russia and 10,000 pairs in Turkey. Densities of up to 400 pairs/km² in spruce plantation in St Petersburg area of NW Russia, and up to 100 pairs/km² in spruce–larch forest in S Belgium. In Britain, Netherlands and Scandinavia population has increased since middle of 20th century as a result of abundance and diversity of planted conifers, with highest numbers present in years following irruptions. Race *poliogyna* is an uncommon resident in Morocco, where prior to 1950s was restricted to E, but subsequently expanded range and now more widespread. Forest fragmentation has caused decline in abundance in Finland, mostly because of overall shortening of rotation times resulting in reduction of average age of forests. Elsewhere, in Canada and USA, increased logging of old-growth habitats may depress populations, because conifers produce their largest cone crops after about 60 years of age. Putative decline of crossbills in NE USA after logging of old-growth forests not confirmed, but decreases expected where deforestation is rapid, as in Pacific Northwest. Precipitous decline in New York and N New England (and probably elsewhere) after about 1910 due to logging. Some recovery of former abundance noted in Nova Scotia. Population of Newfoundland, formerly common, with a recent estimated population of 500–1500 individuals has declined markedly and steadily over the last 50 years, possibly because of competition for cone crops from introduced American red squirrels (*Tamiasciurus hudsonicus*) and accelerated logging of old-growth woods; listed as "Endangered" in Canada in 2004. Intraspecific ecological diversity underscores need for protection of large tracts of mature forests representing each of the known or proposed key conifers. This protection could be achieved by increasing rotation times, and setting aside core tracts of old-growth forest. This policy might best be applied throughout as much as possible of species' range, as its wanderings can carry it over extremely large areas.

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124. Scottish Crossbill

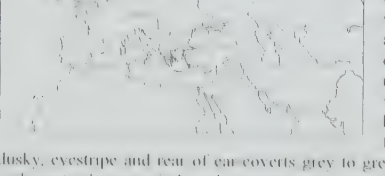
Loxia scotica

French: Bec-croisé d'Ecosse. **German**: Schottlandkreuzschnabel. **Spanish**: Piquituerto Escocés.

Taxonomy. *Loxia curvirostra scotica* E. J. O. Hartert, 1904, East Ross-shire, Scotland.

Forms a species group with *L. curvirostra* and *L. pytyopsittacus*, and all have sometimes been considered conspecific. Present species almost identical to *L. curvirostra* in wing, tail, bill and tarsus measurements, and overlaps in wing and bill measurements with *L. pytyopsittacus*; intermediate between those two species in bill shape (a feeding adaptation), and feeding behaviour (and excitement call) apparently sufficient partly to isolate it from *L. curvirostra*, no hybridization known in slight overlap in breeding ranges; recently found to hybridize with *L. pytyopsittacus*, and genetic evidence reveals limited differences between the three species in Europe, indicating that they are not in total reproductive isolation. Studies of breeding (of captive and wild populations) reveal assortative mating principally on basis of bill size and flight and excitement calls, but extent of hybridization not fully known and differences, although slight, are sufficient to restrict widespread interbreeding; further research required. Monotypic.

Distribution. N & NE Scotland.



Descriptive notes. 16–17 cm; 36–49 g. Medium-large, short-legged and short-tailed finch with distinctive crossed mandibles; all plumages extremely similar to corresponding ones of *L. curvirostra* and *L. pytyopsittacus*. Male has forehead to crown, nape and upperparts bright brick-red (with brown feather centres when worn), scapulars browner, washed variably orange-red to brick-red, rump bright reddish-pink, uppertail-coverts brown, fringed reddish-brown; tail dark brown or blackish, finely edged reddish-brown; upperwings blackish or blackish-brown, coverts and flight-feathers finely edged reddish-brown; lores dusky, eyestripe and rear of ear-coverts grey to grey-brown, rest of face like crown; throat and underparts almost entirely red or orange-red, tinged greyish on flanks; undertail-coverts whitish, tipped browner and washed pinkish; iris dark brown or black; bill grey to greyish-horn, paler yellowish cutting edges; legs brown or dark brown. Differs from *L. curvirostra* in slightly larger size, larger head (appearing neckless) with bill on average larger, deeper and more blunt-shaped, and slightly longer wing and tail; probably not always separable in field from *L. pytyopsittacus*, which is extremely similar in size, shape and plumage, apart from by vocal features (including sonograms). Female has olive-green head and upperparts, mottled or indistinctly streaked darker on crown, face olive green or tinged greyer, nape paler or lighter green than crown; mantle and back with dusky feather bases, scapulars slightly darker olive-green, rump pale olive or yellowish-green, uppertail-coverts the same and with dark olive centres; tail and wing as on male, but finely edged dull olive green; throat and underparts olive-yellow, sometimes with green or grey feather bases on side of breast and flanks, belly to undertail-coverts white or whitish with dark central shaft streaks, bare parts much as for male. Juvenile has forehead to nape and upperparts pale green

or olive-green, streaked darker, mantle and scapulars slightly darker, olive-green (male) or brown (female), rump yellowish or yellowish-green, streaked darker (or browner on male), uppertail-coverts dark brown, fringed olive, tail and wing as adult female but all coverts tipped buff, edges and tips of tertials buffish or yellowish-buff, dull buffish-yellow below, heavily (except lower flanks and belly) streaked blackish-brown; first-winter and first-summer males variably greenish-yellow to orange-red, retains juvenile wing and tail and also some streaks on underparts, these streaks usually lost by first summer; first-winter and first-summer females like adult female, but with buff tips of wing-coverts and streaked upperparts and underparts; adult male plumage acquired in late second winter or second summer. Voice. Call and song very similar to those of *L. curvirostra*, but with slight variation, both higher and lower, in tone and pitch. Song by male from high perch (frequently uses songposts) and in flight, a series of short phrases, "tiup rrreee priooo", often includes several "chip" notes developed into short melody of repeated phrases, may also be preceded by short rattling "schweerr schweerr"; also soft or subdued subsong by both sexes, "tip-tip-tip-toohee-toohee-tip-tip-too-hee-quik-quik", sometimes interspersed with slightly louder "choop" or "toop" notes. Most frequent call a sharp and loud "jip jip", variably as "chip" or "dyip" with variable emphasis, but especially louder when excited, alarmed or about to take flight; also a deeper "toop" or "choop" similar to that of *L. curvirostra* but lower-pitched; contact note between feeding birds a soft or whispered "tip"; excitement calls similar to those of both *L. curvirostra* and *L. pytyopsittacus*, but sonagrams reveal differences in structure.

Habitat. Breeds in lowland forests and stands of Scots pine (*Pinus sylvestris*), including open mature plantations and ancient relict forest trees. In winter mainly in larches (*Larix*) and in established plantations of lodgepole pine (*Pinus contorta*) and sitka spruce (*Picea sitchensis*) and well-spaced pine woodland with heather (*Calluna*) understorey.

Food and Feeding. Mostly seeds of Scots pine (bill shape intermediate between those of *L. curvirostra* and *L. pytyopsittacus*, apparently better adapted for feeding on cones of this species); when these unavailable, takes seeds, blossom, buds and shoots of larch (*Larix*), spruce (*Picea*), fir (*Abies*), Douglas-fir (*Pseudotsuga*) and beech (*Fagus*). Possibly also small invertebrates, including flies (Diptera). Nestling diet regurgitated pine seeds and possibly some insect larvae. Forages in pine trees, usually towards crown in outermost branches; occasionally on ground. Clings to cones, also twists cone from branch and takes to separate perch for opening; extracts seeds in same manner as *L. curvirostra*, by inserting bill tips between scales of cone and turning bill, using upper mandible or tongue to retrieve seed. Searches branches, lichens and bark of trees for invertebrates. Makes frequent visits to water, including at puddles, ditches and peat-runnels, to drink. In pairs and in small flocks of up to 20 individuals; may feed in close association with, but not known to join, flocks of *L. curvirostra*, which occasionally occur within range on passage.

Breeding. Season late Jan/Feb–Jun; one or two broods, depending on availability of food. Monogamous, rarely polygamous; pair-bond endures for length of brood (not proven to last for second broods). Solitary or loosely colonial. Territory used for courtship, defence of nest and female, also some feeding, but poorly understood and boundaries apparently not well defined; groups of associated nesting males may also defend small foraging areas. Pair formation takes place within wintering flocks. Displaying birds face each other on perch, wings held away from sides, bills touch and link together, heads swaying from side to side or back and forth; other displays include male in rapid pursuit of female through treetops, male approaching female in moth-like circular flight with rapid, shallow, flicking wingbeats, also female soliciting from male in crouched position, giving "chittering" call, with tail raised and wings slightly drooped and shivering; mate-guarding by male (while female feeding) and courtship feeding from start of pair formation through to incubation stage. Nest built by female, occasionally accompanied or helped by male, a large bulky cup of twigs (mostly pine, larch or birch), heather, grass, plant fibres, bark strips, moss, lichens, animal hair, leaves and feathers, placed 6–8 m above ground in upper level of old Scots pine, usually high in crown or at end of spreading branch, very occasionally in spruce, larch or Douglas-fir, occasionally close to trunk. Clutch 3–4 eggs, creamy to pale bluish or greenish-white with red or blackish-red spots and scrawls; incubation by female, period 13–15 days; chicks fed and cared for by both parents, nestling period 17–25 days; young fed by adults (including adults other than parents) for up to 8 weeks after fledging and until mandibles fully crossed. Success rate in single study fairly high: of 152 eggs in 41 nests, 75·6% hatched and 46·6% of young fledged young, average of 1·7 young per nest; main predator Eurasian red squirrel (*Sciurus vulgaris*). Probably first breeds in first year, but failure rate high among first-time breeders, especially those in immature plumage.

Movements. Resident and locally dispersive. In non-breeding season moves short distances (less than 20 km) within Scottish Highlands to find new feeding areas, returning to nesting area in Feb–Mar. Very rare outside restricted breeding range; non-irruptive as principal food source, Scots pine, has regular annual cone crop.

Status and Conservation. Not globally threatened. Restricted-range species: present in Caledonian Pine Forest Secondary Area. Uncommon and local; more or less confined to E Highlands, with important core areas of population in Deeside, Strathspey and NW of the Great Glen. Total breeding population estimated in 1970s at c. 1500 adults (a figure which may have included some peripheral *L. curvirostra*) and in 1980s put at 300–400 pairs; more recent estimate of 300–1300 pairs based on recalculation of survey data from 1975. Population considered to have grown during 20th century as a result of increase in extent of large-scale conifer plantations, but further detailed survey required in order to determine an accurate population estimate. Over the last 5000 years, suitable semi-natural habitat has declined from c. 15,000 km² to fragments totalling 160 km²; amount of plantation woodland, however, has increased substantially during 20th century.

Bibliography. Anon. (2009i), Arnaiz-Villena *et al.* (2001), Butchart & Stattersfield (2004), Callahan (2010), Clement *et al.* (1993), Cramp & Perrins (1994), Forrester & Andrews (2007), Hagemeijer & Blair (1997), Jardine (2002), Knox (1975, 1976, 1990a, 1990b, 1990c), Marquiss & Rae (2002), Münch (2003), Nethersole-Thompson (1975), Piertney *et al.* (2001), Robb (2000), Snow & Perrins (1998), Summers (1999, 2002), Summers & Piertney (2003), Summers, Dawson & Phillips (2007), Summers, Jardine & Dawson (2003), Summers, Jardine, Marquiss & Rae (2002), Thom (1986), Voous (1978), Wernham *et al.* (2002).

125. Parrot Crossbill

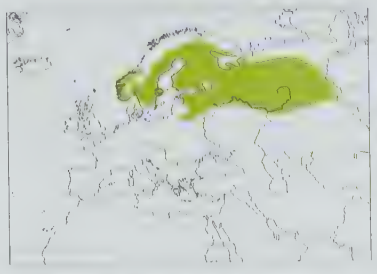
Loxia pytyopsittacus

French: Bec-croisé perroquet **German**: Kiefernkreuzschnabel **Spanish**: Piquituerto Lorito

Taxonomy. *Loxia pytyopsittacus* Borkhausen, 1793, Sweden.

Forms a species group with *L. curvirostra* and *L. scotica*, and all have sometimes been considered conspecific. Has hybridized with former, and recently found to hybridize with *L. scotica*. Recent genetic studies indicate limited differences between the three in Europe, indicating that they are not in total reproductive isolation, but extent of hybridization very slight, and differences in bill size and in flight and excitement calls considered sufficient to restrict widespread interbreeding; further research required. Monotypic.

Distribution. NE Scotland, Fennoscandia, Estonia and N Latvia S to E Lithuania and extreme E Poland, E to SW Siberia (R Irtysh).



Descriptive notes. 17–18 cm; 44–69 g. Medium-large, large-headed and bull-necked, short-legged and short-tailed finch with distinctive crossed mandibles. Male has forehead to crown, nape and side of neck deep brick-red (variably flecked or tinged darker), upperparts like crown or mottled darker crimson, scapulars the same or slightly browner, fringed deep orange-red to brick-red, rump bright pink or reddish-pink, uppertail-coverts brown, fringed darker reddish-brown; tail dark brown or blackish, finely edged reddish-brown; upperwing dark olive-brown, median coverts narrowly fringed rufous-brown, greater coverts and secondaries fringed olive-brown or tinged pinkish (reddish-brown in fresh plumage), primary coverts finely edged reddish-brown; lores dusky, cheek and ear-coverts same as crown, eyestripe to rear of ear-coverts grey to grey-brown; throat and underparts almost entirely dark red, sometimes tinged olive on side of breast and orange or greyish on flanks, undertail-coverts whitish, finely streaked darker; in worn plumage, hindneck and side of neck brown or grey-brown, mantle reddish-brown, broader greyish eyestripe, brighter red underparts mottled with grey to grey-brown feather bases; iris dark brown or black; bill grey to greyish-horn, paler cutting edges; legs brown or dark brown. Distinguished from *L. curvirostra* by larger size, larger head, larger or deeper (almost square-shaped in profile) blunt-tipped bill with bulging edge of lower mandible, thicker neck and vocal characters; from *L. scotica* with great difficulty, mainly by slightly larger size and thicker-necked appearance, usually more square bill shape with more bulging lower mandible, but much overlap in measurements and characters, and best separated by vocal differences. Female lacks red in plumage; has greenish olive-grey head and upperparts, mantle and back with dusky feather bases, scapulars slightly darker olive-green, rump pale olive or yellowish-green, uppertail-coverts the same with dark olive centres; tail and wing as on male, but finely edged dull olive; underparts yellowish to dull olive-yellow, sometimes tinged with green or grey on side of breast and flanks, belly to undertail-coverts whitish with grey central shaft streaks; bare parts much as for male. Juvenile has forehead to nape and upperparts dark olive-green to grey-green, streaked darker, mantle to scapulars slightly darker or greyer, tinged olive-green, with darker centres, rump yellowish or yellowish-green, streaked darker, uppertail-coverts dark brown, fringed olive, tail and wings as on adult male, but wing-coverts narrowly fringed pale grey-green or yellowish (variable in extent, may be broadest on inners or present only on outers), buffish when worn, tips of tertials buff or yellowish-buff, face same as crown or slightly greyer, usually darkest on ear-coverts, pale or dull buffish-grey below, heavily (except on belly) streaked blackish-brown, broad darker streaks on undertail-coverts; first-winter and first-summer males variably greenish-yellow to orange-red, some streaks on underparts in first winter (usually lost by first summer), retains juvenile wing and tail feathers; first-winter and first-summer females like adult female, except for buff tips of greater coverts (from retained juvenile feathers) and streaked upperparts and underparts; adult male plumage acquired in late second winter or second summer. Voice. Calls extremely similar to those of *L. curvirostra*, differ only in variations in timbre, pitch and strength, generally louder, deeper in tone and more metallic than those of latter (but differences often slight, and overlap occurs); most frequent call "choop choop", "chok chok" or "clop clop", lower than more distinct "chip chip" or "dyip" or "djip" of *L. curvirostra*, also a soft "gop" contact note by foraging birds in trees; alarm a loud "gop" at approach of predator, also rapid, stuttering "tsu-tsu-tsu-tsu" and hard "cherk cherk"; nestlings and recently fledged juveniles have sharp "tee-tu, tii" or "chii". Song, throughout year from prominent perch at top of tree or in song flight, also by birds in flock and on passage, very similar to call notes and includes "chit", "tlip" and "tchoo-ee", usually in longer series of slow notes run together, "chit, chit, chit-chit-chit tcho-ee tcho-ee" or "p-te-che p-te-che p-te-che" and slightly faster "chee-ler chee-ler", and sometimes followed by long series of "chip" notes.

Habitat. Lowland pine forests and woodlands, principally tall, mature and open woodlands of Scots pine (*Pinus sylvestris*), occasionally in mixed conifer forests with larch (*Larix*), spruce (*Picea*) and rowan (*Sorbus*); also in coastal shelter-belts and introduced conifer plantations, usually of large-coned species. On passage and in wintering areas may occur more widely in mixed conifer and deciduous woodlands.

Food and Feeding. Diet includes seeds, buds, shoots, mostly of pines (particularly Scots pine) and spruce, also larch, poplar (*Populus*), alder (*Alnus*), thrift (*Armeria*), crowberry (*Empetrum*), bilberry (*Vaccinium*), rowan, thistle (*Cirsium*), and cereals including oats (*Avena*). Also small numbers of insects and larvae, including beetles (Coleoptera), sawfly larvae (Symphyta) and bugs (Hemiptera), including scale insects (Coccoidea). Nestling diet mostly regurgitated conifer seeds. In study in Murmansk region of NW Russia, average daily intake of adult was 2450 spruce seeds, and over nesting period 105,000 seeds fed to brood; in SW Sweden study, estimated 70,000–80,000 seeds fed to brood during nesting period. Forages mostly at middle to upper level of pines and occasionally deciduous trees; on passage or during irruptions may feed on ground, including along tideline. Agile and acrobatic, clambering between branches of conifers and on cones, also breaks off cones and holds in one foot while seeds extracted with large bill; spends up to 1 minute in extracting seeds from cones, both open and green; also bites through twigs supporting cones and carries cones to branch. Foraging behaviour similar to that of *L. curvirostra*. Frequently makes short visits to drink at pools and puddles. Forages singly, in pairs and in small family groups, males in summer also gather in small to medium-sized flocks; in non-breeding season in larger flocks, and particularly in irruption years in mixed-species flocks with *L. curvirostra*.

Breeding. Season Dec to late Jun, laying mostly mid-Mar to mid-Apr, timing determined largely by availability of pine seeds; two broods. Probably monogamous. Solitary and loosely colonial. Territory small and used for mating, nest and defence of female; may also defend separate feeding territory. Pair formation usually takes place before break-up of winter flocks. Male performs butterfly-like song flight, with tail spread in arc, between trees, chases female rapidly through trees, ending with copulation; also courtship-feeding of female by male during nest-building through to incubation. Nest built by female, mostly of dry conifer twigs, bark strips, pine needles, grass, leaves, moss, lichens, plant fibres and down and animal hair or fur, occasionally also some feathers, usually placed close to trunk, on branch or in fork up to 20 m above ground in conifer at woodland edge (rarely in dense forest). Clutch 3–4 eggs, yellowish-white to pale bluish-green, blotched or finely speckled or spotted rusty or purple-brown; incubation by female, period 14–16 days; chicks fed and cared for by both parents, nestling period 21–23 days; young fed by parents for up to 6 weeks after fledging, until mandibles fully crossed. In study of six nests at Murmansk (NW Russia), 15 of 24 nestlings fledged, average 2·5 young per nest. Breeds in first year.

Movements. Resident, migratory and occasionally irruptive. Most movements local and of short distance to new foraging areas, usually within breeding range or slightly S & W, scale and distance largely influenced by availability of pines producing regular seed crop (fluctuating less cyclically than spruce, the main food source of *L. curvirostra*); as a consequence irruptive movements irregular, less frequent or less extensive, but small numbers within movements of *L. curvirostra* may be

overlooked more regularly than records indicate. Post-breeding dispersal by family groups mostly Jul–Aug, either locally or short distance within breeding range, and groups occur S or SW of breeding areas from mid-Sept, with main onward passage Oct–Nov; return from wintering area begins mid-Feb, peak passage Mar, and most back in breeding area early Apr. In irruption years occurs W to Kola Peninsula, in NW Russia (within breeding range), and SW to NC Europe (27 irruption years during 1800–1965, but none in same years as irruptions into NW Russia), and SW of breeding range W to Britain, SW Germany and E France; in recent years significant irruptions in 1982 and 1990, and failure of pine cone crop in N Norway and movements of this species through Sweden suggest that those involved in 1982 irruption originated largely in N Scandinavia; small numbers sometimes remain to breed in invasion areas. Passage through Denmark, distributed either in E or in W, annual in small numbers and often with larger movements of *L. curvirostra*, reaching more than 1000 individuals in irruption years; numbers reaching Germany usually fewer than 100, mostly in irruption years. Irrupting flocks arrive in Britain from late Sept onwards, peak often in Nov, and may be reinforced by later arrivals in early Jan on broad front across North Sea; flocks reported along E coast N to Shetland, with subsequent movements inland to better feeding areas. Rare, or possibly overlooked, S to Ukraine, Belgium, France and Italy.

Status and Conservation. Not globally threatened. Locally common in NW of range; scarce or rare elsewhere. European breeding population between 56,000 and 190,000 pairs, most in Scandinavia, and at least a further 10,000 pairs in NW Russia. Breeding density highest in areas of good cone crop, up to 5 pairs/km² of mature pine forest and 1·8 pairs/km² in fragmented forest; on Kola Peninsula 0·5–2 pairs/km² in mixed forest. Following large-scale irruptions, small numbers (few pairs) occasionally remain to breed in invasion areas, e.g. Denmark in 1983, C Netherlands in 1983 and 1984, and single pair in E England in 1984 and 1985 (at last site the birds moved only short distance in intervening winter); has also bred Germany and Baltic coast of N Poland. In Scotland, found to be nesting between 1995 and at least 2001 in Abernethy Forest (also recorded more widely between Inverness-shire and Aberdeenshire), in range of *L. scotica* and *L. curvirostra*, and in 2002 population estimated at 30–100 pairs; origins of this population unknown, and may date from previous large-scale irruption into Britain in 1990, or possibly present from an earlier date but previously overlooked. Population in Fennoscandia considered to have declined towards end of 20th century; this due largely to commercial removal of mature pine trees, which affected amount and distribution of conifer seed.

Bibliography. Arnaiz-Villena *et al.* (2001), Benkman (1993a), Bradshaw (1991), Callahan (2010), Catley & Hursthouse (1985), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Flint *et al.* (1984), Forrester & Andrews (2007), Glutz von Blotzheim & Bauer (1997), Groth (1993b), Hagemeijer & Blair (1997), Knox (1975, 1986), Marquiss & Rae (2002), Millington & Harrap (1991), Münch (2003), Nethersole-Thompson (1975), Olsson (1964), Piertney *et al.* (2001), Pulliainen (1972), Robb (2000), Ryabitsev (2001), Snow & Perrins (1998), Stepanyan (2003), Summers (1999, 2002, 2006), Summers & Piertney (2003), Summers *et al.* (2002), Svensson (1991), Thom (1986), Vaurie (1956a, 1959), Wernham *et al.* (2002).

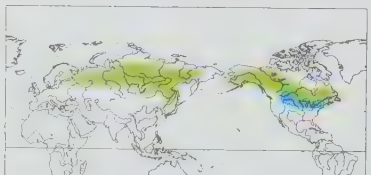
126. Two-barred Crossbill

Loxia leucoptera

French: Bec-croisé bifascié **German**: Bindenkreuzschnabel **Spanish**: Piquituerto Aliblanco
Other common names: White-winged Crossbill

Taxonomy. *Loxia leucoptera* J. F. Gmelin, 1789, Hudson Bay, Canada, and New York, USA.
Previously treated as conspecific with *L. megaplaga*, but differs in plumage details; recent genetic analysis indicates that the two are better treated as separate species. Two subspecies recognized.

Subspecies and Distribution.
L. l. bifasciata (C. L. Brehm, 1827) – E Finland, NW & N Russia (Kola Peninsula E in broad band through Siberia to Sea of Okhotsk, S to C Urals, L Baikal area, Yablonovy Mts and W Amurland), probably also extreme NE China (N Heilongjiang); winters also S to NE Europe (irregular), NE China (Liaoning & Hebei) and S Siberia.
L. l. leucoptera J. F. Gmelin, 1789 – Alaska and C & S Canada E to C & E Quebec, Newfoundland and Nova Scotia, S in USA to N Washington, N Wisconsin and S Maine; in winter also S to S Minnesota, N Ohio, Pennsylvania and Massachusetts.



Descriptive notes. 14·5–17 cm; 25–40 g. Medium-large, short-legged and fork-tailed finch with broad white wingbars and distinctive crossed mandibles. Male nominate race has forehead to crown and nape bright pink to rose-red, sometimes a narrow band of grey across hindneck or upper mantle, and blackish feather centres (more extensive when worn) on forehead and hindneck; upperparts same as crown, with darker bases and fringed bright pink, scapulars black or blackish-brown, washed pink, lower back and rump bright pink, uppertail-coverts black, fringed whitish and tipped pink or whitish-pink; tail black, feathers finely edged whitish on inner webs and pinkish on outers; upperwing black, median and greater coverts tipped white (broadly on inners), alula and primary coverts finely edged pink (visible in fresh plumage), flight-feathers finely fringed white or pinkish-white, tertials broadly tipped white; lores dusky, broken eyering off-white to pinkish, cheek and chin dusky, finely tipped pink, rest of face same as crown, but with dark grey eyestripe and rear edge of ear-coverts; throat and underparts almost entirely red or bright reddish-pink, tinged grey on side of breast and flanks, side of belly indistinctly streaked or lined, dusky feather bases on flanks; vent to undertail-coverts whitish, sometimes tinged pink, with black feather centres.; iris dark brown or black; bill black or blackish-brown, pale horn or yellowish cutting edges; legs brown. Female has greenish-yellow to olive-grey head and upperparts, slightly paler indistinct supercilium extending narrowly onto side of neck; nape also paler or greenish-yellow, mantle and back with broad dusky feather bases, and scapulars blackish, fringed olive-green; rump and uppertail-coverts pale yellowish-green, tail-coverts with broad dark olive centres; tail and wing as on male, but tail finely edged pale greenish-yellow or olive-green, white tips of wing-coverts not always so extensive, tips of tertials white, remiges tipped pale yellow or light olive (in worn plumage often reduced or abraded); lores and eyestripe dusky, cheek and ear-coverts greyish-olive, throat and underparts greenish-yellow to pale olive-yellow, sometimes tinged greyish on side of indistinctly dark-streaked breast and flanks, lower belly to undertail-coverts pale yellowish or buffish with grey central shaft streaks; bare parts much as for male. Juvenile and first-winter are like female, but paler on forehead to nape and upperparts heavily streaked darker brown, rump paler green, streaked dusky, uppertail-coverts blackish-brown, fringed buffish-white, tips of wing-coverts white or yellowish-white, flight feathers finely edged yellowish or paler, short and narrow indistinct pale buffish supercilium, face also buffish or duller and finely streaked darker brown, heaviest on rear ear-coverts, pale off-white or dull buffish-grey below, heavily streaked blackish-brown, paler or whitish and finely streaked darker on undertail-coverts; first-summer male more similar to adult male, variably bright pink or pinkish-red, tipped yellow, greenish-yellow or brownish, in fresh plumage head and body orange-red (duller than adult) and rump light pink, retains wing and tail feathers from juvenile plumage; first-summer female greyer and less greenish-yellow on head and body than adult, rump duller yellow, in worn plumage may lack white tips on greater coverts and tertials and pale fringes on rectrices. Race *bifasciata* is slightly larger and slightly thicker-billed than nominate, male mantle and back more uniformly pink or pinkish-red, lacking broad dark or dusky feather bases on head, upperparts and flanks. Voice. Song, usually from treetop or in display-flight, in North America a long, rapid series of rich and varied high-pitched chattering notes, buzzing trills, harsh rattles, slurred "whee whee whee" whistles or musical notes, chirps and some of the call notes; in Sweden and Finland (possibly also Russia) rich and more varied, containing clear metallic and slurred whistles together with chattering and wheezing notes, and interspersed with some of the call notes (more similar to that of *L. curvirostra*). Main call similar to that of *L. curvirostra* but generally weaker and higher or softer and less metallic or ringing, "glip-glip", "kip-kip" or "chiff-chiff", also "toop" and a higher-pitched "choo-ee" or "tu teee"; also a loud trumpet-like "meep" or "tveeht", either singly or repeated in series of up to five; also a soft chatter or twittering "chut-chut" or "chuch-chuch" like similar note of *Carduelis cabaret* or *Carduelis flammea*, usually for contact between partners or in feeding flocks; usually calls when taking flight.

Habitat. Inhabits dense conifer forests and plantations, mainly larch and larch–pine (*Larix–Pinus*) forests, in C Siberia predominantly with Siberian pine (*Pinus sibirica*); also fir (*Abies*) and spruce (*Picea*), and occasionally resorts to deciduous trees in absence of preferred conifers. In E Russia mainly found in larches, and in Scandinavia and NW Russia mostly in spruce. In North America mainly in tamarack (*Larix laricina*), eastern hemlock (*Tsuga canadensis*) and white spruce (*Picea glauca*).

Food and Feeding. Mostly conifer seeds, buds, berries and shoots, mainly of larch and spruce, also pine, and birch (*Betula*), alder (*Alnus*) and rowan (*Sorbus*); also seeds of smaller plants, including knotgrass (*Polygonum*), thrift (*Armeria*), crowberry (*Empetrum*), sunflower (*Helianthus*) and grass seeds (Gramineae). Also takes variety of invertebrates and larvae, including bugs and aphids (Hemiptera), flies (Diptera), moths (Lepidoptera) and spiders (Araneae); in North America recorded as feeding on small snails (Gastropoda) along tideline. Nestling diet mainly regurgitated conifer seeds. In NW Russia consumed average of 1540 spruce seeds per day in winter and spring, the slowest rate of all three *Loxia* species present; in American study, average consumption of seeds 1·3 times greater when in flocks than when foraging alone. Forages in conifers, also in some deciduous trees, bushes, shrubs in low vegetation, and occasionally on ground. Actions like those of other crossbills, but more usually extracts seeds while perched on cone attached to branch, as thinner bill more adapted to taking seeds from shorter cone scales; in North America recorded as collecting seeds from sweetgum (*Liquidambar*) while hanging upside-down, and holds fruit with foot in manner similar to that of *Carduelis tristis* (behaviour possibly learnt from latter species). Forages alone, in pairs and in small to medium-sized flocks; occurs in flocks throughout year, and males often gather in foraging flocks, including in breeding season, later joined by females and fledged young. In non-breeding season in N of range gathers in larger flocks of 50–300 individuals, or in slightly larger numbers in N America, often with other finches, including *L. curvirostra*, *Carduelis flammea*, *Carduelis pinus*, *Hesperiphona vespertina* and *Pinicola enucleator*.

Breeding. Season Feb to mid-May or Jun–Aug in Europe and Russia, Jan–Aug in North America, timing largely determined by availability of seed crop; probably two broods in years of plentiful seed. Monogamous, possibly sometimes polygamous (males outnumber females); duration of pair-bond not known, possibly endures into wintering area. Colonial, up to 15 pairs together. Territory used for defence of nest and female, songpost may also be within territory; all foraging outside territory. Pair formation takes place during winter flocks. Male performs slow-motion song flight on circular course; display includes also mate-guarding by male, sexual chases of female by male low through trees, bill-touching and courtship-feeding; in pre-copulation flight male ascends with rapidly beating wings over female. Nest built by female, mostly of conifer twigs, plant stalks, grass stems, lichens, moss, plant fibres and down, animal hair or fur and feathers, placed 2–20 m above ground against trunk of conifer, usually spruce, occasionally at end of branch. Clutch 3–4 eggs, pale whitish-blue to whitish-green, finely spotted or speckled blackish; incubation by female, period 14–15 days; chicks fed and cared for by both parents, nestling period 22–24 days; young independent at up to 6 weeks after fledging. Breeding success poorly known: in Murmansk (NW Russia) study of 12 eggs laid, only four hatched and none survived; in second study, single nest hatched and all four young fledged; main nest predators Siberian Jay (*Perisoreus infaustus*), squirrels (*Sciurus*) and humans.

Movements. Resident, migratory and irruptively nomadic. Occasionally present throughout entire winter N to Yamal Peninsula, in NW Siberia; in most years makes only local or short-distance movements to new feeding areas; larger-scale or longer-distance movements to beyond breeding area triggered by high population levels and poor availability of food, and often in association with similar movements of *L. curvirostra*. Those from N parts of breeding range in Europe and Asia wander S & W to winter mainly within breeding range, or slightly beyond into C & S Finland and Sweden; periodically larger numbers move between S and SW during late Jul to Dec to winter (depending on scale and intensity of movement) from S Scandinavia, Baltic countries and SW Russia throughout much of Europe, exceptionally W to Britain, Netherlands, France, Switzerland, N Italy and Hungary; in Norway large numbers or invasions occur every seven years, and some evidence of linkage to shortage of food supply farther E to Urals (where larch cone crop has seven-year cycle of peaks, with poor crop in following year); possibly regular or annual also in N & E Finland; return N to breeding areas from late Jan to Apr/May. Movements in E Asian part of range less well known, but makes similar movements S into C Siberia (often with flocks of *L. curvirostra*), possibly scarce visitor to Altai Mts, vagrant in S Kazakhstan; in NE China breeds in N Heilongjiang and moves locally, sometimes S to Liaoning and Hebei. In North America sometimes occurs S or SW beyond usual wintering area into most of N USA S to Colorado, Kentucky, Kansas and North Carolina; exceptionally or irregularly S to Oregon, California, S Utah and New Mexico. Rare or irregular vagrant in Bermuda, Greenland, Faeroes; also vagrant in Korea and Japan (Hokkaido and Honshu).

Status and Conservation. Not globally threatened. Common to locally abundant. Estimated European breeding population between 1000 and 10,000 pairs, and up to a further 100,000 pairs in Russia. In SE Russia the most numerous passerine in Chita region (N of NW Mongolia), including flocks of up to 200 juveniles in autumn and winter. Breeding densities of 5–20 birds/km² of mixed Siberian taiga, with most in dense riverine forest, and 0–9·2 birds/km² of larch taiga forest NE of L Baikal. Following invasions, exceptionally remains to breed in N Norway and Sweden; after 1990–1991 irruption into C Europe, one pair remained to breed in Berlin, in Germany, c. 1700 km SW of normal breeding range. Population of c. 500 pairs in E Finland may be dependent on recruitment of individuals from winter movements or irruptions; following 1987 irruption into N Finland, this became the third most numerous breeding species in spruce forests, whereas in earlier and subsequent years it was either extremely rare or absent. No population figures for North America, but

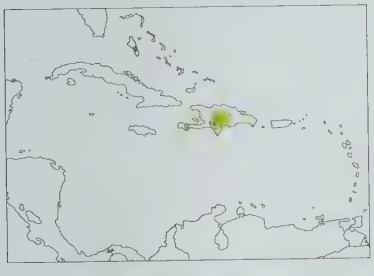
numbers there fluctuate widely in tandem with cone crop; in some years extremely abundant locally, and in others more or less absent in same areas.
Bibliography. Arnaiz-Villena *et al.* (2001), Benkman (1987a, 1987b, 1988, 1989a, 1992), Bent & Austin (1968), Bock & Lepthien (1976b), Brooks & Lunk (1942), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Elmberg (1993), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Génard & Lescourret (1987), Godfrey (1986), Griscom (1937), Groth (1992), Hagemeijer & Blair (1997), Herremans (1982, 1988), Lee Woo-Shin *et al.* (2000), MacKinnon & Phillipps (2000), McCarthy (2006), Meyer de Schauensee (1984), Münch (2003), Newton (1970), Pulliainen (1971, 1972), Rogacheva (1992), Ryabitsev (2001), Sibley (2000), Snow & Perrins (1998), Stepanyan (2003), Vaurie (1959).

127. **Hispaniolan Crossbill**

Loxia megaplaga

French: Bec-croisé d'Hispaniola **Spanish**: Piquituerto de la Española
German: Hispaniolakreuzschnabel

Taxonomy. *Loxia megaplaga* Riley, 1916, El Río, Santo Domingo, Dominican Republic.
Previously considered conspecific with *L. leucoptera*, but differs in plumage details; recent genetic analysis indicates that the two are better treated as separate species. Monotypic.
Distribution. Mountains of Hispaniola.



Descriptive notes. 15–16 cm; 26·7–30·4 g. Medium-sized, short-legged finch with broad white wingbars, large crossed mandibles and forked tail. Male has forehead to crown and upperparts pinkish-red to deep orange, scapulars fringed brownish, lower back and rump bright pink, uppertail-coverts brown or dark brown, tipped pink or whitish-pink; tail dark brown, finely edged whitish on inner webs and pinkish on outers; upperwing blackish-brown, median and greater coverts tipped white (more broadly on medians), alula and primary coverts finely edged pink (visible when fresh), flight feathers finely fringed white or pinkish-white, tertials tipped whitish; lores and face dusky brown, tinged or finely tipped pinkish-red; underparts almost entirely reddish overlying paler brown or buffish-brown feather bases, tinged grey on side of breast and flanks; vent to undertail-coverts buffish or tinged pink; iris dark brown to black; bill black or blackish-brown, pale horn or yellowish cutting edges; legs brown. Female is greenish-yellow to olive-grey on head to nape and upperparts, mantle, back and scapulars olive-green with broad dusky bases, rump pale yellowish-green, uppertail-coverts the same but with broad dark olive centres; tail and wing as for male, but tail finely edged pale greenish-yellow or olive-green, tips of wing-coverts not always broadly white, tips of tertials variably pale yellow to light olive (in worn plumage often reduced or abraded); underparts greenish-yellow to pale olive-yellow, often tinged greyish and streaked darker on breast and flanks, lower belly to undertail-coverts pale yellowish or buffish with grey central shaft streaks; bare parts much as for male. Juvenile and first-winter have head and upperparts heavily streaked dark brown, rump whitish or pale yellow, finely streaked dusky, uppertail-coverts blackish-brown, fringed buffish-white, tail and wing as on adult female, but tips of coverts white or yellowish-white, edges of tertials narrowly whitish, flight-feathers finely edged yellowish or paler, sometimes has narrow indistinct pale buffish supercilium, face also buffish or duller and finely streaked darker brown, streaks heaviest on rear ear-coverts, underparts off-white or whitish-buff, heavily streaked blackish-brown, paler or whitish and finely streaked darker on undertail-coverts. Voice. Calls include high-pitched series of strident "chu-chu-chu-chu" notes, frequently noisy when in flocks. Song not well known; appears to include a series of soft whistled warbling notes.
Habitat. Montane pine forests, principally of Hispaniolan pine (*Pinus occidentalis*), also open areas of scattered pines among deciduous trees and scrub. Usually at 1500–2600 m; down to 540 m in non-breeding season.
Food and Feeding. Diet not well studied. Apparently closely tied to Hispaniolan pine, seeds of which it extracts from cones, utilizing large bill. Forages at all levels of pine trees, also spends long periods quiet and inactive. Makes frequent visits to water to drink. In pairs, family groups and large flocks, including flocks of adult females and immatures.
Breeding. Season Dec–Apr. Nest a deep compact cup of twigs, plant fibres, roots, moss, lichens, bark strips, grass, animal hair and feathers, placed 2–20 m above ground along branch of pine, usually in area of dense pines. Clutch 2–5 eggs, white or greenish-white, blotched and finely spotted with brown and purple. Nests parasitized by Shiny Cowbird (*Molothrus bonariensis*). No other information.
Movements. Resident and locally nomadic; wanders in search of feeding areas. Vagrant in Jamaica, where at least three individuals present for several months from Dec 1970.
Status and Conservation. ENDANGERED. Restricted-range species: present in Hispaniola EBA. Uncommon to locally common or scarce. Has a tiny and fragmented global range extent of which is still diminishing. Current total population estimated at 600–3375 individuals, great majority of these in Sierra de Bahoruco, in Dominican Republic. In Dominican Republic restricted to Cordillera Central and Sierra de Bahoruco; in Haiti confined to the Massif de la Selle and Massif de la Hotte, and recorded also in La Visite National Park. Possibly now extirpated in Haiti. Population declined between 1920 and 1980 owing to habitat loss, but some later recovery apparent; surviving habitat remains under threat from logging, mostly small-scale destruction for agriculture, and further fragmentation. Occurs in both Armando Bermudez National Park and Sierra de Bahoruco National Park, both in Dominican Republic, but no active protection provided and widespread forest clearance for agriculture along border with Haiti has continued unregulated; estimated that, at current rate of uncontrolled burning of forest, all suitable Hispaniolan pine habitat for this species will have been destroyed within 100–150 years.
Bibliography. Anon. (2009i), Arnaiz-Villena *et al.* (2001), Benkman (1989b, 1994), Bond (1979), Butchart & Stattersfield (2004), Clement *et al.* (1993), Dávalos & Brooks (2001), Dod (1978, 1992), Groth (1993a), Keith *et al.* (2003), Kepler *et al.* (1975), Latta, Rimmer *et al.* (2006), Latta, Sondreal & Brown (2000), Latta, Sondreal & Mejia (2002), Münch (2003), Ottenwalder (1992a), Parchman *et al.* (2007), Raffaele *et al.* (1998), Rimmer *et al.* (2003), Smith, P.W. (1997), Stattersfield & Capper (2000), Woods & Ottenwalder (1986).



PLATE 46

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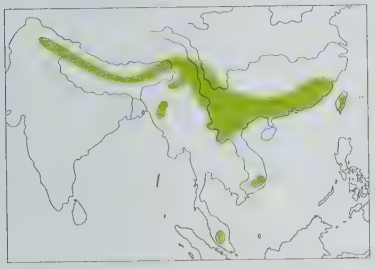
Genus *PYRRHULA* Brisson, 1760

128. Brown Bullfinch

Pyrrhula nipalensis

French: Bouvreuil brun **German**: Schuppenkopfgimpel **Spanish**: Camachuelo Pardo

Taxonomy. *Pyrrhula nipalensis* Hodgson, 1836, central and northern Nepal. Race *ricketti* scarcely separable from nominate and perhaps better subsumed within it. Five subspecies recognized.
Subspecies and Distribution.
P. n. nipalensis Hodgson, 1836 – Himalayas from Himachal Pradesh E to NE India (to S Assam) and SW China (SE Xizang).
P. n. ricketti La Touche, 1905 – NE India (Arunachal Pradesh, SE Assam and Nagaland), S & SE China (E Xizang to W Sichuan, and NW Yunnan E to Fujian and Guangdong), N Myanmar and NW Vietnam (W Tonkin).
P. n. uchidai Nagamichi Kuroda, 1916 – Taiwan.
P. n. victoriae Rippon, 1906 – W Myanmar (Chin Hills).
P. n. waterstradti E. J. O. Hartert, 1902 – mountains of Peninsular Malaysia (Selangor E to Pahang).
Present also in SC Vietnam (S Annam), race undescribed.



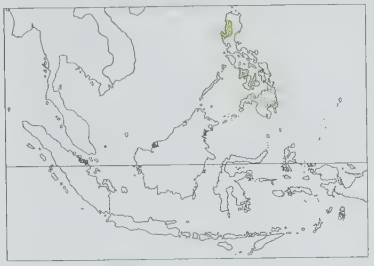
Descriptive notes. 16–17 cm; 18–29 g. Medium-sized to large, blunt-billed bullfinch with long and slightly notched tail. Male nominate race has lower forehead, lores and line around base of bill black, thin white or whitish-buff subocular streak; crown to nape and side of neck pale grey, blackish feather tips on forehead and crown; upperparts slightly darker grey, band of blackish-purple across upper rump, band of white across lower rump; uppertail-coverts and tail glossed blackish-blue, tail fringed velvety black; upperwing black, median coverts broadly tipped deep bluish-purple, outer greater coverts the same, inner greater coverts (and tips of outer two or three) greyish-buff (forming pale patch on closed wing), rest of wing feathers edged glossy purple, more glossy deep blue on tips of secondaries and broadly on fringes of lower tertials, outer edge of upper tertial pinkish or reddish-pink (not always visible in field); face and underparts pale grey, palest on belly to lower flanks and undertail-coverts; iris brown; bill grey or greenish-grey, tip darker; legs pinkish-brown or dark greyish-pink. Female is very like male, but outer edge of upper tertial whitish or yellow or concolorous with rest of feather. Juvenile resembles adult, but more buff-brown on crown and duller grey, tinged buff, on upperparts, with edges of uppertail-coverts and tips of greater coverts warm buff-brown, wing and tail glossy purple-blue, ear-coverts, throat and breast to flanks also buffish-brown. Races differ mainly in colour of crown, mantle and back and presence or extent of white below eye: *ricketti* is very like nominate, but upperparts perhaps darker, crown broadly barred or scaled dark brown and buffish, and white subocular spot or streak smaller, weakly indicated or lacking; *uchidai* is also like nominate, but shafts of central tail feathers white, belly more extensively whitish; *victoriae* is greyer than others, with forehead to lores and upper cheek black, crown faintly barred, and more prominent white streak on lower cheek; *waterstradti* has forehead and crown grey, finely barred or scaled blackish, lores, upper cheek and chin black, lower cheek and ear-coverts white, inner greater coverts pale buffish-brown, tertials and tail deeper glossy blue, upper tertial edged glossy red (pale yellow on female), vent whitish; undescribed race in SC Vietnam has mostly white or whitish head. Voice. Song, usually from cover or within top of tree canopy, a repeated soft and mellow "pi-puee", "u'iih pi-huu" or "her-dee-a-duuee", in Myanmar a slower "ip-pr'ipi-piru" and in SC Vietnam a faster "ip'ipi-you". Calls include soft "veh" and deeper or harder "tyerrlip" in flight, also a mellow "per-lee" similar to that given by *P. erythrocephala* but more melodic; also a soft whistling twitter during foraging.
Habitat. In most of range inhabits undergrowth in dense fir (*Abies*) and deciduous forests, including oaks (*Quercus*), also ericaceous forest and rhododendrons (*Rhododendron*), breeding generally at 1600–3700 m, in Myanmar lower, 1200–2100 m; in non-breeding season in similar habitat at lower levels, in Indian Subcontinent at 1800–3050 m or exceptionally down to 1400 m. Taiwan race *uchidai* resident at 1300–2400 m. In Peninsular Malaysia (*waterstradti*) resident above 1500 m in native *Dacrydium* and introduced conifers.
Food and Feeding. Mostly various seeds, blossom, buds and berries of trees (including conifers) and bushes; also nectar from rhododendron flowers. Forages in bushes and at all levels in trees, rarely on the ground; usually tame and approachable. In pairs and in small flocks of up to six individuals; in non-breeding season occurs in slightly larger flocks of up to 20.
Breeding. Season Feb to mid-Jul. Nest built by both partners, a neat open cup of vine tendrils, creeper stems, leaves and moss, placed 2–15 m above ground on branch of tree, usually conifer. Clutch 2 eggs, pale blue, sparsely spotted with black. No further information.
Movements. Resident and partial altitudinal migrant. Part of population moves short distances in non-breeding season, descending to lower levels; in C Nepal occurs around edges of Kathmandu Valley.
Status and Conservation. Not globally threatened. Locally common to uncommon in Himalayas. Locally fairly common in China. Scarce to uncommon in N & W Myanmar, N & SC Vietnam and Peninsular Malaysia.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Jeyarajasingam & Pearson (1999), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1949, 1956b, 1959), Wells, D.R. (2007).

129. White-cheeked Bullfinch

Pyrrhula leucogenis

French: Bouvreuil des Philippines **Spanish**: Camachuelo Filipino
German: Weißwangengimpel
Other common names: Philippine Bullfinch

Taxonomy. *Pyrrhula leucogenis* Ogilvie-Grant, 1895, mountains of Lepanto, northern Luzon, Philippines.
Two proposed races from Mindanao, *coriaria* (described from Mt Kitanglad) and *apo* (from Mt Apo), both synonymized with *steerei*. Birds of this species on Panay, in WC Philippines, of uncertain race, but possibly belong with nominate. Species name sometimes spelt "*leucogenys*", but this is an unjustified emendation. Two subspecies recognized.
Subspecies and Distribution.
P. l. leucogenis Ogilvie-Grant, 1895 – Cordillera Mts and Zambales Mts, in N Luzon (N Philippines).
P. l. steerei Mearns, 1909 – Mt Malindang, Mt Kitanglad, Mt Hilong-Hilong, Mt Apo and Mt Mayo, in Mindanao (S Philippines).
Present also, race uncertain, on Panay, in WC Philippines.



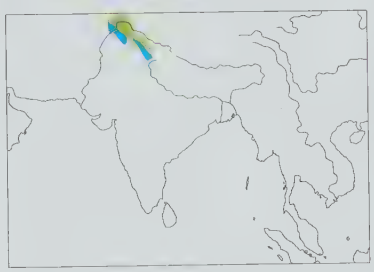
Descriptive notes. 15–16·5 cm; one male 19 g. Medium-sized, blunt-billed dark bullfinch with pale cheek and slightly notched tail. Male nominate race has forehead, lores, chin and centre of throat black, crown to nape glossy bluish-black, side of neck and upperparts rich brown, upper rump blackish, lower rump white, uppertail-coverts dark bluish-black; tail black, glossed bluish or purplish; median upperwing-coverts rich brown (like back), greater coverts black, inner feathers broadly tipped light buff-brown, progressively moving to outers mostly black with buffish-brown tips; flight-feathers black, glossed bluish on secondaries and tertials, outer edge of upper tertial orange-red to deep crimson; lower cheek and ear-coverts white or yellowish-white; lower throat and breast to belly deep buff-brown or gingery brown, undertail-coverts warm rufous-brown; iris grey-brown; bill grey or yellowish, darker cutting edges and tip; legs brown or pinkish-horn. Female is duller than male, face more buffish-white, and with outer edge of upper tertial pale brownish-orange. Juvenile is similar to adult, but base of bill to forehead and around eye blackish, crown and nape grey-brown, rump pale buff-brown, tips of inner greater coverts pale buff-brown, outer edge of upper tertial duller or pale sandy buff, face buffish-white, underparts dull buff-brown, bill paler than adult, lower mandible yellowish-horn. Race *steerei* is slightly smaller than nominate, bill smaller and blackish, with horn-coloured base of lower mandible, and tends to have whiter belly. Voice. Fairly vocal and conspicuous. Calls include ringing "pee yuu", also longer and louder, musical "chuck-a peeee yuuuu" with upward inflection on third syllable and falling on last, repeated at regular intervals; also a harsh metallic and insect-like "zrrreeep".
Habitat. Montane moist oak (*Quercus*) and mossy forests and forest edges on hillsides and valleys; at 1250 m to 1750 m.
Food and Feeding. Diet little known; recorded as eating small berries in fruiting trees, young fruits of *Viburnum glaberrimum*, also tiny flowers and buds of *Dendrocnide densiflora*. Forages in canopy and understorey. Singly, in pairs and in small family groups; forms slightly larger groups, often in mixed-species flocks, in non-breeding season.
Breeding. Birds in breeding condition Mar–Apr. No other information.
Movements. Partial altitudinal migrant; in non-breeding season moves to lower levels.
Status and Conservation. Not globally threatened. Restricted-range species: present in Luzon EBA and Mindanao and the Eastern Visayas EBA. Scarce, uncommon or locally common.
Bibliography. Arnaiz-Villena *et al.* (2001), Clement *et al.* (1993), Dickinson *et al.* (1991), Kennedy *et al.* (2000), Marcozzi (2002), Mearns (1909), Ottaviani (2008), Rand & Rabor (1960), Ripley & Rabor (1961).

130. Orange Bullfinch

Pyrrhula aurantiaca

French: Bouvreuil orangé **German**: Goldrückengimpel **Spanish**: Camachuelo Anaranjado

Taxonomy. *Pyrrhula aurantiaca* Gould, 1858, Kashmir.
Monotypic.
Distribution. N Pakistan (Chitral and Gilgit) E to N Kashmir, in NW Himalayas; in winter also NW India (Himachal Pradesh).



Descriptive notes. 14 cm; 17–22 g. Relatively small bullfinch with short, curved bill and slightly notched tail. Male has forehead to lores, cheek and chin black, forecrown to nape and upperparts rich deep orange, rump and uppertail-coverts white, longest coverts velvety black; tail glossy blue-black; upperwing black, median coverts greyish, broadly fringed pale orange, greater coverts edged bluish-black and broadly (on inners) tipped whitish-orange (forming broad panel on closed wing), primaries black, alula, primary coverts, secondaries and tertials glossy bluish-black, outer web of upper tertial orange; face and underparts pale to deep orange, vent to undertail-coverts white; iris dark brown; bill bluish-black; legs dark brown or dark pinkish-brown. Female has forehead and lores to behind eye and to chin black; crown to upper mantle and side of neck pale grey, rest of upperparts buffish-brown; rump, uppertail-coverts, tail and upperwing as on male, but median coverts grey, tipped buffish or yellowish-buff, greater coverts broadly tipped pale buffish-yellow; underparts browner than on male, warm brown with orange tinge, paler or buffish on flanks, and vent to undertail-coverts white; bare parts much as for male. Juvenile is like female, but head and face buffish-brown or tawny-buff, chin and throat brown, underparts paler or duller brown than on adult, belly to undertail-coverts white or yellowish; first-summer male deeper orange above and below. Voice. Song a loud "tew" followed by a rapidly repeated metallic trisyllabic "tyatlinka-tlinka"; also has soft and warbled subsong usually introduced with soft "tew-tew" notes followed by rising and falling "chip, cheep, chu-chweea" or "chu-chi-chip-chu-chee-ah" phrases, repeated with variation in sequences, and sometimes interspersed with rapid drawn-out "t-r-r-r-t-t-t"

On following pages: 131. Red-headed Bullfinch (*Pyrrhula erythrocephala*); 132. Grey-headed Bullfinch (*Pyrrhula erythaca*); 133. Azores Bullfinch (*Pyrrhula murina*); 134. Eurasian Bullfinch (*Pyrrhula pyrrhula*); 135. Hawfinch (*Coccothraustes coccothraustes*).

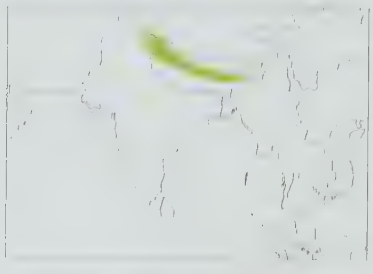
and metallic trang and falling warbled notes. Call a soft and clear, low-pitched "tew"; flight call an upwardly inflected whistle, "tewtya", or disyllabic "tew-tew".
Habitat. Lower montane and submontane fir (*Abies*) and pine (*Pinus*) forests or mixed fir and birch (*Betula*) forest, in N Pakistan favouring blue pine (*Pinus wallichiana*); at 2400–3500 m. In non-breeding season found on forested slopes at slightly lower levels, 1550–2330 m.
Food and Feeding. Mostly hard-shelled seeds, buds, berries and shoots of trees and larger herbaceous shrubs, including buds and catkins of birch, willow (*Salix*) and cherry (*Prunus*). Forages mostly on the ground, in snow-covered areas often at base of trees and shrubs; flocks often fly up into tall trees at intervals, before returning to same patch of ground. Tame, but also wary or quiet and unobtrusive, and spends long periods sitting motionless in bushes or low down in trees. Recorded as taking beakfuls of yellow clay. Forages singly and in pairs; in non-breeding season in flocks of up to 15 individuals.
Breeding. Season late May to early Aug, probably two broods. Pairs form from break-up of winter flocks, by early May. Nest built by female, a cup of plant fibres, roots and grass with some animal hair, on platform of twigs, placed up to 2 m above ground and well concealed on horizontal branch of fir. Clutch 3–4 eggs, white with dark reddish brown blotches; incubation by female, fed on nest by male, period up to c. 14 days; chicks fed and cared for by both parents; nestling period 12–16 days.
Movements. Partial altitudinal migrant. Descends to lower levels and moves slightly S of breeding range in non-breeding season, mostly between late Jan (following first heavy snowfalls) and late Apr.
Status and Conservation. Not globally threatened. Restricted-range species: present in Western Himalayas EBA. Common to very common, scarce and local in N Pakistan. Rare vagrant in Himachal Pradesh.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Clement *et al.* (1993), Gaston (1995), Grimmett *et al.* (1998), Rap *et al.* (1999), Rasmussen & Anderton (2005a, 2005b), Roberts (1992).

131. Red-headed Bullfinch

Pyrrhula erythrocephala

French: Bouvreuil à tête rouge **German**: Rotkopfgimpel **Spanish**: Camachuelo Cabecirrojo

Taxonomy. *Pyrrhula erythrocephala* Vigors, 1832, Simla Almora district, north-west India.
Monotypic.
Distribution. Himalayas from SE Kashmir E to Bhutan, NE India (E to W Arunachal Pradesh) and SW China (SE Xizang).



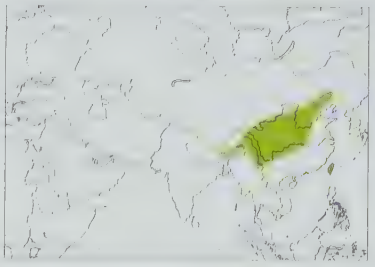
Descriptive notes. 17 cm; 18–27·6 g. Medium-large bullfinch with short, curved bill and long, notched tail. Male has lower forehead and lores to behind eye and across cheek to chin black, narrow pale buff band across upper forehead; forecrown to nape and side of neck variably pale to deep orange, rest of face to centre of throat pale yellowish orange, slightly richer on ear-coverts; upperparts plain grey or deep ash-grey, rump white, uppertail-coverts and tail black, glossed purplish; upperwing black, median coverts broadly tipped pale ash grey, greaters edged purplish-black at base and inners broadly tipped pale grey, passing to outer 2–3 narrowly tipped white, flight-feathers glossed deep bluish-black; breast, upper belly and flanks orange-rufous, rest of underparts whitish, washed orange, iris dark brown, bill dark lead-grey or black, legs pale pinkish-brown. Female has forehead and lores to chin black, bordered by narrow pale or whitish band on upper forehead, forecrown grey, hindercrown to nape and side of neck pale greenish yellow, upperparts deep grey, rump white, uppertail-coverts and tail and wing as on male, but median coverts grey, tipped paler grey, greater coverts broadly tipped grey on inners and narrowly white on outers, flight-feathers black, inner secondaries and tertials glossed blue-black; underparts grey, tinged buffish brown, belly to undertail-coverts white; bare parts much as for male. Juvenile is like female, but browner, head warm brown or tinged rufous-buff, upperparts tinged grey, upperwing-coverts broadly tipped deep buff or rufous-buff, breast pale greyish-olive or yellowish olive, and rest of underparts warm brown. Voice. Song a low mellow "terp-terp-tee" or "heer-I-yeer, heer-I-yeer, yeer phew". Calls include mellow "per-lee", similar to that given by *P. aurantiaca*, and a soft plaintive whistled "pew-pew", similar to that of *P. pyrrhula*.
Habitat. Lower montane and submontane dense conifer forests of cedar (*Cedrus*), juniper (*Juniperus*) and pine (*Pinus*) and open mixed deciduous and conifer forests of fir (*Abies*), birch (*Betula*), willow (*Salix*) and rhododendron (*Rhododendron*), at 2400–4200 m. In non-breeding season found in similar habitat and also in oak (*Quercus*) and rhododendron and scrub in foothills, often near streams or rivers in willows, undergrowth and scrub; usually above 1500 m (1830 m in Nepal), sometimes as low as 1000 m or down to 800 m in Bhutan.
Food and Feeding. Mostly seeds of a variety of trees and plants, including birch, willows, docks (*Rumex*), nettles (*Urtica*), also buds, willow catkins, berries, mostly blackberries (*Rubus*), and nectar from rhododendron flowers. Some arthropods. Forages low down in bushes or vegetation or on the ground. Fairly lethargic, spends long periods in foraging in one place before moving on, or may sit motionless in bushes. In pairs and small flocks (often of single sex); in non-breeding season usually in larger flocks of 20–40 individuals, exceptionally up to c. 60.
Breeding. Season at least May, Jul and Aug. Nest a cup of twigs, plant fibres, roots and lichen (*Usnea*), placed up to 3 m above ground in small tree. Clutch 3–4 eggs, dull greyish-white, tinged green, and blotched dark grey and pale lavender, finely spotted with red or reddish brown. No further information.
Movements. Resident and partial altitudinal migrant. In non-breeding season descends to lower levels of breeding range, e.g. occurs in wintering area in Bhutan Jan–Apr, and departs from lowest parts of range in May, possibly moves to lower levels only when forced down by severe weather.
Status and Conservation. Not globally threatened. Common or locally common; erratic in occurrence in some parts of the range. Probably the commonest member of its genus in Himalayas.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Etchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Spierenburg (2005), Vaurie (1949, 1959).

132. Grey-headed Bullfinch

Pyrrhula erythaca

French: Bouvreuil à tête grise **German**: Maskengimpel **Spanish**: Camachuelo Cabecigris
Other common names: Beavan's Bullfinch

Taxonomy. *Pyrrhula erythaca* Blyth, 1862, Sikkim.
Race *wilderi* weakly differentiated, sometimes subsumed in nominate. Three subspecies recognized.
Subspecies and Distribution.
P. e. erythaca Blyth, 1862 – C & S China (SW Shanxi S to SE Xizang and NW Yunnan and S Sichuan) and E Himalayas from NE India (Sikkim) E to extreme N Myanmar.
P. e. wilderi Riley, 1918 – NE China (W Beijing and N Hebei).
P. e. owstoni E. J. O. Hartert & Rothschild, 1907 – Taiwan.



Descriptive notes. 15–17 cm; 18–21 g. Medium-large bullfinch with curved bill and slightly notched tail. Male nominate race has lower forehead and lores to behind eye and across cheek to chin black, narrowly bordered with pale buff or whitish-buff; forecrown to nape, side of neck and rest of face to lower throat and upperparts pale grey, upperparts slightly darker than crown, band of black across lower back, rump white, uppertail-coverts glossy black; tail black, glossed bluish; upperwing black, median coverts broadly tipped pale grey, greaters edged purplish-black at base and broadly tipped pale grey, outer 2–3 more narrowly tipped white, flight-feathers black, secondaries and tertials glossed bluish-black or tinged purplish; breast to upper flanks deep orange-rufous, tinged yellowish at side, pale grey on rear flanks and belly; vent to undertail-coverts white; iris black; bill dark grey or blackish; legs pink to grey or grey-brown. Female has forehead to nape like male, but duller or tinged brownish; rear ear-coverts and side of neck pale greyish-buff, upperparts dull grey-brown, lower back black or purplish-black, rump white; uppertail-coverts, tail and wing as on male, but wing-coverts tipped duller grey or greyish buff; cheek and ear-coverts dull grey-brown or buffish-brown, underparts warm buff-brown, vent to undertail-coverts white; bare parts much as for male. Juvenile is like female, but less black on face, with crown to nape and upperparts duller or tinged olive, uppertail-coverts narrowly fringed buffish, broad buff-brown tips on greater coverts, remiges and tail feathers glossed deep dark blue, and underparts dull or dingy brown, warmer on flanks and belly; first-winter almost indistinguishable from adult female. Race *wilderi* is very like nominate, but slightly smaller, shorter-winged and with smaller bill; *owstoni* male has faint pale band surrounding black face, bases of outer greater coverts black or blackish-blue, inner edge of upper tertial narrowly dull crimson or bright red, throat to belly and vent lavender-grey, breast sometimes tinged light pink, flanks to undertail-coverts white, female deeper grey on crown and nape than nominate, outer web of upper tertial yellow, inner edge of upper tertial cream (not present on all individuals) and underparts gingery brown. Voice. Song a soft, mellow, whistled warble, including some long slurred notes and shorter creaky notes, dropping initially in pitch and rising towards end. Call a fairly typical slow, soft or mellow piping "soo-ee" or "poo-ee", often repeated or given as triple whistle; race *owstoni* gives soft "yifu yifu" also a nasal "swik yu", and a soft "pu" note in flight.
Habitat. Lower montane and submontane conifer forest and mixed forest with juniper (*Juniperus*) or hemlock (*Tsuga*) and rhododendron (*Rhododendron*) with birch (*Betula*) or larch (*Larix*), also willows (*Salix*), poplars (*Populus*) and sea-buckthorn (*Hippophae*) thickets, at 2000–3800 m; in Taiwan (race *owstoni*) occurs in deciduous forest above 2280 m. In non-breeding season at lower levels of breeding range, 2000–3200 m, exceptionally down to 1700 m.
Food and Feeding. Mostly various seeds, buds, and catkins, mainly of willow (*Salix*) also birch (*Betula*), sea-buckthorn (*Hippophae*) and juniper (*Juniperus*); takes nectar from rhododendron (*Rhododendron*) flowers. Some insects and larvae. Forages low down in bushes and hillside scrub and vegetation, or on the ground. In pairs during breeding season, also in small family groups.
Breeding. Little known. Details based on Jun–Jul 2003 field study in Gansu (Lianhuashan Natural Reserve), in C China, when nine nests found: Nest built by female, male nearby, a loosely constructed cup of twigs, lined with fine rootlets, placed 1·3–16 m above ground on horizontal branch of conifer, five nests in fir (*Abies*), four in spruce (*Picea*); clutch 3 eggs, white with reddish-brown spots, incubation by female. Otherwise, one nest found in Jul, of plant fibres, rootlets and animal hair, 3·6 m from ground in pine (*Pinus*) sapling. No further information.
Movements. Resident and partial altitudinal migrant. In non-breeding season moves to lower levels within breeding range and occurs more widely in N Myanmar. Vagrant in Nepal.
Status and Conservation. Not globally threatened. Locally common to scarce or rare. Uncommon in Myanmar. In NE Indian Subcontinent very poorly known; apparently rare in Sikkim and Bhutan, where possibly only a scarce late-winter visitor or passage migrant Mar to early Jun, and only an assumed resident in Arunachal Pradesh.
Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Etchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp *et al.* (2000), Jia Chenxi & Sun Yuehua (2008), Ludlow (1951), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1956b, 1959).

133. Azores Bullfinch

Pyrrhula murina

French: Bouvreuil des Açores **German**: Azorengimpel **Spanish**: Camachuelo de las Azores

Taxonomy. *Pyrrhula murina* Godman, 1866, São Miguel, eastern Azores.
Previously considered conspecific with *P. pyrrhula*, but considerable differences in morphological characters and is geographically isolated. Monotypic.
Distribution. E São Miguel, in E Azores.



Descriptive notes. 16–17 cm; c. 30 g. Medium-large, plump finch with strong, deep bill and short, rounded wings. Male has crown to nape, lores and chin glossy purplish-black, upperparts dark grey-brown, rump pale buff, uppertail-coverts dingy grey-brown; tail and upperwing glossy purplish-black, greater coverts dark blue, broadly tipped dingy grey, outer web of upper tertial narrowly orange-pink; lower face pale warm buff, more buffish-orange on ear-coverts; throat and underparts light buff-brown, often tinged warmer tawny-brown on flanks and undertail-coverts; iris black; bill black; legs dark brown. Female is

very like male, but slightly less dark on back, lacks tawny wash on lower underparts. Juvenile is very similar to adult, with broad buffish fringes on greater coverts. Voice. Call a soft, piping "pew" or "phew". Song a longer and discontinuous series of the call note, interspersed with squeaky and coarser notes.

Habitat. Native Azorean laurel forest on steep-sided valleys, and during May–Nov also herbaceous vegetation along forest edges and in introduced exotics, including *Clethra*, Japanese cedar (*Cryptomeria japonica*) plantations and cheesewood (*Pittosporum undulatum*) woodland, generally above 400 m; also lower-level woodland (down to 300 m) along streams.

Food and Feeding. Diet includes seeds, buds, berries and fruit of at least 37 native plant species, including *Prunella vulgaris*, *Leontodon filii*, and flowerheads of knotweed (*Polygonum capitatum*) together with those of introduced species, including Japanese cedar and cheesewood; in spring (Apr) buds of Azorean holly (*Ilex parado*) are main source of sustenance in absence of alternatives; also fleshy fruit, including *Rubus*, *Vaccinium cylindraceum* and *Leicesteria formosa*, and tree seeds of *Clethra arborea*; at times of other food scarcity takes fern fronds and sporangia, including *Osmunda regalis*, *Pteridium aquilinum*, *Woodwardia radicans* and *Culcita macrocarpa*, and moss tips. Heavily reliant on native foodplants in spring and autumn, but readily turns to introduced species at other times. Strips flowering heads of knotweed. Forages in trees, forest edges, bushes and on the ground. In pairs and in small family groups.

Breeding. Poorly known; few nests found. Season May to late Aug; two broods. Displaying partners bill-caress and hold small twigs. Nest a cup of twigs, dry grass, plant fibres and moss, placed up to 5 m above ground in conifer, usually cedar. Clutch 2–3 eggs. No further information.

Movements. Resident and locally dispersive. Between Sept and Dec wanders up to 3 km W of breeding range in search of fruiting foodplants; also makes late-spring (May) movements from c. 700 to lower elevations along stream valleys to feed on ripening seeds of herbaceous plants.

Status and Conservation. ENDANGERED. Rare. Confined to E end of island of São Miguel, in E Azores, where population in 2008 estimated at c. 1600 mature individuals or c. 800 pairs within mapped summer range of c. 102 km². In 2005 was thought to number 203–331 individuals, an estimate later revised upwards to c. 775 individuals (607–990), restricted to 43 km² of high-altitude native forest; population was considered to be small and declining, and habitat deteriorating owing to spread of invasive exotic plants, and species' status was altered to Critically Endangered. Since then, considerable efforts to control invasive plants have proven successful, with restoration of native habitat (laurel forest), resulting in re-assessment of this species' status. Numbers and global range still extremely small, but, within small part (c. 250 ha) of range in which invasive plants controlled, its population has stabilized or increased; elsewhere in range invasive plants continue to spread, and more control efforts still required. Before 1920s, when this species was more widespread, it was considered a pest in orange orchards and was extensively persecuted, almost to extinction; population in late 1970s estimated at no more than 30–40 pairs. Its historical decline and extremely small range are thought to be result mainly of widespread clearance of native forest for forestry and agriculture; spread of invasive alien plant species (particularly *Hedychium gardnerianum*, *Clethra arborea* and *Pittosporum undulatum*), which have come to dominate remaining patches of natural vegetation, led to suppression of its natural food supply. Food shortages a possible problem throughout year, but most severe in late winter. Random environmental factors can easily affect small populations, and inbreeding may reduce reproductive output. Predation by introduced rats (*Rattus*) a further adverse factor that could be affecting breeding success. Majority of population lives in Pico da Vara/Ribeira do Guilherme Special Protected Area, which was enlarged to 6067 ha in 2005. Annual survival rate 0·62.

Bibliography. Anon. (2007, 2009h, 2009i, 2010b), Arnaiz-Villena *et al.* (2001), Aubrecht (2000), Bannerman & Bannerman (1966), Bibby & Charlton (1991), Bibby *et al.* (1992), Butchart & Stattersfield (2004), Ceia (2008), Clarke (2006), Clement *et al.* (1993), Cramp & Perrins (1994), Everett & Spencer (1982), Hagemeijer & Blair (1997), Jürgens (2000), Lowe & Bannerman (1930), Monticelli *et al.* (2010), Ramos (1993, 1994a, 1994b, 1995, 1996a, 1996b, 1996c, 1998, 2000), Ramos *et al.* (2005), Snow & Perrins (1998), Stattersfield & Capper (2000), Teodósio (2005, 2006), Teodósio *et al.* (2009).

134. Eurasian Bullfinch

Pyrrhula pyrrhula

French: Bouvreuil pivoine **German**: Gimpel **Spanish**: Camachuelo Común
Other common names: Common/Northern Bullfinch; Baikal/Grey Bullfinch (*cineracea*); Grey-bellied/Oriental/Ussuri Rosefinch (*griseiventris*)

Taxonomy. *Loxia Pyrrhula* Linnaeus, 1758, Europe.

Previously considered conspecific with *P. murina*, but considerable differences in morphological characters. Races *cineracea* and *griseiventris* sometimes considered to represent two additional species, but intergrade with other races. Races *rossikowi* and *caspica* sometimes treated as synonyms of nominate, possibly with some justification, but further research on range of variation within nominate (and probably *europoea*) required. Nominate race intergrades over wide areas with *europoea* in SC Europe and with *cassinii* and *griseiventris* in E Asia, populations of large and small individuals merging in somewhat clinal manner; several additional races proposed on basis of small differences in plumage tones of face, upperparts and underparts and in wing measurements, e.g. *coccinea* (described from Baden, in SW Germany), *germanica* (from Thuringia, in EC Germany) and *paphlagoniae* (from near Bolu, in NW Turkey), all synonymized with nominate, and *roseacea* (from Yokohama, in E Honshu, in Japan), treated as synonym of *griseiventris*. Some regional variation also within *pileata*: birds from Ireland paler than those in S England, and males in W & C Scotland slightly darker and females paler or greyer than corresponding sexes in C England. Nine subspecies currently recognized.

Subspecies and Distribution.

P. p. pileata W. MacGillivray, 1837 – British Is.

P. p. europoea Vieillot, 1816 – W & C Europe (W & C France E to Netherlands and W Denmark, S to Italy).

P. p. iberiae Voous, 1951 – SW France (Pyrenees) and mountains of N Portugal and N Spain.

P. p. pyrrhula (Linnaeus, 1758) – N, SC & E Europe E across Siberia to Verkhoyansk Mts and Sea of Okhotsk, S to N Greece, C Romania and E through Ukraine to NE Kazakhstan, NW China (NW Xinjiang) and N Mongolia; winters S to S Europe, SW & C Asia.

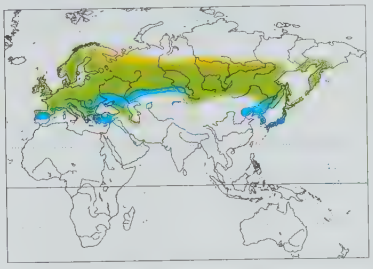
P. p. rossikowi Derjugin & Bianchi, 1900 – N & SC Turkey, Caucasus (except SE) and NW Iran.

P. p. caspica Witherby, 1908 – Azerbaijan and N Iran.

P. p. cineracea Cabanis, 1872 –SW, SC & E Siberia (R Ob, W Altai and N Sayan Mts E to Sea of Okhotsk and Japan Sea), NE Kazakhstan and N Mongolia, probably also NE China (NE Inner Mongolia and N Heilongjiang).

P. p. cassinii S. F. Baird, 1869 – breeds Russian Far East (W & N shores of Sea of Okhotsk, S Koryakland, Kamchatka and N Kuril Is); migrates S to SE Russia (Amurland and Ussuriland), Sakhalin I and NE China (Heilongjiang S to N Hebei).

P. p. griseiventris Lafresnaye, 1841 – Russian Far East (E Amurland and Ussuriland), Sakhalin I, C & S Kuril Is, and N Japan (Hokkaido and N Honshu); winters S to NE China (Heilongjiang S to Liaoning), Korea and C & S Japan.



Descriptive notes. 14·5–16 cm; 21–38 g. Medium-large, plump or robust finch with strong, broad bill and slightly notched tail. Male nominate race has forehead to upper nape, lores and across cheek to chin black or slightly glossy black, lower nape and upperparts (including lesser and median upperwing-coverts) pale grey, tinged bluish, uppertail-coverts black; tail black, central feathers glossy, all outer feathers edged glossy bluish-black (sometimes a buffish-white shaft streak on outermost); greater upperwing-coverts black or slightly glossy bluish-black, broadly tipped greyish-white on inners and narrowly whiter on outers; rest of wing black, flight-feathers edged glossy black, narrow pinkish-red outer edge on upper tertial; side of face to side of neck and underparts bright deep pink, vent to undertail-coverts white; iris black; bill black; legs brownish-pink to blackish-brown. Female has crown to chin black, nape and side of neck grey to greyish-buff; upperparts dull grey, tinged brown (greyer in worn plumage), rump white, uppertail-coverts and central tail feathers glossy bluish-black, all outer rectrices black (sometimes a buffish-white shaft streak on outermost); lesser and median upperwing-coverts dull brownish-grey, greaters black, broadly tipped grey or whitish-grey on inners and less broadly paler greyish-white on outers; flight-feathers as on male, except for pale grey (sometimes tinged pale pinkish) outer edge of upper tertial; side of face to side of neck and underparts light brown or dull grey-brown, sometimes tinged lavender-pink, lower flanks to undertail-coverts white; bare parts as for male. Juvenile is similar to female, but lacks black on crown and chin, has head and upperparts brown or dull brown, rump white or buffish-white, tail and wing as on adult female, but median coverts tipped buffish-brown, greaters broadly tipped paler buff or buff-brown on inners and paler on outers, outer edge of upper tertial pale buff or buff-brown, face pale buff or yellowish-brown, breast and underparts slightly darker, vent and undertail-coverts pale buff or whitish; first-summer resembles adult, but retains juvenile flight-feathers and tail feathers, bill pale horn-coloured. Races differ mainly in size and in intensity or brightness of male plumage colours, largest and brightest in N of range and dullest and brownest in SW: *pileata* is slightly smaller and smaller-billed than nominate, male plumage like latter but upperparts deeper or slightly darker blue-grey, inner greater coverts tipped greyer and outers buffish, face and underparts not so brightly pink, female duller brown above and below than nominate; *europoea* is very similar to nominate, but male slightly darker grey on upperparts and slightly deeper red (less pinkish) on underparts, tips of outer greater coverts greyer, less whitish, female also darker or browner above and below than nominate; *iberiae* male has slightly paler grey upperparts than previous and bright or deep reddish-orange underparts, female upperparts and underparts slightly paler or greyer (intermediate in colour between previous and nominate); *rossikowi* also resembles nominate, but with larger or deeper base of bill, male paler grey upperparts and deeper or more intensely reddish on face, side of throat and underparts, female greyer above and underparts darker buff-brown; *caspica* is very similar to last, but slightly smaller and larger-billed, male slightly paler blue-grey upperparts and very bright reddish-pink underparts, female upperparts as on male or tinged olive-brown on mantle and back, and underparts paler or greyer; *cineracea* lacks pink or red in plumage, male face, side of neck and underparts pale grey, upperparts slightly deeper or darker grey (except for white rump), female like nominate or tinged grey-brown; *cassinii* male is like nominate, but upperparts paler grey and sometimes washed pinkish, outer greater coverts tipped pure white and underparts bright pink, female like nominate or upperparts slightly paler or greyer, and outer greater coverts tipped white; *griseiventris* is slightly smaller-billed on average than others, male has side of head, side of neck and throat deep pink, underparts soft grey (except for white vent and undertail-coverts), extent of pink suffusion below variable, some have sides of breast and belly tinged or washed pink or pinkish-orange ("*roseacea*"), female generally pale brown, but with nape and upper mantle pale grey and reddish or rust-brown tinge on ear-coverts and throat. Voice. Most common call a slow, soft, melancholic, descending piping "peu", "teu teu", "deu" or "du-deu", with varying degrees of emphasis, as contact note between partners and audible for some distance, and given from perch or in flight, also given more persistently as alarm; calls of young similar, louder or more harsh; some nominate individuals in NW Russia have slightly drawn-out and tinny or piping note (like sound of tin trumpet), may also be given following short sequence of soft piping notes. Song by both sexes (most frequently by male), variable individually, mostly the call note or pairs of notes repeated at frequent intervals, occasionally interspersed with higher-pitched and slightly drawn-out piping note; subsong a shorter and softer or lower-pitched version of piping warble.

Habitat. Lowland and lower montane deciduous forest and woodlands, thickets and copses, also heaths, hedgerows and scrubby areas, parks and edges of cultivation, including orchards (mostly in spring) and gardens in towns and cities (usually more rural in E of range, occurring only around villages); in Siberia and other parts of Russia mainly in conifers, also mixed and broadleaf forest, in Caucasus mainly in pine (*Pinus*) and tall beech (*Fagus*) forest. In N Europe and in C & E Asia prefers conifer forests with well-developed undergrowth of spruce (*Picea*), cedar (*Cedrus*), larch (*Larix*), also birch (*Betula*), yew (*Taxus*) and bamboo, to c. 3000 m, at 1400–2000 m in Altai (*cineracea* slightly lower than nominate) of NE Kazakhstan, and 1000–2500 m in Japan.

Food and Feeding. Variety of seeds, buds and shoots of various plants, also some invertebrates. Seeds and buds include those of yew, juniper (*Juniperus*), larch, spruce, pine, fir (*Abies*), willow (*Salix*), poplar (*Populus*), birch, alder (*Alnus*), hornbeam (*Carpinus*), beech, oak (*Quercus*), elm (*Ulmus*), mulberry (*Morus*), maple (*Acer*), ash (*Fraxinus*), privet (*Ligustrum*), lilac (*Syringa*), holly (*Ilex*), docks (*Rumex*), mistletoe (*Viscum*), hemp (*Cannabis*), hop (*Humulus*), nettle (*Urtica*), knotgrass (*Polygonum*), amaranth (*Amaranthus*), fat-hen (*Chenopodium*), orache (*Atriplex*), burdock (*Arctium*), chickweed (*Stellaria*), mouse-ear (*Cerastium*), corn spurrey (*Spergula*), buttercup (*Ranunculus*), poppy (*Papaver*), shepherd's-purse (*Capsella*), garlic mustard (*Alliaria*), charlock (*Sinapis*), bur-marigold (*Bidens*), mignonette (*Reseda*), rose (*Rosa*), meadowsweet (*Filipendula*), flax (*Linum*), spurge (*Euphorbia*), crane's-bill (*Geranium*), spindle (*Eunomys*), sea-buckthorn (*Hippophae*), dog's mercury (*Mercurialis*), bryony (*Bryonia*), willowherb (*Epilobium*), violet (*Viola*), balsam (*Impatiens*), St John's-wort (*Hypericum*), dogwood (*Cornus*), forget-me-not (*Myosotis*), nightshade (*Solanum*), figwort (*Scrophularia*), yellow-rattle (*Rhinanthus*), plantain (*Plantago*), honeysuckle (*Lonicera*), guelder-rose (*Viburnum*), dandelion (*Taraxacum*), sow-thistle (*Sonchus*), groundsel (*Senecio*), also grasses (Gramineae); berries including rowan (*Sorbus*), buckthorn (*Rhamnus*), hawthorn (*Crataegus*), blackthorn (*Prunus*) and blackberries (*Rubus*), and buds particularly of fruit trees (wild and cultivated); size of seeds taken in range 0·5–14 mm. Small invertebrates include aphids (Aphidoidea), moths (Lepidoptera), flies (Diptera), sawflies (Symphyta), weevils and other beetles (Coleoptera), spiders (Araneae) and snails (Pulmonata). Nestling diet mostly invertebrates. Forages at low to medium height in trees, bushes and low vegetation, occasionally

on ground; more rarely or very locally, visits birdtables and feeding stations, taking seeds of sunflower (*Helianthus*) and variety of other seeds. While feeding usually perches horizontally or sideways on seedhead or slender twig, or on sloping perch; more rarely, hovers at outer fruit or seedheads of e.g. honeysuckle; sometimes pursues flying insects. Extracts seeds from fruit by crushing in bill and ejecting pulp, will remove seeds while leaving skin and pulp of fruit in place; smaller fruits may be swallowed whole, and flesh of hawthorn eaten whole as seeds apparently too hard; will bite off seedheads of grasses or thistles and extract seeds in bundles. Takes 20–50 seconds to eat ash seeds, c. 10 seconds of which is for de-husking; tree buds eaten at rate of up to 30 per minute. Forages alone, in pairs and in small groups of up to c. 20 individuals, sometimes more; rarely, in flocks of up to 100 individuals.

Breeding. Season late Apr (exceptionally from Mar) to mid-Sept; two, occasionally three, broods. Monogamous; pair-bond usually endures for more than one season, with female dominant over male. Solitary; exceptionally, two nests in same bush. Pair formation takes place before break-up of winter flocks. Displaying partners take equal share of active roles, and once pair-bond established greet each other with soft calls; courtship displays (given throughout year) include bill-touching and bill-caressing, whereby male leans towards female and bills touch briefly, then turns away and hops to one side, female may respond with similar action, display can become more intense, both birds having ruffled belly and flank feathers, tail twisted around, and hopping towards each other to touch bills and then turning away, repeatedly for some time; male courtship-feeds female; begging calls of female and twig-carrying by female at start of breeding season similar to bill-touching, but female holding small twig and giving subdued call and crouching, with body swivelled from side to side and wings drooped, tail slightly raised. Nest built by female, site often selected by male, mostly of dry grass, plant fibres, roots, moss, lichen and leaves, on loose base of dry twigs, placed up to 5 m from ground in thick bush (frequently hawthorn), brambles and honeysuckle or on flat low branch of conifer (including spruce and yew); new nest built for each brood. Clutch 4–6 eggs (clutch size increases S–N, largest in Finland and N Russia), variable from pale greenish-blue to pale blue with light purple or violet blotches and dark brown or purplish-brown spots, specks and streaks; incubation by female, period 12–14 days; chicks fed and cared for by both parents, nestling period 14–16 days; young fully independent 15–20 days after leaving nest. In studies in Netherlands, 62·5% of 1321 eggs hatched and 50% of young fledged, of 279 clutches 41% lost at egg stage through predation and desertion during prolonged periods of bad weather, earliest clutches least successful, and highest success rates of clutches in Jul and Aug; in German study, 73% of 64 eggs hatched and 44% of young fledged; in study in S England, 15% of Apr–May clutches produced fledged young, 50% of Jun ones did so and 70% of Jul–Aug ones did; success in N Europe and Russia highest in years with good conifer crop; main nest predators Eurasian Jay (*Garrulus glandarius*), Carrion Crow (*Corvus corone*), weasels and stoats (Mustelidae) and small rodents. First breeds in first year.

Movements. Resident, migratory and partially migratory; nominate race periodically irruptive, moving short to medium distances S or E in non-breeding season to winter within and S of normal range. In British Is race *pileata* largely sedentary or makes local movements of up to c. 20 km, also some evidence that part of population moves up to 200 km SE in autumn and NW in early spring, movements more pronounced or visible (especially at coastal sites) in some years than in others; small number of recoveries of ringed individuals in non-breeding season in Netherlands, Belgium and France. Iberian race *iberiae* largely sedentary, but those at higher elevations make post-breeding descent to valleys and surrounding plains; possibly this race irregular S to Strait of Gibraltar and in extreme NW Africa in N Morocco, also this race or *europoea* irregular in N Tunisia. Most *europoea* sedentary, small numbers, mostly from NW France, moving up to 500 km to Spain; wintering birds in France mostly from Belgium, Germany and Switzerland, also (mostly in NE) includes some nominate race *pyrrhula* from Poland and Lithuania. Nominate race recorded as passage migrant, usually in small numbers (periodically in larger irruptions), from Fennoscandia and N Russia S through E Europe and W Russia to Switzerland, Romania (occasionally S to Greece and E Bulgaria) and N Caspian region, where more numerous in winter, birds from areas farthest N moving up to 2000 km in irruption years (including into NW & C Europe), those from middle latitudes moving up to 400 km; also widespread in N Kazakhstan, where individuals from NC Russia and Altai move mostly SW; females and immatures move (on average) farther than do males, proportion of males migrating increasing in years of extreme cold weather; often sedentary throughout winter in Scandinavia (occasionally N to S Kola Peninsula) and W Siberia, sometimes moving short distance away from woods and forests to more open areas. Race *caspica* is resident; *rossikowi* largely an altitudinal migrant, occurring in foothills and river valleys of Caucasus and more widely C & W Turkey in non-breeding season. Breeding *cineracea* from Altai more widespread in E & SE Kazakhstan (possibly also reaching into NW China). In E of range *griseiventris* moves altitudinally to lower areas, mostly within Japan and more widely within Ussuriland, and an uncommon winter visitor in Korea; *cassinii* migratory, moving to SE Russia and N parts of NE China, also rare visitor to Japan. Departures from breeding range mid-Oct and Nov, with onward movements in early Dec or later, depending on severity of weather; return N from non-breeding areas farthest S mid-Feb and from farther N Mar–Apr, first returning arrivals at N limits, including Kola Peninsula, early Mar to mid-Mar; most movements diurnal, and singly or in small loose flocks. Nominate race recorded exceptionally W to N British Is (further S in irruption years), also vagrant Iceland, S Portugal, Morocco, several Mediterranean islands, Jordan. Vagrant to Alaska (including St Lawrence, Nunivak and Aleutian Is), one individual identified as of race *cassinii*.

Status and Conservation. Not globally threatened. Common to locally common in most of range. Estimated European breeding population between 2,760,000 and 3,887,000 pairs, most in Germany, France, Sweden and Finland; up to a further 10,000 pairs in Turkey and 10,000,000 pairs in Russia. Breeding densities variable, from 1–2 pairs/km² in woodland, heath and bog mosaic to average of 4·9 pairs/km² in mixed farmland in S England, 2–7 pairs/km² in shelter-belts of C France, up to 21 pairs/km² in conifer plantations in Wales, and up to 68 pairs/km² in pine forest in Bulgaria. Range has expanded slowly N & W in Britain since start of 19th century, but numbers declined since late 1970s mainly as a result of changes in agricultural practice, which adversely affected supply of weed seeds; this followed a period of abundance, which coincided with scarcity of Eurasian Sparrowhawk (*Accipiter nisus*), the main predator of adults (see page 506). In Poland, range also increased since 19th century; in Norway more recent spread in W and also N to North Cape. No information on numbers in E of species' range, but appears fairly common in most parts. In several parts of Europe considered an agricultural pest, causing damage to commercial fruit trees, mostly plums and cherries (*Prunus*), pear (*Pyrus*) and apples (*Malus*), and also currant bushes (*Ribes*).

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Genus *COCCOTHRAUSTES* Brisson, 1760

135. **Hawfinch**

Coccothraustes coccothraustes

French: Gros-bec casse-noyaux **German**: Kernbeißer **Spanish**: Picogordo Común

Taxonomy. *Loxia coccothraustes* Linnaeus, 1758, southern Europe, probably Italy.

Geographical variation fairly slight and partly clinal, nominate race increasing in size from W to E. Nominate intergrades widely with *nigricans* in Croatia, S Bulgaria and Greece E to S Ukraine and NW & N Turkey, and latter race may fall within level of variation of nominate, from which considered doubtfully separable by plumage features; further research required. Six subspecies currently recognized.

Subspecies and Distribution.

C. c. coccothraustes (Linnaeus, 1758) – S Fennoscandia and C & S Britain S to Spain, Corsica, Sardinia, C Italy, Slovenia, N Bulgaria, N Greece, NW & N Turkey and N & C Caucasus, E through Russia and C Siberia to Transbaikalia, S to NE Kazakhstan and N Mongolia; winters Europe (except N) S to N Africa, Cyprus, C Asia, and C, S & SE China (Gansu E to Jiangsu, S to Fujian, also Guizhou).

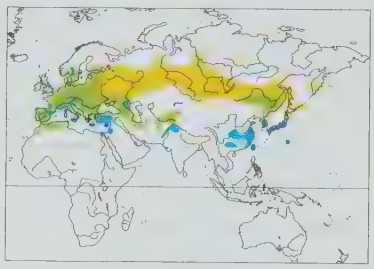
C. c. buvryi Cabanis, 1862 – N & NC Morocco, N Algeria and N Tunisia.

C. c. nigricans Buturlin, 1908 – Ukraine, C & S Caucasus, NE Turkey, N Iran, possibly also SW Turkmenistan.

C. c. humii Sharpe, 1886 – E Uzbekistan E to W Kyrgyzstan and S Kazakhstan (W Tien Shan), S to WC & NE Afghanistan and W Tajikistan; winters also S to N & W Pakistan and W Kashmir.

C. c. schulpini H. Johansen, 1944 – breeds Russian Far East (Amurland and Ussuriland), NE China (N Inner Mongolia and Heilongjiang S to S Liaoning) and N Korea; migrates to E & SE China.

C. c. japonicus Temminck & Schlegel, 1848 – breeds E Russia (C & S Kamchatka), Sakhalin I, S Kuril Is and N & C Japan; migrates to S Japan, Ogasawara-shoto (Bonin Is), S Korea, E China (Hebei S to Jiangsu) and Taiwan.



Descriptive notes. 16–18 cm; 46–72 g. Large, plump finch with big conical bill, short tail, and unique crescentic or cleaver-shaped and laterally sharply pointed tips of inner primaries. Male nominate race breeding has line at base of upper mandible, lores, line at side of lower mandible to chin and throat black; forehead to crown light warm brown, darker or chestnut on upper nape; face bright tawny or orange-cinnamon, sometimes a narrow whitish subocular line; lower nape and side of neck pale grey; upperparts rich dark brown, lower back, rump and uppertail-coverts warm orange-brown; tail cinnamon-brown, broadly tipped white, outer feathers blackish; median upperwing-coverts dark grey, broadly tipped white or buffish-white, alula and primary coverts black, outer greater coverts black with buffish-white at base, central ones buffish-white with concealed blackish inner webs, inner ones cinnamon-brown, rest of wing black, glossed metallic purplish-blue on secondaries and inner primaries, small square white patch on outer primaries at mid-point of inner webs (broad white wingbar in flight), other primaries have white towards base of inner web; side of throat grey or grey-brown, breast to belly pale brown, tinged pink or pinkish-buff, vent and undertail-coverts white, underwing-coverts also whitish; iris variable, pale brown to dark reddish-brown, paler at base; bill slate-blue or lead-grey, paler base of lower mandible; legs pale pinkish-brown. Non-breeding male is slightly duller than breeding male, bill yellowish-horn. Female is similar to male, but slightly paler or less warm brown; forehead and face paler brown, crown to nape and upperparts dull brown, rump and uppertail-coverts paler brown; secondaries broadly pale bluish-grey, underparts pale brown. Juvenile male is similar to adult, but duller or browner, head and nape yellowish-buff to orange-brown, feathers tinged yellowish and finely tipped brownish, lores duller, eyering buffish, chin and upper throat dusky grey, narrow black line at base of lower mandible/upper chin, upperparts duller and more mottled brown and grey, wing and tail as on adult, but tips of greater coverts tinged greyish (tips of medians whiter), modified tips of inner primaries blunter, underparts paler brown or buff-brown, spotted or streaked darker, bill pale brown to yellowish-horn; juvenile female like same-age male, but lacks black line at base of bill, lores grey-brown, rest of face dull grey, sometimes with yellowish lower cheek/side of neck and mottled blackish malar, flight-feathers edged greyer, paler below; first-year resembles respective adult, but male back and rump greyer or more olive-brown (less buffish), flight-feathers, greater coverts and tail feathers retained from juvenile plumage and inner primaries less heavily modified and more bluntly tipped (tail and primaries show wear from mid-Feb), female head often greyer or grey-brown, mantle and back pale grey-brown, rump and uppertail-coverts pale olive-brown or tinged greyish, underparts paler brownish-grey, tinged buffish or dull whitish on belly. Races differ mainly in size, bill size, and some details of plumage: *schulpini* is like nominate, but larger, with bill much bigger; *buvryi* is slightly smaller than nominate, with bill a little smaller or less heavy, head and body paler, crown, rump and uppertail-coverts greyer, less white in wing and at tip of tail; *nigricans* is poorly differentiated from nominate, in fresh plumage slightly darker on mantle and back, underparts lightly tinged vinous-pink, and female underparts paler or whitish; *humii* has mantle and back paler and more yellowish-brown, scapulars also slightly paler brown, underparts pale tawny or warm buffish-brown, female head pale grey, tinged olive; *japonicus* is like nominate, but slightly smaller bill, paler and whiter on belly, and less white at tip of tail. Voice. Song, usually from top of tree, intermittently throughout year but very infrequently heard, an emberizid-like "deek-waree-ree-ree" or "tchee-tchee-turr-wee-wee", sometimes introduced with a whistled note, and concluding with more musical or liquid notes. Call a sharp or abrup "tick" or "tzik", somewhat similar to that of European Robin (*Erithacus rubecula*) and often as a double note, given in flight, from cover and from ground; also shrill "teee", "tzeep", "tsip" and longer or drawn-out "sreeee".

Habitat. Old deciduous woodland and (except in W of range) mixed broadleaf and conifer woodlands where broadleaf predominant; most numerous in oak–hornbeam (*Quercus–Carpinus*) forests, also beech (*Fagus*), ash (*Fraxinus*), elm (*Ulmus*), maple and sycamores (*Acer*) within forests, also in rowan (*Sorbus*) and both wild and cultivated cherries (*Prunus*), and often faithful to specific areas containing preferred trees; often in riverine forest strips or woods near streams and ponds, also in coppices, hedgerows, edges of cultivation, especially orchards, parks, gardens and tree-lined avenues of towns and cities. In C & E of range also in conifers, mostly pine (*Pinus*), and junipers (*Juniperus*); in S Europe and E Mediterranean also in small woodlands and olive (*Olea*)

groves in more open landscape; in N Africa race *buvryi* breeds in forests of Aleppo pine (*Pinus halepensis*) with cork oak (*Quercus suber*) and alders (*Alnus*), mainly at 600–1900 m. Breeds at up to 1300 m in Europe, and to c. 2200 m in Caucasus and Afghanistan. In non-breeding season slightly more widespread, venturing into open areas with bushes.

Food and Feeding. Wide variety of hard seeds, buds and shoots of trees and shrubs, also some fruit; some invertebrates and larvae. Seeds and buds include those of yew (*Taxus*), juniper, larch (*Larix*), spruce (*Picea*), pine, fir (*Abies*), willow (*Salix*), aspen (*Populus*), walnut (*Juglans*), birch (*Betula*), alder, hazel (*Corylus*), hornbeam, hop-hornbeam (*Ostrya*), beech, oak, elm, mulberry (*Morus*), laurel (*Laurus*), maple, lime (*Tilia*), ash, olive, privet (*Ligustrum*), lilac (*Syringa*), mistletoe (*Viscum*), hemp (*Cannabis*), dock (*Rumex*), chickweed (*Stellaria*), traveller's-joy (*Clematis*), barberry (*Berberis*), hackberry (*Celtis*), radish (*Raphanus*), apple (*Malus*), pear (*Pyrus*), cherry (*Prunus*), hawthorn (*Crataegus*), rowan (*Sorbus*), raspberry (*Rubus*), currant (*Ribes*), bean (*Phaseolus*), pea (*Pisum*), broom (*Cytisus*), laburnum (*Laburnum*), holly (*Ilex*), spindle (*Euonymus*), dogwood (*Cornus*), buckthorn (*Rhamnus*), alder buckthorn (*Frangula*), grape (*Vitis*), ivy (*Hedera*), cotoneaster (*Cotoneaster*), nightshade (*Atropa*), plantain (*Plantago*), elder (*Sambucus*), honeysuckle (*Lonicera*), guelder-rose (*Viburnum*), dandelion (*Taraxacum*), burdock (*Arctium*), sunflower (*Helianthus*), grasses (Gramineae) and cereals, including maize and wheat; fruit includes *Pistacia terebinthus*. Invertebrates taken include locusts and grasshoppers (Orthoptera), bugs (Hemiptera), moths (Lepidoptera), beetles (Coleoptera), spiders (Araneae), earthworms (Lumbricidae) and snails (Pulmonata). Nestlings fed principally with insects and larvae. Forages at all levels in trees (frequently in crown in summer) and in shrubs, occasionally (mostly in winter) on ground, where it takes fallen seeds. Usually shy, quiet and unobtrusive, perches high in trees or on ground beneath trees; walks, waddles or hops with head held upright. Occasionally pursues insects in flight, and may hover briefly to pluck fruit from outer foliage. Uses massive bill to split large hard seeds in equal halves, and mandibles able to exert force of up to 50 kg; bites through shoots and buds from stalk. Will collect small berries in bunch and pick out seeds individually, then extracts seeds from fleshy fruits by turning them in bill and stripping fleshy parts against lower mandible, before cracking seeds; worms either eaten whole or cut into smaller sections. Flocks often return over several days to same fruiting tree until latter stripped of all seeds and buds; also feed on infestations of defoliating moth caterpillars, mainly green oak roller (*Tortrix viridana*) and winter moth (*Operophtera brumata*), from rolled-up leaves, often flying several kilometres to do so. Forages singly, in pairs and in loose flocks; in non-breeding season often in larger flocks of up to 300 individuals, at times much larger, and gatherings of up to 1200 recorded.

Breeding. Season end Mar to mid-Aug; one brood. Monogamous; pair-bond apparently endures for more than one breeding season. Solitary, sometimes colonial in small groups. Solitary pairs defend area of up to 2000 m² around nest; those in groups defend only area immediately around nest. Pair formation takes place before break-up of wintering flocks. In display male, holding body upright, bill pointing downwards and neck feathers ruffled, bows to female, sometimes ending with head almost facing between legs; in upright posture, wings drooped and held slightly forward (showing white shoulder patches), he waddles stiff-legged, with body slightly swayed from side to side, in front of female, also drags drooped wingtips on ground; during early stages of courtship female may fend off male with forward lunges and bill-snapping, but as pair-forming advances she accepts display and the two partners perform bill-touching display; also slow-winged moth-like courtship display-flight by male towards female; male begins courtship-feeding of female when partners perch close together, face each other and alternately bob head, this followed in time by begging of female in crouched posture with head down, body feathers ruffled and wings quivering. Nest built by both partners, a large or bulky but shallow cup of twigs, bark strips, grass, plant fibres, moss and lichen on a platform of thicker twigs, placed up to 14 m above ground, and often in ivy or honeysuckle, against trunk, in shallow fork or on horizontal branch in mature shrubby tree, frequently fruit tree (including apple and pear), also oak, hawthorn, blackthorn (*Prunus*), sycamore, poplar or birch. Clutch 3–5 eggs (larger clutches in years with high abundance of defoliating moth larvae), variably pale blue or greyish-green, occasionally pale buff, grey, slate-grey, pure white, creamy white or greenish-blue, and boldly spotted and scrawled with blackish-brown; incubation by female, period 11–13 days; chicks fed and cared for both parents, nestling period 12–13 days; young independent at c. 30 days of age. Of 286 eggs in Netherlands study, 74·5% produced fledged young, average of 4·4 young per successful nest; in German study, 72 clutches produced 38 fledged young, average of 1·9 young per successful nest, and of 66 clutches 30% fledged young, 11% abandoned during egg-laying stage, 48% suffered egg loss and 11% failed through loss of young (asynchronous hatching often leads to death of youngest); solitary breeding pairs less successful than colonial nesters; early nests often suffer predation by Red-backed Shrike (*Lanius collurio*), highest success rates late in season, when nest more likely to be concealed by vegetation; main predators Eurasian Sparrowhawk (*Accipter nisus*), which takes sitting adults, nestlings and newly fledged young, Eurasian Jay (*Garrulus glandarius*), Common Magpie (*Pica pica*), Carrion Crow (*Corvus corone*), squirrels (*Sciurus*) and martens (*Martes*). Breeds in first year.

Movements. Resident and migratory. Asian populations largely migratory; N populations move farther than do those in S of range; numbers migrating also highly variable, and adult females and immatures move farther than do adult males. Actively migrating flocks up to 150 individuals recorded. In N & C Europe nominate race sedentary, locally dispersive (including to lower levels) or partially migratory, moving between W and S to winter largely within breeding range or slightly to S; most movements of less than 50 km, but main wintering area, harbouring birds from Netherlands, Germany, Czech Republic and Poland, in NE Spain (occasionally also N Portugal), S France, N & C Italy and Balkans, also smaller numbers in Balearic Is, Corsica and Sardinia; regular passage through Gibraltar, presumably of local origin, and irregular or scarce in Morocco, N Algeria and N Tunisia; single individuals ringed Germany and Switzerland recovered Algeria. In E Europe and SW Russia winters mostly in S Ukraine (where occasionally abundant on passage) and Caucasus from early Sept and late Oct to end Mar or Apr (with especially high numbers in years with good beechmast), also becomes more widespread in W & S Turkey. In E Mediterranean nominate race and *nigricans–coccothraustes* intergrades irregular (occasionally fairly common) winter visitors to Greece, Cyprus, N Egypt and N & C Israel from mid-Oct to early Apr, and occasional in N Iraq; in Lebanon rare on passage Nov and early Mar to early Apr and scarce Dec to mid-Feb; in N Iran either resident or makes local altitudinal movements. In Siberia in years of good rowan crop, winters as far N as Tomsk and Krasnoyarsk; part of population moves S to N Kazakhstan, and more frequently (but still uncommon) SE Kazakhstan and Uzbekistan; in W Tien Shan race *humii* an altitudinal migrant, moving to lower levels in late Nov and Dec, when descent usually triggered by first heavy snowfall. Farther E, some *schulpini* remain throughout winter in parts of Ussuriland and NE China, but part of population moves S to winter within breeding range in NE China, also S in China to Fujian and Guizhou. One individual ringed in Korea in winter (where irregular) subsequently recovered in summer in W Siberia, 3800 km W. In N Japan, breeding *japonicus* migrates from Hokkaido S to Honshu (where residents largely altitudinal migrants), islands in Sea of Japan and S Korea during Oct–Mar, with most in mid-winter, numbers varying with severity of winter. Those breeding in C Asia largely altitudinal migrants, moving to lower levels from end Nov and Dec, when snowfall becomes heavy; also migrate S in annually varying numbers Oct–Dec to N & W Pakistan and W Kashmir, where present to mid-Apr, occasionally early May. Little evidence of site-fidelity in successive winters, e.g. birds ringed in winter SE Sweden retrapped in subsequent winters in Denmark, Germany, Netherlands, France and Italy, and areas visited by large flocks in one year may have only few in other years. Largely inconspicuous on passage, usually recorded only at coastal headlands or mountain passes; numbers on passage variable, apparently linked to abundance of food supply (principally seed crop of beech and hornbeam), e.g. in poor crop years in S Sweden this species more numerous in Finland, Denmark and Switzerland. Leaves wintering areas between mid-Feb and end Apr, some lingering into early May in parts of wintering range; in N Europe peak of return passage mainly mid-Apr and first birds back in NW Russia from early Apr, but small numbers still present in NE China to end Apr and passage continues through Ussuriland into May, and later, to end May, through W Mongolia. Scarce or irregular non-breeding visitor in many areas outside normal range, e.g. Ireland, Balearic Is, N Africa, Jordan and SW Iran; scarce Hong Kong and vagrant in Iceland, Faeroes, Canary Is, Madeira, Commander Is and Alaska (including Aleutian Is and Pribilof Is, St Lawrence I).

Status and Conservation. Not globally threatened. Common to locally common in much of range; uncommon in Caucasus, and generally rare in Siberia. Estimated European breeding population between 1,133,700 and 1,498,000 pairs, most in Germany, Romania and Czech Republic; up to a further 10,000 pairs in Turkey and 100,000 pairs in Russia. Breeding densities variable, 3–10 pairs/km² in gardens and town parks, 3–14 pairs/km² in mixed woodland and copses, 5–33 pairs/km² in broadleaf woodland (Germany), 20–128 pairs/km² in (protected) damp oak–hornbeam woodland, 42–81 pairs/km² in poplar plantations with undergrowth; in oak–hornbeam forest, densities in E Poland reach 68 pairs/km². Since 1960s, range in Europe has expanded N around Baltic, Sweden and Finland following the planting of broadleaf trees on edges of towns. Netherlands population quadrupled in same period, and in Spain increase in wintering numbers recorded in recent years. Population in Britain immersed in long-term decline, breeding population currently estimated at c. 3000–6500 pairs, with estimated 10,000–15,000 birds in winter; similar reduction in range and numbers in Denmark, Lithuania and Ukraine possibly related to destruction of deciduous woodland, removal of old orchards or increased predation.

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PLATE 47

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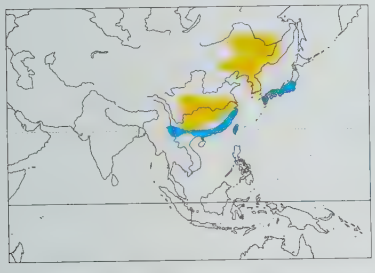
Genus *EOPHONA* Gould, 1851

136. Yellow-billed Grosbeak

Eophona migratoria

French: Gros-bec migrateur **German**: Weißhand-Kernbeißer **Spanish**: Picogordo Chino
Other common names: Chinese Grosbeak/Hawfinch, Yellow-billed/Black-tailed Hawfinch

Taxonomy. *Eophona melanura migratoria* E. J. O. Hartert, 1903, Sidemi River, southern Ussuriland, Russia.
Geographical variation in plumage weak, not constant, and intermediates occur. Two subspecies currently recognized.
Subspecies and Distribution.
E. m. migratoria E. J. O. Hartert, 1903 – breeds E Siberia and Russian Far East (E Transbaikalia, middle Amurland and S Ussuriland), NE China (Inner Mongolia and Heilongjiang) and Korea; migrates to S Japan (S Honshu and Kyushu), E China (Guangxi E to Fujian) and Taiwan.
E. m. sowerbyi Riley, 1915 – breeds C & EC China (W Sichuan and Hubei E to Shanghai); migrates to Yunnan.



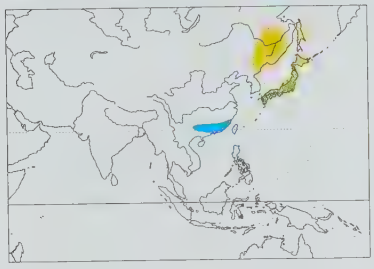
Descriptive notes. 15–18 cm; 40–57 g (China). Medium-large, large-billed grosbeak with long forked tail. Male nominate race has head to upper nape, chin and throat black, bordered by narrow pale buff band; nape and upperparts pale greyish-brown or greyish-buff, lower back and rump somewhat paler, uppertail-coverts white, longest (or rearmost) uppertail-coverts black; tail bluish-black; upperwing black, glossed bluish, primary coverts broadly tipped white, distal third of outer five primaries white, tips of secondaries and tertials white; underparts same colour as upperparts or slightly paler buff, flanks warm buff or light rufous, vent to undertail-coverts white; iris black; bill yellow, with grey to greenish-yellow or blackish cutting edges and tip; legs brown to pinkish-brown. Female is similar to male, but lacks black on head; forehead, lores and chin dark grey or blackish, rest of head grey, upperparts pale greyish-buff, paler grey on rump, uppertail-coverts and central tail grey, all outer rectrices black; upperwing as on male, with distal fringes of outer primaries and tips of secondaries white, tertials brown, finely tipped white; underparts as on male or pale greyish-buff, flanks ginger or tawny-brown; bare parts much as for male. Juvenile is similar to female, but with buffish lores, plain pale face and whitish chin, broad pale buff or buff-brown tips on median and greater upperwing-coverts, tail greyish centrally with black or bluish-black edges and tip. Race *sowerbyi* is slightly larger and larger-billed than nominate race, bill with curved culmen and deeper base, upperparts variably slightly darker or more sandy, throat and breast are greyer, and sometimes with heavier tinge of ginger or light rufous on the flanks. Voice. Song is a loud series of whistles, transcribed as "chee chee choree kirichoo", similar to that of *E. personata*. Call is a loud "tek-tek".
Habitat. Inhabits edges and clearings in lowland mixed or deciduous forests, mostly of oak (*Quercus*), birch (*Betula*), alder (*Alnus*) and beech (*Fagus*); also occurs in wooded hills, river valleys, edges of marshes and cultivation, orchards, parks and gardens, including those in centre of large cities.
Food and Feeding. Seeds of various trees and shrubs, also some fruit, including berries; also insects. Nestlings fed mostly with insects and larvae. Forages in trees and bushes, and on ground; often remains concealed within foliage or in upper branches. Generally in pairs; on passage and in non-breeding season occasionally gathers in larger numbers.
Breeding. Season May–Jul. Nest a small, compact cup of dry grass, plant fibres, roots and strips of bark intertwined with dense foliage, placed up to 3 m above ground against trunk of tree or in dense bush. Clutch 3–5 eggs, pale azure-blue with scattered spots of blackish-purple to light purple or greyish-purple; incubation by female, fed on nest by male; nestlings fed by both sexes. No further information.
Movements. Migratory. Nominate race migrates between S and SSW to winter quarters in S China and Taiwan, also regular passage migrant and winter visitor in S Japan, scarce and local visitor to Hong Kong; departs from breeding areas between mid-Aug and mid-Sept, arrives in wintering area late Aug to Nov; return from early May, passage through S Ussuriland mid-May to early Jun, and present in breeding area in Korea May to early Oct. Race *sowerbyi* less well known; migrates to non-breeding quarters in S China (Yunnan). Vagrant in N Myanmar, EC Thailand, N Laos and N Vietnam (E Tonkin). Individuals recorded in Europe (Faeroes, Sweden and Germany) considered to have originated from captivity.
Status and Conservation. Not globally threatened. Locally common to scarce or irregular. Has bred in SC Japan (Kyushu); recently (2003) bred in Hong Kong; presumed to have bred in 2007 in Taiwan, where juveniles present in summer on Kinmen I (situated off Chinese Fujian coast). This species is widely trapped for the cagebird trade in China.
Bibliography. Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gore & Won Pyong-Oh (1971), MacKinnon & Phillipps (2000), McKay & Peng Yiwen (2007), Meyer de Schauensee (1984), Robson (2000), Stepanyan (2003), Vaurie (1956b, 1959).

137. Japanese Grosbeak

Eophona personata

French: Gros-bec masqué **German**: Maskenkernbeißer **Spanish**: Picogordo Japonés
Other common names: Japanese/Masked Hawfinch, Masked/Black-headed Grosbeak

Taxonomy. *Coccothraustes personatus* Temminck and Schlegel, 1845, Japan.
Two subspecies recognized.
Subspecies and Distribution.
E. p. magnirostris E. J. O. Hartert, 1896 – breeds Russian Far East (E Amurland and S Ussuriland), Sakhalin I and NE China (N & E Heilongjiang and E Jilin); winters in S China (Guizhou E to Fujian).
E. p. personata (Temminck & Schlegel, 1845) – breeds N & C Japan (Hokkaido and N Honshu); winters S to S Japan.



Descriptive notes. 18–23 cm; male 65–99 g. Large and large-billed grosbeak with long forked tail. Male nominate race has forehead to upper nape, side of crown, cheek and chin black, narrowly bordered by whitish-grey, forehead and crown glossed blue in fresh plumage; lower nape, side of neck and upperparts pale grey, sometimes tinged buffish, duller grey on uppertail-coverts, longest coverts tipped bluish-black; tail glossy bluish-black, outermost feathers black; upperwing black or bluish-black, inner greater coverts same colour as upperparts or sometimes with buff-brown wash, secondaries edged glossy blue-black, primaries with broad white band half-way along (triangular white patch on closed wing), tertials warm buff-brown, narrowly fringed paler or greyer; underparts pale grey, flanks pale tawny or light rufous-buff, belly to undertail-coverts white; iris dark brown or black; bill bright yellow, sometimes pale brown base; legs straw-yellow to brown or reddish-brown. Female is very like male, but has duller wings, with glossy blue edges of secondaries less extensive. Juvenile is like adult, but duller grey on upperparts and underparts, black on head restricted to lower forehead, lores and base of bill, rest of head and upperparts buff-brown, tinged greyish, thinly or indistinctly streaked blackish on scapulars, upperwing as adult, but tips of median and greater coverts broadly pale yellowish-buff, small whitish patch distally on outer primaries, tertials as on adult or warmer buff-brown. Race *magnirostris* is larger than nominate, slightly larger-billed, paler in general plumage, and white patch in primaries generally smaller. Voice. Song, from mid-Mar to end Jul/early Aug, a series of 4–5 short fluty rising and falling whistles, "tsuki-hi-hoshi", last note usually protracted. Call a short, hard "tak, tak" and a high-pitched "kik" or "kick", given by foraging birds in treetops and in flight.
Habitat. Mixed and deciduous forests and woodlands, including birch (*Betula*) and oak (*Quercus*), occasionally in cedar (*Cedrus*), spruce (*Picea*) and fir (*Abies*), also well-wooded hills, river valleys, edges of cultivation, parks and gardens; mostly in lowlands.
Food and Feeding. Variety of seeds and fruit, including those of cedar, pine (*Pinus*) and birch, also berries; also insects, including beetles (Coleoptera) and caterpillars, mainly in summer. Seeds of Korean pine (*Pinus koraiensis*) important in autumn and winter in parts of range, e.g. Amur basin. Forages in trees, occasionally lower in bushes, where it stays within foliage of canopy and often detected only by contact calls. In pairs and small flocks.
Breeding. Poorly known. Season May–Jul. Nest is described as a large, deep cup made from sticks and twigs, broad grass blades and stems, lined with finer grasses, situated 2–6 m above ground on the branch of tree. Clutch 3–4 eggs, pale blue with fine blackish spots. No further information available.
Movements. Resident and migratory. Race *magnirostris* migrates S & SW during Sept–Nov, occasionally later, in Dec–Jan, passage through S Ussuriland (L Khanka) Sept to mid-Oct, to non-breeding grounds in S & E China W to Guizhou; return N from mid-Mar and early Apr, arriving May–Jun at N end of range; occasional on passage Apr–Jun in S Korea, and scarce passage migrant and winter visitor Hong Kong. Nominate race winters mostly within S Japan (where non-breeders present all year), and occasional or irregular in Korea (Cheju-do), Izu Is and Bonin Is; rare in winter in Taiwan. Vagrants recorded in extreme NE India (E Arunachal Pradesh), S China (Yunnan) and Laos. Individuals recorded in Europe (Britain, Norway, Sweden) considered to have originated from captivity.
Status and Conservation. Not globally threatened. Common or locally common; occasionally abundant. Widely trapped in China, often in large numbers, for the cagebird trade; no information on any possible effect of this on the species' population levels.
Bibliography. Arnaiz-Villena *et al.* (2001), Brazil (2009), Carey *et al.* (2001), Cheng Tsohsin (1987), Choudhury (2006), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gore & Won Pyong-Oh (1971), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Ottaviani (2008), Pilgrim *et al.* (2009), Stepanyan (2003), Vaurie (1959), Williams (2000).

Genus *MYCEROBAS* Cabanis, 1847

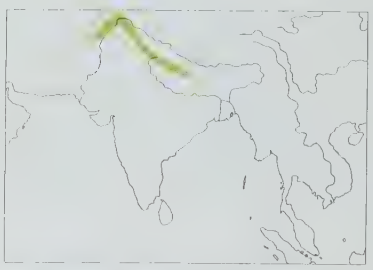
138. Black-and-yellow Grosbeak

Mycerobas icterioides

French: Gros-bec noir et jaune **German**: Goldkernbeißer **Spanish**: Picogordo Negrigualdo
Other common names: Black-and-yellow Hawfinch

Taxonomy. *Coccothraustes icterioides* Vigors, 1831, Simla–Almora district, north-west India.
Monotypic.
Distribution. NE Afghanistan and N Pakistan E in Himalayas to N India (Uttarakhand) and W Nepal.
Descriptive notes. 22 cm; 67 g. Large grosbeak with large head, massive bill and medium-length, notched tail. Male has entire head down to upper nape, upper side of neck and lower throat black, nape to lower rump, lower side of neck and underparts bright golden-yellow; side of mantle, scapulars, wing, uppertail-coverts and tail black; iris reddish to dark brown; bill pale green to yellowish-green; legs pale flesh-brown to reddish-brown. Female has head to upper breast and upperparts pale ashy grey, tinged slightly buffish on mantle and scapulars; lower back and rump pale tawny or light buff-brown with pale grey feather bases, uppertail-coverts pale grey; central tail feathers greyish, outer feathers black; median and greater upperwing-coverts ash-grey, broadly

On following pages: 139. Collared Grosbeak (*Mycerobas affinis*); 140. Spot-winged Grosbeak (*Mycerobas melanozanthos*); 141. White-winged Grosbeak (*Mycerobas carnipes*); 142. Evening Grosbeak (*Hesperiphona vespertina*); 143. Hooded Grosbeak (*Hesperiphona abeillei*); 144. Gold-naped Finch (*Pyrrhoplectes epauletta*).



fringed pale grey, rest of wing blackish-brown, broadly edged pale grey on secondaries and tertials; lower breast and underparts fawn-buff; bill pale green or greyish-green. Juvenile is like female; first-winter and first-summer males have blackish feather tips on head, black wing and tail, blackish-mottled mantle and back, yellow rump and greyish-yellow throat to breast; acquires adult plumage in second winter, bill as on adult female or more horn-coloured. Voice. Song is a rich, rather clear "prr-trweeet-a-troweeet", "tri-a-tr-a i-i-t tra-tr-u-wa-ey", or similarly rich and clear "tookiyu, tookiyu", also a soft and repeated "tir-ir-ir-ir tir-ir-ir-ir" and a loud, ringing disyllabic whistle, "cheek-a-cheek, cheek-a-cheek", occasionally given as a more lively "trekatree trekatree trekup terekup". Call mostly by male, a high-pitched whistled "pi-riu, pir-riu, pir-riu" and a 3-note repeated "tit-te-tew, tit-te-tew" whistle; both sexes also give short "chuck" or "cluck" contact note while foraging.

Habitat. Montane and submontane moist conifer and deodar (*Cedrus deodara*) forest mostly at 1800–3350 m, also oak (*Quercus*) and scrub vegetation at edges of forest or woodlands; in N Pakistan occurs in mixed forests of blue pine (*Pinus wallichiana*) and silver fir (*Abies pindrow*) and spruce (*Picea*); 1800–2400 m in N Pakistan and 2100–3500 m in E Afghanistan. In non-breeding season found in similar habitat or more open woodlands at lower levels, locally down to c. 1500 m, and in severe weather to c. 750 m.

Food and Feeding. Diet includes seeds, buds, shoots and berries of pine, fir, yew (*Taxus*), crab apple (*Malus*), also rose hips (*Rosa*). Occasionally takes insects, including adult and larval moths (Lepidoptera) and cicadas (Cicadidae), latter including cryptically coloured larvae on tree trunks); occasionally also snails and slugs (Gastropoda). Nestlings fed mostly with small insects and larvae. Forages on the ground in bushes and low trees, and in canopy of tall trees, where usually concealed in foliage; in non-breeding season often digs into exposed areas of ground beneath trees and bushes. Generally shy and retiring, but occasionally tame and approachable, and usually detected by ringing calls. In pairs and in loosely scattered flocks; in non-breeding season occurs in small groups of up to ten individuals, but often larger numbers at communal roosts.

Breeding. Season May to early Sept; two broods. Displaying male with body horizontal and wings spread, quivering or fluttering rapidly, perches alongside female and offers her berries from his bill; mating may follow. Nest built by both sexes, majority by female (male presenting nesting material to female as part of pair-bonding process), a large, shallow cup of plant stems, roots and fibres, dried grass, bark strips, pine needles, moss and lichens, on platform of fir twigs, placed up to 20 m above ground and well concealed by overhanging foliage close to trunk of tree, often silver fir. Clutch 2–3 eggs, pale greyish-white to greyish-green, blotched purple and with fine black lines and swirls; incubation by female, period 14–15 days; chicks fed by both parents, no information on duration of nestling period.

Movements. Largely sedentary in N Pakistan. Elsewhere an altitudinal migrant, descending to lower levels in non-breeding season and often present in foothills into late spring and sometimes to early Jun; less frequently in W Nepal where possibly scarce resident.

Status and Conservation. Not globally threatened. Common to locally common. Rare in W Nepal, where possibly breeds, but may be only a scarce non-breeding visitor.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Clement *et al.* (1993), Grimmett *et al.* (1998), Hüe & Etchécopar (1970), Lewis (1993), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Vaurie (1949, 1959).

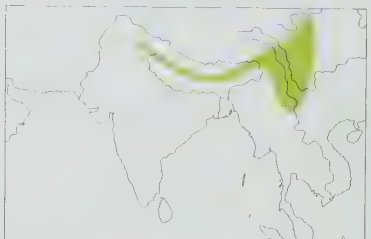
139. Collared Grosbeak

Mycerobas affinis

French: Gros-bec voisin **German**: Gelbschenkel-Kernbeißer **Spanish**: Picogordo Acollarado **Other common names**: Allied Grosbeak

Taxonomy. *Hesperiphona affinis* Blyth, 1855, [probably] alpine Punjab, north India.
Monotypic.

Distribution. Himalayas from NW India (W Himachal Pradesh) E to N Myanmar, and C & S China (SW Gansu S to SE Xizang, W Sichuan and NE Yunnan).



Descriptive notes. 22–24 cm; male 69–72 g, one female 83 g. Large grosbeak with large head, massive bill and short, notched tail. Male has entire head to upper nape, upper side of neck and lower throat black, glossy on crown and face; nape to mantle and lower side of neck yellow, heavily tinged golden-brown, lower mantle and upper back black, broadly streaked yellow, lower back to lower rump deep yellow, tinged golden-brown, uppertail-coverts black; side of mantle to wing and tail black, scapulars and central tail feathers glossy, greater upperwing-coverts and tertials glossy; underparts bright deep yellow; iris reddish-brown to dark brown; bill pale bluish-green, grey or steely grey-blue; legs pale flesh-brown to reddish-brown. Female has head to nape, upper side of neck and lower throat (marginally to centre of upper breast) pale ashy grey, lores slightly darker grey; lower nape and upperparts pale greyish olive-green, sometimes slightly duller olive on mantle and scapulars and paler or brighter green on rump and uppertail-coverts; tail black or blackish-grey; median and greater upperwing-coverts fringed bright olive-green to golden-olive, rest of wing black, broadly edged bright olive-green on secondaries and outer edge of tertials; lower side of neck, side of breast and remaining underparts yellow, sometimes tinged olive-buff; bill as on male or paler green or greyish-green. Juvenile is like female, but much duller, rump more yellowish and centre of throat grey-brown; first-winter and first-summer males closer to adult, but black of head duller and streaked brownish or finely whitish, and yellow on upperparts and underparts paler or flecked with olive. Voice. Song a clear, loud and rising musical or piping whistle of 5–7 notes, "ti-di-li-ti-di-li-um", and a loud series of creaking notes interspersed with musical and bulbul-like (Pycnonotidae) notes, frequently repeated. Call a mellow but rapid "pip-pip-pip-pip-pip-pip-ugh"; alarm or anxiety call a sharp "kurr", often rapidly repeated as a double note.

Habitat. Breeds in lower montane and submontane mixed deciduous and conifer forests, mostly consisting of silver fir (*Abies pindrow*) and hemlocks (*Tsuga*), and conifer stands and woods, also in maple (*Acer*), birch (*Betula*), oak (*Quercus*) and rhododendrons (*Rhododendron*), as well as dwarf juniper (*Juniperus*) above the tree-line; at 2400–4000 m, occasionally to 4200 m in Bhutan. In non-breeding season found in similar habitat at lower levels, to c. 2700 m in Nepal and Sikkim and at 2200–2800 m in Bhutan, occasionally down to 1800 m or, exceptionally, to 1065 m in Nepal.

Food and Feeding. Variety of seeds, including those of pine (*Pinus*), also buds, shoots and fruit, including crab apples (*Malus*) and nuts; in summer takes small insects, larvae and snails (Gastropoda). Forages in upper canopy of trees and lower down in bushes, low vegetation or on the ground. Uses strong bill to extract pine seeds from cones. Forages in pairs and in small, loose or scattered groups; also in larger groups of up to 20 (exceptionally to c. 100) individuals in non-breeding season.

Breeding. Poorly known. Season late Mar to Jul. Displaying pairs follow each other through forest undergrowth while calling loudly. Nest a flat cup mostly of twigs, plant fibres and lichen, placed high up on horizontal branch in tall conifer. No further information.

Movements. Dispersive and altitudinal migrant. In post-breeding period wanders or disperses over long distances within range, some moving to somewhat higher altitudes. In subsequent non-breeding season descends to lower levels within breeding range, exceptionally to as low as 1065 m (in Nepal), and occurs more widely within NE Myanmar. In Bhutan, most numerous on passage to higher-altitude breeding areas during Mar–May, and lower levels of wintering area deserted by mid-May. Vagrant in NW Thailand.

Status and Conservation. Not globally threatened. Varies from locally common to uncommon or scarce.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Etchécopar & Hüe (1983), Feijen & Feijen (2008), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1959).

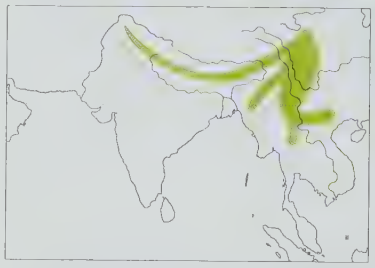
140. Spot-winged Grosbeak

Mycerobas melanozanthos

French: Gros-bec à ailes tachetées **German**: Fleckenkernbeißer **Spanish**: Picogordo Alimoteado

Taxonomy. *Coccothraustes melanozanthos* Hodgson, 1836, Nepal.
Monotypic.

Distribution. NE Pakistan (Murree Hills) E in Himalayas to NE India (E & S Assam, Arunachal Pradesh, and E & S Assam and Nagaland), S China (SE Xizang, W Sichuan and NW & W Yunnan), W, N & NE Myanmar, NW Thailand, N Laos and NW Vietnam (W Tonkin).



Descriptive notes. 22–23 cm; 50–74 g. Large grosbeak with large head, massive bill and short, notched tail. Male has entire head to central upper breast and upperparts slate-black with paler or glossy grey feather tips (in fresh plumage may show white tips on mantle and inner scapulars); tail and wing black, greater coverts broadly (on inners) tipped pale cream or pale yellow, outer edge of tips of secondaries and outer web of tertials yellowish-white, small white patch at base of primaries (usually more obvious in flight); underparts bright or deep yellow; iris dark brown; bill leaden blue-back; legs pale grey or dark bluish slate-grey. Female is heavily streaked yellow and black on forehead to crown, side of neck and upperparts; side of mantle, scapulars, rump and uppertail-coverts dark slate, finely fringed paler buffish or yellowish, tail black, finely edged dull yellow; wing as on male, but with greyer edges and pale yellow tips on median coverts; long, broad supercilium yellow (sometimes finely flecked or streaked blackish), broad black eyestripe, cheek and lower ear-coverts yellow, finely streaked blackish; narrow moustachial stripe (to side of neck) black, broad yellow submoustachial stripe and blackish malar stripe to side of lower throat; throat and underparts deep yellow, broadly streaked black on breast, flanks and side of belly; bill slate-blue. Juvenile and first-winter are like female, but duller or more mottled paler yellow or buffish, scapulars and lower back to uppertail-coverts fringed olive, underparts pale whitish-yellow and more heavily or continuously streaked black; first-summer male similar to juvenile, but throat and upper breast tinged variably warm buff, reddish or rufous-brown. Voice. Song a loud, 3-note melodious whistle, "tew-tew teeeu", sometimes "tyiuu, tyiuu", falling in pitch and repeated up to three times in fairly quick succession; also several more melodic or mellow whistles, including a soft piping "peu", a repeated "peu peu", a higher-pitched "pee-ee", "tyop-tiu" or "tyu-tio" and a rising and emotive "ah". Call a soft "kiup" and a rattling "krrrr" or a drier and slightly more drawn-out grating "charrarauuu" reminiscent of call of Fieldfare (*Turdus pilaris*); foraging groups and communally roosting birds maintain a constant cackling chorus.

Habitat. Breeds in lower montane and submontane mixed and evergreen forests, mostly of fir (*Abies*) and birch (*Betula*), hemlock (*Tsuga*) and maple (*Acer*), principally at 2400–3600 m; down to 1400–1800 m in Thailand and to c. 1000 m in summer in Bhutan. In non-breeding season in similar habitat, but also in deciduous forest, at lower levels; 1400– 2135 m in Nepal and down to c. 1200 m, occasionally to 900 m, elsewhere in Himalayas and as low as c. 600 m in Bhutan; down to 300 m in Indochina.

Food and Feeding. Diet consists of seeds and berries, including those of cherry (*Prunus*) and *Myrica*, (fruit pulp of which it discards, eating only seeds), also berries of *Viburnum*; also buds of deodar (*Cedrus deodara*) and seeds of maple. Forages mostly in trees, low down in bushes and on ground; occasionally tame and approachable, but also shy and unobtrusive, spending long periods perched almost motionless. Noisy when feeding on fruit in trees, cracking open stones and dropping outer seed cases on to ground. Forages in pairs and small groups; in non-breeding season and prior to moving back to breeding area, gathers in larger groups of up to c. 100 individuals.

Breeding. Poorly known. Season May–Jul. Nest (only one described) a woven platform of fir twigs supporting cup of plant fibres, roots, fern stems and moss, placed up to 5 m from ground on horizontal branch in conifer or yew (*Taxus*). Clutch 2–3 eggs, pale green with reddish-brown blotches and fine blackish lines; incubation by female alone. No further information.

Movements. Poorly known; probably a nomadic altitudinal migrant. Those breeding in Murree Hills (Pakistan) move E with onset of severe winter weather; also descends to lower elevations in Himalayas and elsewhere. In C Nepal regular but uncommon in winter in Kathmandu Valley; in Bhutan arrives at lower levels of wintering area during Oct–Nov and present until mid-Apr or May, occasionally to early Jun.

Status and Conservation. Not globally threatened. Local, and uncommon to scarce. Scarce in N Pakistan, breeding only erratically in Murree Hills, occasionally N into Galis. Uncommon in S China. Generally uncommon in SE Asia; irregular in N Laos (reported as regular in summer in 1940s).

Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Duckworth *et al.* (1998), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), Lekagul & Round (1991), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Ottaviani (2008), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Spierenburg (2005), Vaurie (1949, 1956b, 1959).

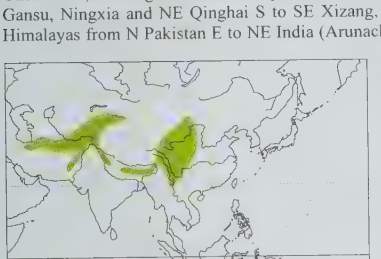
141. White-winged Grosbeak

Mycerobas carnipes

French: Gros-bec à ailes blanches **Spanish**: Picogordo Aliblanco
German: Wacholderkernbeißer

Taxonomy. *Coccothraustes carnipes* Hodgson, 1836, Nepal.
Geographical variation slight and clinal, with a certain increase in size and in plumage darkness moving from W to E. Birds from Kashka-suu, in N Kyrgyzstan, described as race *merzbacheri*, but differences from nominate considered trivial; synonymized with latter. Two subspecies currently recognized.

Subspecies and Distribution.
M. c. speculigerus (J. F. Brandt, 1841) – N & NE Iran and S Turkmenistan E to NW & EC Afghanistan and W Pakistan (Baluchistan).
M. c. carnipes (Hodgson, 1836) – E & SE Kazakhstan (Dzhungarian Alatau and Tien Shan) S to E Uzbekistan, NE Afghanistan and Tajikistan, W, C & S China (SW Xinjiang; S Inner Mongolia, Gansu, Ningxia and NE Qinghai S to SE Xizang, NW Yunnan, S Sichuan and S Shaanxi), and Himalayas from N Pakistan E to NE India (Arunachal Pradesh) and N Myanmar.



Descriptive notes. 22–24 cm; 50–66 g. Large, heavy-bodied grosbeak with short wing and longish, relatively slender tail. Male nominate race has head to upper back and to lower breast sooty black or blackish-grey, scapulars black with dull yellow tips on rearmost feathers (in fresh plumage); lower back and rump dull yellow, uppertail-coverts black or blackish with dull yellow tips; tail and wing black, tips of inner greater coverts deep yellow, bases of outer primaries white (forming small square patch on closed wing, short wingbar in flight), dull yellow on distal part of outer edges of tertials; belly and flanks to undertail-coverts dull yellow; iris dark brown; bill dark grey or blackish-horn, paler base of lower mandible; legs pale brown to pinkish-brown. Female has head to lower back slate-grey (may show black feather bases), rump dull yellow or olive-yellow, uppertail-coverts dark grey, fringed dull yellow; tail black or blackish-grey; wing as on male, but blackish-grey (not black), inner greater coverts tipped pale olive-yellow, flight-feathers finely edged olive-yellow, white patch at base of outer primaries smaller, tertials edged pale yellow or yellowish-buff and tipped paler greyish-white; face and underparts slightly paler grey, finely streaked whitish on cheek, ear-coverts and throat to centre of breast; belly greyish-yellow, becoming yellowish-olive on undertail-coverts; bare parts much as for male. Juvenile is like female, but browner, with pale feather tips on head and upperparts, median and greater upperwing-coverts brown, tipped olive-yellow; first-winter more similar to adult female (without pale tips); first-summer male also like female, but with olive wash on mantle, upper back and wing-coverts, brighter yellow rump and uppertail-coverts, and patches of dark grey and dull whitish spots on throat and breast. Race *speculigerus* is slightly smaller than nominate, upperparts more slate-grey, less intensely black, female paler grey above and below. Voice. Noisy and extremely vocal; most calls given from fairly high perch, occasionally near ground. Calls of male include low-pitched, grating "goink" and more rapid and harsh "chet-et-et-et" or "chet-tet-tet-tet", female similar but harsher and usually concludes with rattling "chitititititit"; also soft nasal "shwenk" or "chwenk" and more strident "wit" or "wet", latter sometimes extended into "wet-et-et" or rhythmic "add-a-dit" phrase and frequently repeated. Song, rarely heard, a longer sequence of grating calls, usually in melodious piping sequence and continuing into "add-a-dit-di-di-di-dit" or "dja-dji-dji-dju".

Habitat. Submontane and montane juniper (*Juniperus*) and spruce (*Picea*) forest, mixed fir (*Abies*) and deciduous forest with rhododendron (*Rhododendron*), dwarf juniper and bamboo, also sparse bushes and scattered scrub on slopes at or above tree-line; In N Pakistan found principally in junipers, including patches of dwarf or creeping juniper and juniper scrub along tree-line. Breeds at 1900–3000 m in Kazakhstan, to 4260 m in Himalayas (usually higher E of Himachal Pradesh) and to 4600 m in NW China. In non-breeding season in similar habitat at lower levels in foothills and adjacent plains; down to 2800 m in China, usually down to 1000 m in C Asia, and exceptionally down to 1500 m in Himalayas after severe cold weather. Recorded at 1100 m in Jul in Bhutan.

Food and Feeding. Mostly juniper berries (with pulp discarded), also berries of dogwood (*Cornus*), also seeds of spruce and mountain ash (*Cerasus*), rose hips (*Rosa*), docks (*Rumex*) and strawberries (*Fragaria*). Nestlings fed with juniper seeds and bark-dwelling weevils (Curculionidae), Orthoptera larvae and leafhoppers (Cicadellidae). Forages on the ground, often spending long periods in one area; also in low bushes and in trees. When disturbed from ground, flies to top of nearby tree before returning to feeding area; also spends long periods inactively perched on secluded or open branch. A noisy feeder; uses large bill to break open hard shells, and drops shell and pulp to ground. Usually in pairs or in small to medium-sized flocks of up to 90 individuals; in non-breeding season often in mixed foraging flocks with other finches, including *M. melanozanthos* and *Carpodacus rhodochlamys*.

Breeding. Season May–Sept. Monogamous. Solitary. Nest built by female, a loose or bulky cup of fine twigs, plant stems and fibres, juniper bark strips and grass, on a platform of twigs, placed up to 2 m (sometimes to c. 20 m) above ground and well concealed by surrounding foliage in spruce or juniper tree, sometimes other tree. Clutch 2–3 eggs, exceptionally 4–5, dull white, marbled with violet and dark brown blotches, spots and lines; incubation by both sexes, mainly by female, period 15–16 days; nestling period 17–18 days; young fed by parents for at least one week and possibly for up to two months after leaving nest.

Movements. Partial altitudinal migrant. Some from higher areas descend to 1000–2400 m in non-breeding season between Nov and Apr, and usually most numerous at lower levels in late winter (late Feb to Apr) in years when conifer crop poor or fails; in Himalayas exceptionally down to 1500 m, but many sedentary at high altitudes (to 4200 m) unless winter weather particularly severe. Irregular non-breeding visitor to Adung Valley, in N Myanmar.

Status and Conservation. Not globally threatened. Common to locally common in most of range.

Bibliography. Ali & Ripley (1983), Arnaiz-Villena *et al.* (2001), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Hüe & Étchécopar (1970), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Spierenburg (2005), Stepanyan (2003), Vaurie (1949, 1956b, 1959), Wassink & Oreel (2007).

Genus *HESPERIPHONA* Bonaparte, 1850

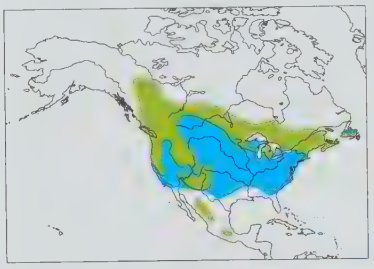
142. Evening Grosbeak

Hesperiphona vespertina

French: Gros-bec errant **German**: Abendkernbeißer **Spanish**: Picogordo Vespertino

Taxonomy. *Fringilla vespertina* W. Cooper, 1825, Sault Sainte Marie, Michigan, USA.
Geographical variation slight. Other proposed races in USA are relatively somewhat shorter-billed *californica* (described from Crane Flat, in Yosemite National Park, in east California) and narrow-billed *warreni* (from Bear Creek, near Colorado Springs, in C Colorado), both a little paler than, but synonymized with, *brooksi*; some vocal differences apparent, however, and further research required. In Mexico, proposed race *mexicana* (from Las Vigas, in Veracruz), is considered inseparable from *montana*. Three subspecies recognized.

Subspecies and Distribution.
H. v. brooksi Grinnell, 1917 – breeds W Canada (E & S British Columbia) and W USA (S to NW & EC California, and from W Montana and W Wyoming S to C Colorado, also C Arizona and CS New Mexico); winters to SW USA (S California E to SW Texas).
H. v. vespertina (W. Cooper, 1825) – breeds C & E Canada (Alberta E to S Newfoundland, New Brunswick and Nova Scotia) and NE USA (Maine); winters throughout C & E USA S to Texas and N Florida.
H. v. montana Ridgway, 1874 – extreme SW USA (SE Arizona) and interior W & S Mexico (Sierra Madre Occidental S to Michoacán; Hidalgo S to N Oaxaca).



Descriptive notes. 18–21·5 cm; 51·1–71·7 g (Pennsylvania). Large, large-billed, plump grosbeak with short, slightly notched tail. Male nominate race has feathering at base of upper mandible, lores, cheek and narrow eyestripe black or blackish; forehead and supercilium bright yellow, tapering at rear of ear-coverts, crown to nape blackish or blackish-brown, merging into yellowish or bright olive-brown on mantle and upper back, side of neck and face; scapulars, lower back and rump bright yellow, uppertail-coverts black, finely fringed yellow; tail and wing black, inner greater coverts, inner secondaries and tertials white or creamy and finely edged pale yellow; throat and breast same colour as side of neck, becoming yellow on side of lower breast, and flanks and belly to undertail-coverts bright yellow, tinged brownish on flanks; iris dark brown; bill pale greenish-yellow (summer) or off-white to buffish-horn; legs flesh-pink or brownish. Female has pale grey or greyish-brown head (narrow black band at base of upper mandible), ear-coverts often washed yellowish, slightly darker or greyer on lores, and short pale or off-white supercilium; nape and side of neck pale yellow; upperparts pale grey or greyish-buff, washed yellowish, lower back and rump paler buffish, uppertail-coverts and tail black, broadly tipped white; wing black, median and greater coverts edged pale grey, but inner greaters and bases of primaries white, small white patch at base of outer primaries, inner secondaries broadly edged white at tips and tertials largely pale grey on tips and on outer webs (in flight shows as broad broken wingbar) with narrow white fringing; chin and throat white, sometimes a short blackish malar stripe, underparts peach-buff, tinged yellow, or greenish-yellow on flanks, and vent to undertail-coverts white; bare parts much as for male. Juvenile is like female, but duller or tinged more olive-green on head and upperparts, rump pale brown, uppertail-coverts blackish, tipped browner, wing brown or blackish-brown, inner greater coverts and primaries forming pale lemon-yellow panel (less extensive on juvenile female, which also has small white patch at base of primaries, absent on same-age male), tertials paler buffish, underparts slightly paler or more yellow than adult (more yellow on throat of juvenile male than same-age female), juvenile male also lacks white tail tips; first-summer male more like adult, but head and upperparts tinged greenish or duller yellow, yellow forehead finely streaked darker, and tertials dull pale brown with dark central shaft stripe. Race *brooksi* has slightly longer bill than nominate, male with narrow band on forehead, female and immature male with upperparts mid-brown (not greyish), tinged buff; *montana* is like previous, but upperparts of female and immature paler buff-brown. Voice. Song a rambling or erratic series of uneven musical warbling notes, usually concluding with short whistle. Call a loud, sharp "cleer", "cleep" or "peeer" and a soft clicking or chattering note.

Habitat. Breeds in mature conifer woods of fir (*Abies*) and spruce (*Picea*), also mixed spruce, fir, pine (*Pinus*) or hemlock (*Tsuga*) and deciduous forests, principally in pine–oak (*Pinus–Quercus*), also spruce or juniper–aspen (*Juniperus–Populus*) forests; apparently has preference for open-canopy mixed–conifer areas; also edges of forest, parks, orchards and small copses, and often in forests of jack pine (*Pinus banksiana*) during outbreaks of spruce budworm (*Choristoneura*); occurs to c. 2700 m in Canada and SW USA. In Mexico breeds in ponderosa pine (*Pinus ponderosa*) and pine–oak woods at 1500–3000 m. In non-breeding season occupies similar habitat and found also in suburban parks and gardens.

Food and Feeding. Mostly seeds of trees, shrubs and other plants; also some insects and larvae. Seeds, buds and flowers include those of maple (*Acer*), particularly box maple (*Acer negundo*) in Canada, also willow (*Salix*), oak, aspen, ash (*Fraxinus*), cherry (*Prunus*), apple (*Malus*), tulip poplar (*Liriodendron*), elm (*Ulmus*), pine, dock (*Rumex*), bindweed (*Polygonum*) and goosefoot (*Chenopodium*); berries include those of ash, cherry, crab apple (*Malus*), snowberry (*Symphoricarpos*), hawthorn (*Crataegus*), Russian olive (*Eleagnus*), juniper; also ripe and unripe cones of bald cypress (*Taxodium distichum*), also maple sap, and at feeders takes seeds of sunflow-

ers (*Helianthus*). Insects taken include beetles (Coleoptera), aphids (Aphidoidea), and larvae and pupae of spruce budworms. In summer, especially in areas of spruce budworm infestation, diet may consist solely of invertebrates and larvae; conversely, winter diet can consist almost entirely of tree seeds. Forages on the ground for fallen seeds and fruit, and turns over leaves and stones in search of insects; takes salt and minerals from roadsides and areas of mineral-rich soil. Also forages in outer branches of trees; sometimes pursues and catches insects in flight. Removes fleshy parts of fruit in bill and cracks seeds open before swallowing; also forages for and eats seeds after fleshy parts removed by other birds. In pairs, family groups and small flocks.

Breeding. Season Apr–Jul; usually one brood, in Colorado sometimes two. Monogamous; exceptionally polygamous. Pair formation usually takes place before break-up of winter flocks, sometimes in breeding area. Displaying male crouches on ground, breast feathers fluffed out, wings outspread and fluttered or slightly quivering, head held back and bill pointing skywards, and often swivels body back and forth and raises crest; female begs food with head outstretched, wings fluttered and tail spread; courtship-feeding of female by male continues until after young have left nest. Nest built by female, accompanied by male, a flat and loosely constructed saucer (eggs often visible from below) of small twigs, plant fibres, roots, grasses, lichens, moss and pine needles, placed 5–35 m above ground against trunk, in fork or up to 3 m from trunk along horizontal branch of tree or large shrub. Clutch 2–5 eggs, pale blue to bluish-green with brown or purple blotches and scrawled lines; incubation by female, period 12–14 days; chicks fed and cared for by both parents, majority of food brought by female, nestling period 13–14 days; fledglings remain within vicinity of nest for up to 5 days. Of 64 nests in Colorado study, 35 (55%) produced at least one young (average of 2·9 nestlings per successful nest), 4 failed at building stage, 16 during incubation and 9 during brooding of young; failures due mostly to avian predators, abandonment of nest (during building) and poor weather; predators of eggs and young include Sharp-shinned Hawk (*Accipiter striatus*) and Cooper's Hawk (*Accipiter cooperii*), Northern Goshawk (*Accipiter gentilis*), Mountain Pygmy-owl (*Glaucidium gnoma*), Common Raven (*Corvus corax*) and Great Grey Shrike (*Lanius excubitor*). Maximum recorded longevity 15 years 3 months.

Movements. Migratory, altitudinal migrant, nomadic and occasionally irruptive. Diurnal migrant, often moving at considerable height; occasional nocturnal migrant. Departs from breeding areas between early Jul and end Oct/Nov, adults about two months ahead of immatures, which remain in natal area to about mid-Sept. Reaches wintering areas in N & NE USA from early Sept, with peak arrival end Oct; main arrival period in NC USA mid-Oct to mid-Nov, with occasional later arrivals in Jan and Feb; recorded Florida from early Jan. In W & WC USA races *brooksi* and *montana* present in lower-level wintering areas between Nov/early Dec and May, with highest numbers Jan–Mar; often present at high elevations in New Mexico until Feb/Mar, when moves to lower areas, often remaining there to early Jun. Returns to breeding areas between Mar and May, most movement in early May; departs from wintering areas farthest S, e.g. Florida, by mid-Mar. Nominate race occasionally or irregularly irruptive, mainly in late winter in response to poor (or exhausted) food supply, usually cone crops in N parts of winter range; irruptive movements often in association with other finches, including *Loxia curvirostra* and *Carduelis pinus*. Prior to 1980s was more irruptive than in recent decades, e.g. in early 1940s irruptions in Great Lakes area of NC USA occurred at intervals of 2–3 year and in New York state during 1960–1980 regularly every two years, but significant decline since 1980s, with scale of such movements much smaller and less frequent. Wintering distributions differ between sexes, males more numerous in E Canada and NE USA and females more numerous farther S (numbers of females increase with returning birds arriving in Mar), and males in E of range winter farther N than do those wintering in NC USA; reasons for differentiation unclear, possibly related to cone crops or the fact that males, being larger than females, are more adapted to colder winter temperatures and occasional food shortages. Scarce or irregular visitor to SE Alaska, S Mackenzie, N Newfoundland and Bermuda; vagrant in British Is and Norway.

Status and Conservation. Not globally threatened. Common to locally common; until recently was locally abundant, but has undergone rapid and serious decline since last years of 20th century. Prior to 1920s was distributed primarily across W USA, but subsequently spread rapidly E in narrow band across C Canada, reaching Atlantic coast on Cape Breton I, in Nova Scotia. In contrast, has recently been found to be decreasing in numbers and range across North America: for example, by 2006 had disappeared from 50% of sites at which it was reported in 1988, and average flock size fell by 27% at sites where the species continued to be recorded; reasons for this unexpected change in the species' situation are not known, but habitat simplification and chemical control of spruce budworm have been suggested.

Bibliography. Arnaiz-Villena *et al.* (2001), Balph & Balph (1976), Balph & Lindahl (1978), Bekoff (1995), Bekoff & Scott (1989), Bekoff *et al.* (1987, 1989), Bennetts & Hutto (1985), Blais & Parks (1964), Bock, C.E. & Lepthien (1976b), Bock, W.J. (1966), Clement *et al.* (1993), Coues (1879), Cramp & Perrins (1994), Farrand (1992), Fast (1962), Fee & Bekoff (1986), Gillihan & Byers (2001), Gobeil (1963), Godfrey (1986), Grinnell (1917), Hagar *et al.* (1996), Hejl & Woods (1991), Hess (2009a), Howell, S.N.G. & Webb (1995), Howell, T.R. *et al.* (1968), Magee (1934), Mitchell (1952), Newton (1972), Parks & Parks (1963), Peck & James (1987), Prescott (1992, 1994), Pyle *et al.* (1997), Scott (1990), Scott & Bekoff (1991), Shaub, B.M. & Shaub (1950, 1958), Shaub, M.S. (1954, 1956, 1963), Sibley (2000), Speirs (1968), Vincent (1996), Yunick (1977, 1983b).

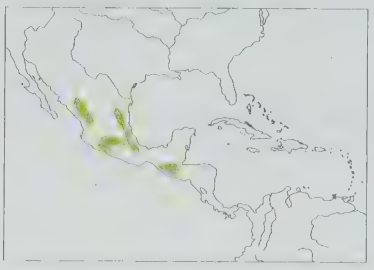
143. **Hooded Grosbeak**

Hesperiphona abeillei

French: Gros-bec à capuchon **German**: Kapuzenkernbeißer **Spanish**: Picogordo Encapuchado
Other common names: Abeille's Grosbeak

Taxonomy. *Guiraca abeillei* Lesson, 1839, Mexico.
Four subspecies recognized.
Subspecies and Distribution.
H. a. pallida Nelson, 1928 – NW Mexico (S Chihuahua, Sinaloa and Durango).
H. a. saturata Sutton & Burleigh, 1939 – NE Mexico (E San Luis Potosí and SW Tamaulipas).
H. a. abeillei (Lesson, 1839) – C & S Mexico (Guerrero, and Michoacán E to Veracruz and N Oaxaca)
H. a. cobanensis Nelson, 1928 – S Mexico (SE Chiapas) E to SW Guatemala.

Descriptive notes. 16–18·5 cm; c. 46–50 g. Fairly large, large-billed, plump grosbeak with short, slightly notched tail. Male nominate race has entire head to nape, side of neck, chin and throat black, upperparts bright yellow, tinged olive, uppertail-coverts yellow, tipped black, rearmost feathers black; tail and wing black, inner greater coverts and tertials pure white or edged yellowish; underparts entirely bright yellow; iris black; bill pale greenish-yellow; legs pale flesh or pinkish-brown. Female has forehead to crown and nape black, lores and area around eye blackish, lower face pale greenish-buff, finely streaked darker; lower nape to side of neck and upperparts light olive-green, tinged yellowish, rump and uppertail-coverts paler yellowish, longest coverts tipped whitish; tail black, outer feathers tipped whitish; wing as on male, but inner greater coverts and tertials pale grey, small white square at base of primaries; chin blackish; throat and underparts pale buffish, tinged yellowish on breast, with vent and undertail-coverts pale buffish-brown; bare parts much as for male. Juvenile resembles female, but face brighter yellow, juvenile male with bright yellow on inner greater coverts, dark inner edge of tertials and brighter yellow underparts than adult female. Race *pallida* male is paler or greyer than nominate, has upperparts dull grey-brown, and undertail-coverts whitish or pale lemon-yellow, female also paler than nominate, has tail entirely black, lacks greenish-yellow tinge on breast; *saturata* is dullest and greyest race, has less yellow above and below than nominate, also shorter-tailed than previous, inner web of outermost tail feather tipped white, female duller and greener above than nominate; *cobanensis* has larger and broader bill than nominate, male brighter yellow, especially on breast, paler undertail-coverts, tertials whiter, female more strongly buffish-brown, side of neck and breast suffused with yellow. Voice. Call is "beebink" or a disyllabic "bree-bink" or "bre-bruk", also utters a sharp "beet beet" and loud "clew-clew" or "tyew-tyew", together with a single "clee" and a harsh "jerr". Song is a continuation of or variation on the call notes, including "be-be jerr chee" or "be-be chee" and a buzzing "wij-ee-er-tee" or "wheirr whrr" with final syllables rising, also "beehn beehn bee-beihr", and "bee-bink-beeaw" with last note descending and fading.



Habitat. Inhabits submontane and lower montane deciduous forest, pine–oak (*Pinus–Quercus*) forest, also humid or moist oak woods, edges of cultivation, orchards, parks and gardens; at 1000–3350 m.

Food and Feeding. Mostly seeds, buds, berries and fruit. Forages unobtrusively in upper and canopy levels of trees, sometimes on exposed perches at top of trees. In pairs and in scattered flocks of up to 50 individuals.

Breeding. Nest reported to be situated at middle to upper levels in trees. No other verified information available.

Movements. Resident or partially nomadic; small numbers wander to lower-level foothills and valleys in non-breeding season.

Status and Conservation. Not globally threatened. Comparatively poorly known species. Locally common to uncommon or rare.

Bibliography. Arnaiz-Villena *et al.* (2001), Clement *et al.* (1993), van Daele (1975), Howell & Webb (1995), Nelson (1928), Sutton & Burleigh (1939).

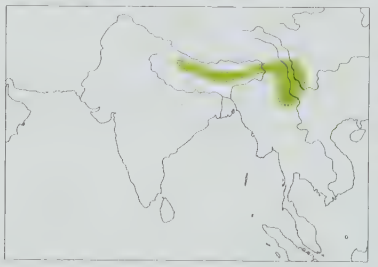
Genus *PYRRHOPLECTES* Hodgson, 1844

144. **Gold-naped Finch**

Pyrrhoplectes epauletta

French: Pyrrhoplecte à nuque d'or **German**: Goldnackengimpel **Spanish**: Pinzón Nuquigualdo
Other common names: Gold-headed (Black) Finch, Golden-headed Finch, Gold-crowned Black Finch, Epaulet(ted) Finch

Taxonomy. *Pyrrhula epauletta* Hodgson, 1836, northern and central Nepal.
Recent analysis of mitochondrial DNA suggests close relationship with *Pyrrhula*. Monotypic.
Distribution. From W Nepal E in Himalayas to NE India (Arunachal Pradesh), S China (SE Xizang, SW Sichuan and NW Yunnan) and NE Myanmar.



Descriptive notes. 13–15 cm; 19 g. Fairly small, slender, short-winged finch with slightly notched tail. Male is almost entirely jet-black, except for bright orange hindcrown and nape; upperwing more glossy black, inner edges of tertials white (forming two short parallel lines); underparts slightly duller or dark grey, feathers of lower flanks and side of lower belly tipped orange to rufous-brown; axillaries rufous-orange (often appearing as deep orange patch at side of breast beside bend of wing), underwing-coverts white; iris and bill black; legs dark grey or pinkish-grey. Female has hindcrown and nape to ear-coverts olive-green, flecked darker or finely blackish, forecrown to cheek grey, flecked darker, side of neck, mantle and upper scapulars deep grey, lower scapulars and back to uppertail-coverts warm brown or chestnut; tail dark brown; upperwing-coverts same colour as scapulars and with blackish bases and slightly paler or warmer brown tips, alula and primary coverts blackish-brown, flight-feathers black, outer web of tertials same as scapulars, shafts blackish and inner webs white; throat and underparts entirely chestnut or cinnamon-brown, underwing-coverts white; bare parts much as for male. Juvenile is similar to female, but duller, more dusky brown; first-winter male also like adult female, but upperparts darker chestnut, nape may be flecked with yellow-orange, underparts as on adult but flecked with blackish; first-summer like adult, but may show partial juvenile plumage in early summer. Voice. Song a rapid and high-pitched "pi-pi-pi-pi", as well as a soft, low, piping "teu" similar to that of *Pyrrhula pyrrhula*. Call a distinctive, thin and high-pitched piping whistle given repeatedly, "teeu", "tseu" or "peeuu", also "pur-lee" and squeaky "plee-e-e".

Habitat. Dense undergrowth and edges of submontane oak (*Quercus*) and rhododendron (*Rhododendron*) forest, also rhododendron thickets and scrub in mixed deciduous forest, ringal (dwarf) bamboo and patches of scrub, and nettles (*Urtica*); at 2800–4000 m, down to 1850 m in Bhutan, and at 1700–2135 m in N Myanmar. In non-breeding season found in similar habitats at lower levels, 1400–3300 m, possibly slightly lower in Bhutan.

Food and Feeding. Variety of seeds, including those of nettles, also buds, berries; also small insects. Forages unobtrusively on ground, in low vegetation and dense undergrowth, occasionally venturing into open at edges of forest or thickets; often sits motionless in bushes. Singly, in pairs and in small groups of up to five individuals, exceptionally to c. 20; in non-breeding season often in mixed foraging flocks with other forest-dwelling seed-eaters, including *Propyrrhula subhimachala* and *Carpodacus nipalensis*.

Breeding. Adults carrying nesting material in Mar. In Nepal, thought to nest in rhododendrons. No further documented information.
Movements. Resident and short-distance altitudinal migrant, but scale of movements not well known. Those in highest areas of range descend or disperse to lower elevations in Oct–Nov; reaches lowest levels of wintering range in Mar and Apr, prior to returning to breeding area from mid-Apr; occasional around Kathmandu Valley in winter, and scarce late-winter visitor to lower levels of NE Myanmar. Vagrant in Meghalaya, in NE India.

Status and Conservation. Not globally threatened. Locally common to uncommon or rare. Four singing males located along 1 km of trail in Bhutan suggests possibly fairly high densities in parts of breeding range.
Bibliography. Ali & Ripley (1983), Cheng Tsohsin (1987), Clement *et al.* (1993), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Inskipp *et al.* (2000), King *et al.* (1975), Ludlow & Kinnear (1937), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Nguembock *et al.* (2009), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Spierenburg (2005), Vaurie (1959).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family DREPANIDIDAE (HAWAIIAN HONEYCREEPERS)



- Small to medium-sized passerines with very varied morphotypes; some dull olive-green, others bright red or yellow.
- 10–19 cm.



- Hawaiian Islands.
- Wet and dry forest, and atoll vegetation.
- 15 genera, 23 species, 24 taxa.
- at least 18 species threatened; 3 of these, and 3 currently unassessed species, possibly extinct; at least 16 other species extinct since 1600.

Systematics

The Hawaiian honeycreepers evolved in the isolation of the Hawaiian archipelago from a single ancestral colonist, almost certainly a cardueline finch resembling modern-day redpolls, goldfinches and siskins (*Carduelis*), the Pine Grosbeak (*Pinicola enucleator*) or possibly even a crossbill (*Loxia*). This evolutionary origin is clearly indicated by studies of morphology, osteology, behaviour and genetics, but consensus came only recently. When these birds first became known to scientists of the late eighteenth century, they were so diverse that they were initially distributed among several different avian families. In the 1890s, R. C. L. Perkins argued that they represented a single radiation, including both finches and thin-billed morphotypes, a view based on a distinctive odour common to nearly all of the species. It is a musty or dusty aroma, mildly unpleasant to some, and well known to anyone who has worked with these birds either in life or as specimens. To date, no similar odour has been reported among cardueline finches, and its adaptive significance remains the subject of speculation. Hawaiian honeycreepers also lack the usual avian predator-response behaviour (see General Habits, Breeding), even though they evolved with a variety of aerial predators. A more tangible character that unites most of the Hawaiian honeycreepers is a unique squaring of the proximal end of the tongue resulting from the loss or reduction of the backward-projecting "lingual wings" present in the tongues of virtually all other passerines, including all cardueline finches. Interestingly, two genera, the parulid-like *Paroreomyza* and the heavy-billed bark-picking *Melamprosops*, lack all three of these uniquely derived features, which led H. D. Pratt to question whether they were honeycreepers at all. However, recent osteological work by R. L. Zusi and H. James, and DNA studies from the Smithsonian Institution laboratory of R. C. Fleischer, indicate that these aberrant genera are, indeed, honeycreepers, but that they are basal in the group; they diverged from the main line of honeycreeper evolution before the appearance of the three shared uniquely derived features (synapomorphies) that define the core clade of Hawaiian honeycreepers.

The family Drepanididae was established largely by default, because the group's relationships were not readily apparent. Scientists such as H. F. Gadow, in the nineteenth century, and D. Amadon, in the mid-twentieth century, concluded that the Hawaiian honeycreepers were related to other nectar-feeding groups, such as the Neotropical "Coerebidae", a purported family that later proved to be a conglomeration of nectar-adapted members of several different taxa. Thus, the finch-like Hawaiian honeycreepers were thought to have evolved convergently from thin-billed ancestors. This view prevailed for decades, despite dissenting voices such as those of P. P. Sushkin, H. B. Tordoff, W. J. Bock and others, who suggested that a finch ancestry was far more likely. Bock pointed out that cardueline finches, well known for their irruptive flights and a penchant for breeding in new areas, were far more likely to have colonized a remote archipelago than were the largely sedentary Neotropical groups that had been suggested as possible ancestors. Eventually, as new evidence from morphology and behaviour emerged, the finch hypothesis gained ground, and by the 1980s was widely, if not universally, accepted. Evidence of the drepanidid–cardueline relationship is now overwhelming, and includes a varied array of synapomorphies.

Sushkin's early support for the relationship was based on his observation that both cardueline finches and Hawaiian honeycreepers, unlike most other passerines, have a solid bony palate. Bock surveyed a cranial feature known as the palatine process of the premaxilla and found that carduelines and Hawaiian honeycreepers shared a unique "lateral flange" condition. Zusi found that both carduelines and drepanidids have a thick, double-walled interorbital septum, the sheet of bone that separates the eye sockets, although it is thinner in some of the thin-billed honeycreepers. In other passerines, including all other "finches", this wall is thin and has one or more openings, known as fenestrae. The only thin-billed passerines having a thick interorbital septum are Hawaiian honeycreepers, indicating that the thin-billed birds evolved from finch-like ancestors. The two aberrant genera mentioned above, *Paroreomyza* and *Melamprosops*, have a thin, fenestrated interorbital septum unlike that of other drepanidids, but the floor of the fenestra is broad and flat, as seen in cardueline finches, rather than narrow, as in other passerines. The flat floor of the cranial fenestra is one of the few osteological features that tie together cardueline finches and aberrant Hawaiian honeycreepers such as *Paroreomyza* and *Melamprosops*.

Bock and R. J. Raikow studied the musculature of carduelines and drepanidids and concluded that the two were generally more similar to each other than they were to any other passerines, and

Raikow discovered some distinctive features of limb musculature that occur only in some members of both groups. Although Amadon thought that the presence in some Hawaiian honeycreepers of a nasal operculum, a flap covering the nostrils of nectarivorous birds, indicated a nectarivorous ancestry, Raikow found that the nostrils of cardueline and drepanidid finches did not differ. Hawaiian honeycreepers resemble cardueline finches in plumage colour and pattern, a few rather outrageous extremes notwithstanding, and both groups lack structural colours, such as blue and iridescent green, and have the same feather pigments. Other suggested ancestors, the "Coerebidae" being an example, are rather strikingly different in coloration, and many display vivid structural colours.

Cardueline finches and Hawaiian honeycreepers are both accomplished singers, and their songs are in some cases amazingly similar, the term "canary-like" having been used frequently to describe some honeycreeper songs. Among their varied calls (see Voice), many Hawaiian honeycreepers utter an upslurred whistle that is very similar to call notes of some carduelines, especially goldfinches and siskins. Breeding biology also reveals some synapomorphies of carduelines and honeycreepers. Both have an unusual mate-centred form of territoriality, and some species in each group are the only passerines that allow dried faecal sacs to accumulate on the outside of the nest, which becomes quite messy by the time when the young are ready to depart from it (see Breeding).

Even the earliest molecular studies, such as those by C. G. Sibley and his colleagues, suggested a cardueline connection for the honeycreepers, and subsequent DNA research in many laboratories has supported the contention that carduelines and drepanidids are closely related. Recently, J. G. Groth's molecular-genetic evidence, along with James's osteological studies, suggested that the honeycreepers are in fact a spectacularly varied clade embedded within the cardueline finches, rather than a sister-group to them. If this placement is upheld by other studies, this distinctive and easily definable group of birds may lose all taxonomic designation and be classified as one clade within the subfamily Carduelinae of the family Fringillidae.

The evolution of the Hawaiian honeycreepers is closely tied to the geological development of the present-day Hawaiian Islands. The archipelago resulted from movement of the Pacific tectonic plate over a mid-ocean hotspot. The magma plume from the hotspot produces volcanoes that eventually break the surface of the sea. As the volcanoes age, and the plate continues to move, connections to the hotspot are broken and a new island begins to form. Fleischer and colleagues have compared the process to a conveyor belt. The oldest Hawaiian islands are at the north-west end of the archipelago, and the youngest at the south-eastern end. As islands age, they not only erode from above, but also subside, slowly sinking from their own weight, until they once again slip below the ocean surface, usually, for a while, leaving a "crown" of coral at the surface as an atoll. Ultimately, the island becomes a submerged seamount. The Hawaiian archipelago runs from north-west to south-east, starting with the Emperor Chain of seamounts, stretching north towards the Aleutians, and then the low Northwestern Hawaiian Islands, mostly atolls or coral islands, some with remnants of the original volcanic base. Two of these, Laysan and Nihoa, harbour endemic honeycreepers. Nihoa is the youngest of the Northwestern Hawaiian Islands, with a noticeably large gap between it and the oldest of the larger islands, Kauai, which is about 5 million years of age. Hawaii, the "Big Island", is the youngest and is still actively growing. The islands of Maui, Molokai, Lanai and Kahoolawe were united as recently as the last glacial period in a single island, called Maui-nui, meaning "big Maui".

For many years, biogeographers thought that the honeycreepers, and other endemic Hawaiian birds, might have first inhabited the Northwestern Hawaiian Islands when these were high, forested islands and then moved progressively down the chain to the larger islands that can be seen today. In this view, the honeycreepers on Laysan and Nihoa would be ancient relicts, rather than recent colonizers. It is now known that such is not the case. The Nihoa–Kauai gap was an evolutionary bottleneck for birds, and the ancestor of the honeycreepers colonized Kauai only after it was a high forested island. This means that the stunning array of morphotypes evolved in an amazingly rapid burst of evolutionary diversification. The latest estimate for age of the Hawaiian honeycreepers as a definable group is 3·5 million years. This very rapidity makes it extremely difficult to discern branching sequences within the group, and genetic studies over the past two decades have been quite variable and not well supported in their details. It also makes the taxonomist's task all the more difficult, and generic limits have been by far the most controversial aspect of Hawaiian honeycreeper classification.

Every Hawaiian honeycreeper morphotype has an available genus name. Various authors have attempted to consolidate these



Four different kinds of sickle-shaped bill are found among the Hawaiian honeycreepers. The nectar-eating ***Iiwi****, and its now-extinct congeners, the Hawaii Mamo* (Drepanis pacifica) *and the Black Mamo* (D. funerea)*, have the heaviest of these, with strong bone support. The honeycreepers were once thought to be related to other nectar-eating groups, but evidence now points overwhelmingly to evolution from cardueline finches. Clearly visible here are the Iiwi's squared-off outer primaries.*

[*Drepanis coccinea*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]





At the opposite extreme from the sickle-billed honeycreepers, the ***Hawaii Akepa*** *has a bill apparently very like its cardueline-finch ancestors. However, from above, the mandibles are seen to be slightly crossed at the tip. The male is bright orange or vermilion and the female grey-green above and paler below. Of the four species currently recognized in this genus, one has been extinct since the nineteenth century, and another has probably now joined it, while the Akekee* (Loxops caeruleirostris) *is Critically Endangered and the Hawaii Akepa Endangered.*

[*Loxops coccineus*, Hawaii, Hawaiian Islands. Photos: Jack Jeffrey]

small genera into larger groupings. Amadon combined all of the finch-billed honeycreepers into *Psittirostra* and all of the short-billed ones into *Loxops*. Pratt and the S. L. Olson and James team favour a more fragmented taxonomy that essentially equates genera with morphotypes, but they do not agree on all points. For example, Pratt's 2005 classification groups all of the curve-billed green birds with black lores and short songs in a large genus *Hemignathus*, in which bill morphotypes form subgenera, but keeps *Loxops* (akepas *sensu stricto*) separate, whereas Olson and James separate Pratt's long-billed subgenera *Hemignathus* (heterobills) and *Akialoa* (akialoas) and merge *Viridonia* (Greater Amakihi), *Chlorodrepanis* (amakihis) and *Magumma* (the Anianiau) into an enlarged *Loxops*, with components different from those of Amadon's expanded *Loxops*. To date, all classifications have been based on various interpretations of phenotypic characters, but ongoing comprehensive genetic/phenotypic studies by Fleischer's laboratory and by James could bring consensus and understanding to honeycreeper phylogeny. In the meantime, a conservative approach to genera that at least does not misrepresent any facts is probably the best one. In the present treatment, the subgenera of Pratt's "greater *Hemignathus*" have all been elevated to genus level, and the Hawaii Creeper (*Manucerthia mana*) is placed in a genus recently named by Pratt as a result of genetic studies by D. M. Reding's team which indicated that it is related to akepas or amakihis, and is not a sister-species to the Akikiki (*Oreomystis bairdi*). All of these genera are diagnosable on the basis of suites of morphological, behavioural and genetic data, as discussed in the following paragraphs.

Although it now seems unwise to subdivide the Hawaiian honeycreepers taxonomically at the family level, many previous authors have designated subfamilies or tribes. The most common division is between the "green birds" (including the drepanidid finches) and the "red birds", based on differences in plumage colour and vocalizations. The "green group" can then be subdivided into "finches" and "not finches", but two species in particular, the Ou (*Psittirostra psittacea*) and the Maui Parrotbill (*Pseudonestor xanthophrys*), are problematic intermediates. In fact, the red/green division is entirely artificial. The only large subgroup that holds up to phylogenetic scrutiny is a clade of genera defined by the presence of a tubular tongue (see Morphological Aspects), or a tongue derived from it. The finch-type genera are morphologically similar, but their resemblances are in primitive characters (symplesiomorphies) that give no information about relationships. Falling outside both groups are the enigmatic *Paroreomyza*, *Melamprosops* and *Oreomystis*. Furthermore, several thin-billed genera known only from bones obviously cannot be sorted according to tongue structure. Consequently, most authorities nowadays are content to consider the group as a single clade with no named subdivisions, although "finches", "green birds" (termed "chlorodrepanines") and "red-and-black birds" (termed "melanodrepanines") remain convenient informal groupings.

The drepanidid finches are unremarkable examples of seed-eating birds. Beginning with genera that are less finch-like, one can see the first steps in the process of adaptive radiation that is played out in the Hawaiian honeycreepers in spectacular fashion, producing a stunning array of morphotypes unequalled in any other single avian group. Nevertheless, although many ecological or morphological analogues can be named, none of the comparisons is exact. In the course of this radiation, the honeycreepers have experienced nearly all of the common textbook evolutionary phenomena, including allopatric speciation, double-invasion speciation, character displacement, convergence both within the group and with non-drepanidids, parallelism, competitive exclusion, and co-evolution with plants. All of these are discussed in the appropriate places in the following review of the genera.

The most cardueline-like honeycreeper genus is *Telespiza*, today restricted to Laysan and Nihoa, but once widespread on the main islands. The Laysan Finch (*Telespiza cantans*) and the Nihoa Finch (*Telespiza ultima*) were thought to be single-island endemics until bones of both were found on the main islands from Kauai east to Maui-nui. Two smaller species, the Makawehi Finch (*Telespiza persecutrix*) from Kauai and Oahu and the Maui-nui Finch (*Telespiza ypsilon*) from Maui and Molokai, have been described from bone deposits, and an even smaller species may be present among unclassified remains. The species are morphologically similar to one another, but form a stepwise size hierarchy similar to that seen among Galapagos finches, undoubtedly the result of a series of double invasions with subsequent character displacement. Members of this genus have a heavy bill, slightly hooked at the tip in some, and a thick fleshy tongue. The surviving species are the only honeycreepers to have streaked upperparts





*The **Nihoa Finch** and the Laysan Finch* (Telespiza cantans) *were both believed to be single-island endemics until their bones were found on the main Hawaiian Islands. As their common names suggest, they are the most finch-like of the honeycreepers, with the least specialized bills. Their calls are finch-like, and the relatively brightly coloured males (above) have loud canary-like songs. The females and juveniles (below, a juvenile male) of these two species are the only honeycreepers with streaked plumage. Measuring up to 19 cm and 34 g, the Laysan Finch is the largest known member of the genus, followed by the Nihoa Finch at 17 cm and 21–28 g. Two smaller species have been described from bone deposits and an even smaller one may be awaiting description. They formed a size hierarchy similar to Galapagos finches, and up to four of these species cohabited on some of the main Hawaiian Islands. The Nihoa Finch is now confined to a single island, with a total range of just 63 ha. Any one of the many pressures on Hawaii's endemic species, from the accidental introduction of predators or diseases to a single hurricane, could push this Critically Endangered species into extinction. However, being non-specialist feeders,* Telespiza *honeycreepers are perhaps more resilient than others in the family.*

[*Telespiza ultima*, Nihoa, Hawaiian Islands. Photos: Jack Jeffrey]



Unlike most surviving honeycreepers, the ***Hawaii Creeper*** *has no known Hawaiian name. It has been considered congeneric with the Akikiki* (Oreomystis bairdi). *These two species look not unlike nuthatches (Sittidae) and share a short down-curved bill, along with many other features, such as tongue morphology and juvenile begging calls. DNA studies show that these similarities are not due to a close relationship but instead offer a truly spectacular example of evolutionary convergence.*

[*Manucerthia mana*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]

like those of a New World sparrow (Emberizidae), this applying mainly to females and immatures. They are sexually dimorphic, with males more brightly coloured and larger-billed than the females. They have eclectic feeding habits, the Laysan Finch having survived the total devastation of the island's vegetation by eating seabird eggs. These finches are highly vocal, having loud canary-like songs and finch-like call notes.

Closely related to *Telespiza* is the genus *Loxioides*, large finches specialized for feeding on seed pods of woody legumes. The Critically Endangered Palila (*Loxioides bailleui*) is a specialist on mamane (*Sophora chrysophylla*) (see Habitat) and is today found only at high elevation on Hawaii, but it is known from remains discovered in the lowlands of Kauai and Oahu. The James and Olson team recently described a larger species, Pila's Palila (*Loxioides kikuchi*), from bones on Kauai. It was sympatric with the Palila on that island, and may even have survived into the historical period. The palilas are a morphological analogue of the Eurasian bullfinches (*Pyrrhula*), having a relatively small bill with a bulbous profile. Males of the one surviving species are more brightly coloured than the females, but dimorphism is not striking. This species' vocalizations include onomatopoeic whistled calls and complex canary-like songs. The Palila is the sole finch-type drepanidid still surviving in the main group of the Hawaiian Islands.

Koa finches (*Rhodacanthis*) were large finches specialized for feeding on seed pods of the koa tree (*Acacia koa*). The two historically known species, designated the Greater Koa Finch (*Rhodacanthis palmeri*) and the Lesser Koa Finch (*Rhodacanthis flaviceps*), were discovered in the late nineteenth century high in the Kona region of Hawaii, and disappeared shortly afterwards. Whether the smaller of the two was a valid species or was just a variant or subspecies of the Greater Koa Finch remained controversial until bones of both revealed constant qualitative differences; E. Fuller (HBW7, page 57) considered them subspecies of a single species. Koa finches have a somewhat elongated heavy bill and a simple tongue with a hollow "seed cup" on the upper surface. Males are bright yellow or orange on the head, whereas females are plain olive-green. The Greater Koa Finch had distinctive whistled vocalizations (see Voice). In 2005, James and Olson described two new species of koa finch, *Rhodacanthis litotes* and *Rhodacanthis forfex*, that once inhabited Kauai, Oahu and Maui and the appearance and behaviour of which can only be surmised. The Greater Koa Finch was the largest historically known Hawaiian honeycreeper.

The Hawaiian grosbeaks (*Chloridops*) possess a very large seed-crushing bill reinforced internally by strong bony struts. The one historically known species, the Kona Grosbeak (*Chloridops kona*), was specialized for extracting seeds from the very hard pericarps of the naio tree (*Myoporum sandwicense*) (see Habitat). It was a dull-coloured, rather inactive olive-green bird with no sexual dimorphism, but juveniles had a differently coloured beak. Olson and James have described, from bones, two further species in the genus, the Wahi Grosbeak (*Chloridops wahi*) from Kauai, Oahu and Maui, and the King Kong Grosbeak (*Chloridops regiskongii*) from Oahu. The latter had what was proportionally one of the largest bills of any passerine. The whimsical non-Hawaiian epithet given to it originated with a reporter's misquotation of Olson, but the name stuck.

Two long-extinct finches are currently placed in the genus *Xestospiza*, but it is possible that they are not congeners. According to James, the Cone-billed Finch (*Xestospiza conica*), known from very fragmentary remains on Kauai, may be closer to *Rhodacanthis* or *Chloridops*. The Ridge-billed Finch (*Xestospiza fastigialis*) had a bill shaped like that of a cowbird (*Molothrus*), but other features of its skull show it to be a Hawaiian honeycreeper. The large number of bones found on Oahu, Molokai and Maui suggest that this bird was once abundant in the lowlands of those islands. The enigmatic Mauka Grosbeak (*Orthiospiza howarthi*), a huge finch with a massive bulbous bill, is also of uncertain relationships. Its remains have been found only at higher elevations on Maui, and, while it has some features typical of drepanidids, James's 2004 analysis placed it outside the Hawaiian honeycreeper clade. The drepanidid finches exhibit an array of morphologies comparable to the variation found among cardueline finches, an excellent example of evolutionary parallelism.

Several drepanidid genera are somewhat finch-like, but with unique adaptations that defy comparison with any other



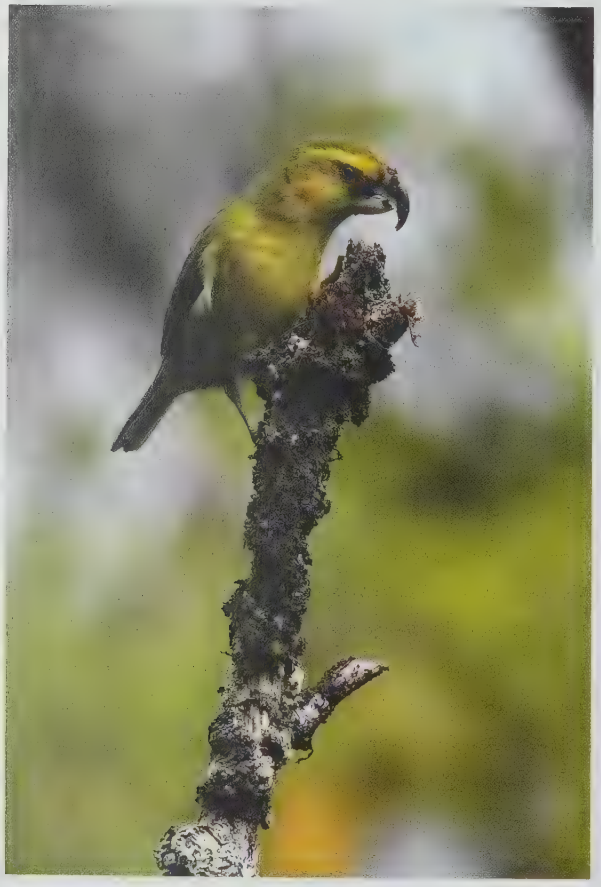
The amakihis of the genus Chlorodrepanis *are the commonest and most widespread of the surviving Hawaiian honeycreepers. Their plumage shows a suite of colour characters including olive green upperparts and paler yellow underparts that has been termed "amakihi coloration", and is shared by many species from several honeycreeper genera. The* ***Hawaii Amakihi*** *is one of three species currently recognized in* Chlorodrepanis. *Until recently all three were lumped into a single species. Now the much larger bill and different feeding habits and vocalizations of the Kauai Amakihi* (C. stejnegeri), *and the distinctive coloration of the Oahu Amakihi* (C. flava), *have been backed by DNA evidence that supports their recognition as full species. The large bill of the Kauai Amakihi is diagnostic, and the male Oahu Amakihi can be told from other amakihis on the basis of its distinctive "two-tone" plumage, which is much more yellow below.*

[*Chlorodrepanis virens virens*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]

passerines. The probably extinct Ou exhibits a thick but elongated bill with a strongly hooked upper mandible. The males were olive-green with a bright yellow head, whereas the females were uniformly green. The Ou was historically one of the most abundant Hawaiian birds, distributed among all of the main high islands and with no inter-island variation, suggesting that it moved frequently among them. The enigmatic Lanai Hookbill (*Dysmorodrepanis munroi*), known from a single specimen, was long regarded as an aberrant Ou, and its status remains somewhat unsettled. Fuller followed J. C. Greenway in considering it a freak. G. C. Munro, the original collector, however, made a convincing argument that the bird was, indeed, a valid species, and he gained support from the team of James, Zusi and Olson, who studied the skull extracted from the specimen.

The position of the Maui Parrotbill within the honeycreeper radiation has long been debated. Amadon included it among the drepanidid finches, and James places it in a clade with the Ou and the Lanai Hookbill. On the other hand, many scholars, from Perkins to Pratt, argue that, on the basis of plumage colour, vocalizations and diet, this mainly insectivorous bird is a secondarily heavy-billed relative of other insectivorous honeycreepers such as the Akiapolaau (*Hemignathus wilsoni*). Zusi found that the Maui Parrotbill and the Akiapolaau share some otherwise unique features of their jaw muscles, and the two are remarkably similar in their feeding movements. Most DNA studies have also suggested a relationship with thin-billed species, and James's osteological data could not refute this alternative interpretation. If one excludes its bold yellow supercilium and huge pale bill, the Maui Parrotbill resembles many of the chlorodrepanines both visually and acoustically (see Voice).

Also possessing a vaguely finch-like bill is the Poo-uli (*Melamprosops phaeosoma*), a snail specialist. Fleischer's team found this species to be basal to the drepanidid radiation, representing one of the earliest offshoots from the basic finch pattern. These findings, along with osteological features described by James, indicate that this distinctive bird is a honeycreeper, despite lacking many of the defining characters. Another likely basal branch, with a slightly downcurved but still more or less finch-like bill, is the bark-picking specialist and nuthatch (Sittidae)





Among the variants of the Drepanidid "sickle-bill" is the heterobill, in which the upper mandible is much longer than the lower. In the ***Akiapolaau*** *the lower mandible is straight, creating a gap, or diastema, when the bill is closed. The mandibles are used independently, the lower for pecking and hammering, the curved upper one for probing. In the other* Hemignathus *heterobill species, the lower mandible is curved to fit the upper. Of these, the long extinct Giant Nukupuu* (H. vorpalis) *was the largest honeycreeper yet found. Three other recent species of* Hemignathus *range from probably to definitely extinct, in all probability leaving the Akiapolaau as the last of its genus. It is Endangered.*

[*Hemignathus wilsoni*, Hakalau, Hawaii, Hawaiian Islands. Photo: Jim Denny]

analogue the Akikiki, a monotypic genus endemic to Kauai. *Oreomystis* was long thought to include the Hawaii Creeper, now segregated in *Manucerthia*, but the aforementioned studies of both mitochondrial and nuclear DNA, especially one led by Reding, as well as James's 2004 osteology study, reveal that the many phenotypic characters that these two birds share, including tongue morphology (see Morphological Aspects), song, juvenile begging calls, creeping habits, lack of adult sexual dimorphism, and possession of a distinct juvenile plumage, are, amazingly, the result of evolutionary convergence, and that the relationships of *Manucerthia* lie somewhere among the tubular-tongued genera described below.

A possible sister-group to *Oreomystis* and also probably a basal branch of the honeycreeper tree is the generalist genus *Paroreomyza*. The three species are known only from the central islands of Oahu and Maui-nui, on which two of them were apparently sympatric before the arrival of humans. They have a short, straight bill that resembles that of the New World warblers (Parulidae). The probably recently extinct Oahu Alauahio (*Paroreomyza maculata*) and the still common Maui Alauahio (*Paroreomyza montana*) are sexually dimorphic, the males being yellow and green and the females drab-coloured. Also recently extinct, the larger Kakawahie (*Paroreomyza flammea*) of Molokai had brilliant scarlet males and brown females. Although the alauahios and the Kakawahie were long considered conspecific, bones of a smaller species, presumably the Maui Alauahio, found on Molokai indicate that it was broadly sympatric with the Kakawahie on Maui-nui. The speciation pattern in *Paroreomyza* thus appears to be an example of double invasion followed by character displacement, the two Maui-nui species representing the extremes of variation in the genus. When first discovered, the Maui Alauahio population on Lanai was considered taxonomically distinct, but its differences are so slight that H. D. Pratt and T. K. Pratt suggested that the two forms might represent the ends of a former cline on Maui-nui. If so, the Lanai form would not qualify for recognition even as a subspecies.

The Kiwi Shovelbill (*Vangulifer mirandus*) and Pololei Shovelbill (*Vangulifer neophasis*) are known only from bones found on Maui, and their exact position in the drepanidid radiation is still poorly understood. Indeed, James suggests that the two species may not be so closely related as was originally thought. They had a unique blunt-tipped bill, downcurved in the

The ***Maui Parrotbill*** *was long seen as allied with drepanidid finches such as the Ou* (Psittirostra psittacea). *But it has a long upper and short lower mandible, like a heterobill, and uses its huge, laterally compressed bill in quite un-finch-like ways. In many of its feeding movements, the Maui Parrotbill resembles the Akiapolaau* (Hemignathus wilsoni), *with which it shares some otherwise unique features of jaw musculature.*

[*Pseudonestor xanthophrys*, Hanawi, Maui, Hawaiian Islands. Photo: Eric VanderWerf]

former species and straight in the other, the use of which can only be guessed. The bills exhibit features convergent with certain aspects of the bills of todies (Todidae), tyrant-flycatchers (Tyrannidae) and monarch-flycatchers (Monarchidae), all of which feed by making aerial sallies, and the shovelbills may have filled that same niche, especially considering the absence of the Elepaio (*Chasiempis sandwichensis*), a monarch-flycatcher, from Maui-nui.

All of the remaining Hawaiian honeycreepers, and possibly the shovelbills, too, possess the drepanidid tubular tongue (see Morphological Aspects), a synapomorphy that unites them in a single large clade. This tongue may well be considered the evolutionary breakthrough that enabled the honeycreepers to diverge so widely. Pratt subdivided this clade into melanodrepanine and chlorodrepanine sister-groups, but James regards it as a single line, with the melanodrepanines at the pinnacle. Pratt considered the melanodrepanines to represent a more mature radiation because they are relatively well differentiated, with no surviving intermediate morphotypes, whereas the chlorodrepanines have many intermediate forms and Bock even used them to illustrate a transformational series of evolutionary changes. The lack of intermediate forms among the melanodrepanines could, however, be an artefact of their poor representation, for reasons not well understood, in prehistoric remains.

Despite the prefixed epithet, the chlorodrepanine honeycreepers are not all green, as red males occur in the genus *Loxops*. They are small honeycreepers with a conical, finch-like bill reminiscent of that of siskins and redpolls, but with the tips of the mandibles slightly crossed. They are primarily insectivorous, but have a nectarivory-adapted tongue (see Morphological Aspects). For decades, the four forms of akepa were considered to belong to a single polytypic species. Pratt, however, showed that the Kauai representative possessed a suite of isolating mechanisms that justify its recognition as a separate species. Not only does it have yellow and green, rather than red, males with a larger, differently coloured bill, but it is also ecologically and vocally distinct, with very different nesting habits. For a long time the taxonomic status of the three other forms was moot, because the Oahu Akepa (*Loxops wolstenholmei*), probably extinct since the 1890s, and the apparently recently extinct Maui Akepa (*Loxops ochraceus*) were so poorly known. As-yet-unpublished research from Fleischer's DNA laboratory, however, indicates that, despite similarities that led earlier taxonomists to consider them conspecific, the "red" akepas differ genetically among themselves as much as they differ from the Akekee (*Loxops caeruleirostris*), at a level equivalent to that of many other closely related passerine species, and they should therefore be ranked as full species. That taxonomy is adopted provisionally herein for the first time.

The Anianiau (*Magumma parva*) is a still common Kauai endemic with a short, slightly downcurved and rather warbler-like bill. It was traditionally regarded as a member of the amakihi complex (*Viridonia* and *Chlorodrepanis*), even being called the "Lesser Amakihi" by some authors, but recent analysis of plumage and bare-part colour details by a team led by S. Conant, along with several DNA studies, reveal it to be evolutionarily independent of the amakihis. The genus is monotypic, and unrepresented in bone deposits outside Kauai.

The genera *Hemignathus*, *Akialoa*, *Viridonia* and *Chlorodrepanis* have a sharply pointed bill that varies from being nearly straight to being strongly downcurved and from being short to being very long. They all share what Pratt called "amakihi coloration" (see Morphological Aspects) and simple advertising songs (see Voice). This uniformity of colour and voice led Pratt to classify these four taxa as subgenera under the senior-named *Hemignathus*, and even authors who do not use such a classification may refer to this as the "hemignathine group". Within the overall similarity, however, lies a great divergence of bill structure, and in the present treatment the four are considered separate genera.

Hemignathus comprises five species known as "heterobills", having the lower mandible less than half the length of the upper one. In the three species of nukupuu, the lower mandible is curved to fit the upper mandible. Kauai, Oahu and Maui each have their own species of nukupuu, although most recent references, including Fuller, regard the three as conspecific. Nevertheless, they exhibit striking inter-island variation in size and coloration and, according to Fleischer, have large genetic divergences. Recently,



With its downcurved though not sickle-shaped bill, and red and black coloration, the ***Apapane*** *is the drepanidid that most resembles some of the honeyeaters (Meliphagidae) of other Pacific avifaunas. The sexes are alike in plumage, although females are slightly smaller. Its conspicuous white undertail-coverts and lower abdomen, and shorter, less decurved bill distinguish it from the Iiwi* (Drepanis coccinea)*, with which it often associates. Still abundant in some parts of its range, the Apapane has one of the highest densities of any non-colonial bird, at up to 4000 individuals per km².*

[*Himatione sanguinea*, Kokee, Kauai, Hawaiian Islands. Photo: Jim Denny]



The stiff white crest on the forehead of the ***Akohekohe*** *cannot be raised or lowered. When wet, the dishevelled crest contributes to the bird's scruffy appearance. This is further accentuated by the often unkempt orange feathers on its nape, which are joined by a short stripe to an orange-buff eyering. In shape, including its pointed, slightly curved bill, the Akohekohe resembles a larger Apapane* (Himatione sanguinea). *This bird is feeding in a native mint of the genus* Stenogyne, *one of many Hawaiian plants co-evolved with the curved bills of honeycreepers. A combination of habitat degradation and mosquito-borne disease has reduced it to a declining population of fewer than 4000 birds, with a global range of just 60 km² on the island of Maui. The Akohekohe is listed as Critically Endangered.*

[*Palmeria dolei*, Maui, Hawaiian Islands. Photo: Jack Jeffrey]

James and Olson described the Giant Nukupuu (*Hemignathus vorpalis*) from bones found in a lava tube on Hawaii. It is the largest Hawaiian honeycreeper ever found, and was apparently contemporaneous with the surviving Akiapolaau on the island. The Akiapolaau differs from the other heterobills in having a straight, rather than curved, lower mandible. This different configuration may well have come about as a result of character displacement in response to the presence on the island of the Giant Nukupuu.

The genus name *Akialoa* is based on the Hawaiian name for several species with an extremely long, thin, curved bill. Historically, akialoas were known from Kauai, Oahu, Lanai (a component of Maui-nui) and Hawaii, but those from the two middle islands are very poorly known. They have been regarded variously as one species; as two (Greater and Lesser), with the dividing line either between Kauai and Oahu or, better, between Lanai and Hawaii; or as four species. Olson and James described the Hoopoe-billed Akialoa (*Akialoa upupirostris*) from bones found on Oahu and Kauai. It was a slightly larger species the bill of which resembled that of the Hoopoe (*Upupa epops*). The difficulty of sorting out speciation patterns among the forms led these scientists to suggest a five-species taxonomy, which is followed herein. The question is largely moot, because all akialoas are now extinct.

Unlike the other hemignathine honeycreepers, the poorly known Greater Amakihi (*Viridonia sagittirostris*) was not colour-dimorphic. Specimens of all ages and both sexes look much alike, being uniformly dull olive-green, slightly paler below. The somewhat elongated bill was nearly straight, and was utilized in probing crevices such as the leaf axils of ieie (*Freycinetia arborea*) (see Habitat). At the time of its discovery, the Greater Amakihi inhabited a very small area on windward Hawaii, and it has not been found since 1900. The Straight-billed Gaper (*Aidemedia chascax*) and the Curve-billed Gaper (*Aidemedia zanclops*), known only from one site on Oahu, have a bill that is superficially similar to that of the Greater Amakihi, and they may belong in *Viridonia*, although it is not possible to know whether they had the drepanidid tubular tongue.

The amakihis of the genus *Chlorodrepanis* are today the most common and widespread of the Hawaiian honeycreepers. For many years, only one species of amakihi, with four subspecies, was recognized, but Conant and her co-workers showed that the Kauai Amakihi (*Chlorodrepanis stejnegeri*), with a much larger bill, different feeding habits and distinctive vocalizations, has sufficient isolating mechanisms to be recognized as a separate species. The larger bill and ecological shift of the Kauai Amakihi may represent character displacement resulting from the presence of the Anianiau on the same island. C. L. Tarr and Fleischer found DNA evidence to support the Kauai Amakihi split, and also the recognition of the Oahu Amakihi (*Chlorodrepanis flava*), which has a distinctive coloration. At present, the Maui-nui form is regarded as a subspecies of the Hawaii Amakihi (*Chlorodrepanis virens*), and as such will be the only named form of Hawaiian honeycreeper to remain a subspecies if all recent suggested species splits are accepted. It should be noted that if the Kauai Amakihi is placed in the genus *Hemignathus*, wherein the species name *stejnegeri* is preoccupied, it then takes on the specific name *kauaiensis*.

Among the melanodrepanines, the most superficially finch-like species are the palmcreepers in the extinct genus *Ciridops*. James considered them the most derived of the red-and-black honeycreepers, with the finch-like bill a secondary development. Known historically from only five specimens, the Ula-ai-hawane (*Ciridops anna*) was found on Hawaii and probably Maui-nui, while the Kauai Palmcreeper (*Ciridops tenax*) is known only from bones on its namesake island. Oahu may have harboured an additional, as yet unnamed species of *Ciridops*. Very recently, Olson and J. Hume worked out the plumages represented in the five specimens, and suggested that the single green specimen was, in fact, the adult female, rather than, as had long been thought, an immature stage. *Ciridops* is therefore the only melanodrepanine genus in which the adults are sexually dimorphic.

Resembling each other in having a longer, acutely pointed and slightly downcurved bill, the nectarivorous genera *Himatione* and *Palmeria* may be closely related, although their plumage differences are striking. Several authors have suggested that the two

genera should be combined, but none has yet done so. Members of both genera are ecological equivalents of honeyeaters (Meliphagidae) and are similar to them in a general way. The Apapane (*Himatione sanguinea*) and the extinct Laysan Honeycreeper (*Himatione fraithii*) resemble the red-and-black *Myzomela* honeyeaters, a conspicuous component of other tropical Pacific avifaunas, in coloration and bill shape, but their vocalizations are more finch-like. The former has always been one of the most abundant and widespread Hawaiian honeycreepers. Like the Ou, it is undifferentiated among the larger islands and probably moves frequently between them. The Laysan Honeycreeper is still regarded by many as a subspecies of the Apapane, but both Pratt and James consider it to be a separate species on the basis of both anatomical and ecological differences. The bizarre Akohekohe (*Palmeria dolei*) is a Maui-nui endemic with mostly black plumage splotched and spotted with red. It has a unique "pollen-brush" crest of recurved, stiffened feathers on its forehead. It is a specialist on ohia-lehua (*Metrosideros polymorpha*) (see Habitat), and has strange-sounding songs reminiscent of those of honeyeaters, but in general shape and habits it is not unlike a large, quite differently coloured Apapane.

The members of the genus *Drepanis*, derived from a Latin word meaning "sickle", have a long, heavy, strongly downcurved bill. Each of the three species, the Hawaii Mamo (*Drepanis pacifica*), the Black Mamo (*Drepanis funerea*) and the Iiwi (*Drepanis coccinea*), has at one time been placed in a monotypic genus, *Drepanoramphus* for the Black Mamo and *Vestiaria* for the Iiwi, although no recent author has recognized *Drepanoramphus*. In his 2005 monograph, Pratt argued that *Drepanis* and *Vestiaria* differed only in species-level colour characters and should be combined, and James's osteological study included only the Iiwi because it is osteologically so similar to *Drepanis*, material of which was limited. Nevertheless, many recent sources keep the genus *Vestiaria* separate, even though it is diagnosable only by plumage colour, a seemingly flimsy basis for defining a separate genus. Mamos and the Iiwi are primarily nectarivores, and their curved bills have co-evolved with the falcate corollas of certain Hawaiian flowers (see Habitat), although they can and do feed also on flowers with open, accessible nectaries. They are vocally distinct among drepanidids, having loud penetrating whistles, mechanical sounds and reedy dissonances (see Voice). Both of the mamos are extinct, but the iconic Iiwi remains relatively common in places and is perhaps the quintessential Hawaiian honeycreeper.

Morphological Aspects

Overall, the postcranial anatomy of Hawaiian honeycreepers is quite unremarkable and differs little from that of most other passerines. In fact, unassociated bones of the trunk skeleton found in subfossil deposits are rarely identifiable to species. Within the family, heavy-bodied species, such as the group known as finches, tend to have shorter and stouter leg bones than those of the more active thin-billed species. Raikow's detailed studies of limb musculature reveal that Hawaiian honeycreepers are remarkably uniform in this respect, despite their otherwise extensive variation. One small leg muscle, usually called the "plantaris", is found in some drepanidids but not in others, although the significance of this particular variation is not yet known. The internal organs of Hawaiian honeycreepers do not differ significantly from those of other birds.

Compared with the body trunk, the head region exhibits considerably more variation, much of which has already been discussed because of its phylogenetic significance (see Systematics). The three most important cranial synapomorphies of cardueline finches and Hawaiian honeycreepers are the solid bony palate, the lateral flange condition of the palatine process of the premaxilla, and a thick, double-walled interorbital septum forming a broad, flat floor for the cranial fenestra; all three exhibit considerable variation within the drepanidids, thin-billed birds having somewhat less cardueline-like features. Unlike mammals, in which the upper mandible is fixed to the skull and the lower one articulates directly with it, birds benefit from cranial kinesis, by which the upper mandible can move separately from the cranium, and the lower mandible can swing far forward because it articulates with the skull indirectly via the quadrate bone. In some Hawaiian honeycreepers, these movements are developed to a remarkable degree, as can be seen in the many bill types, which are the basis of the current generic classification.

Bills of the drepanidid finches vary as widely as do those of carduelines, and in parallel fashion. Such variations include length relative to thickness, the amount of overhang of the upper man-



Braced against the trunk of the tree, the ***Akiapolaau*** *holds its upper mandible out of the way as it pecks holes with a characteristic vigorous hammering motion, throwing its whole body into the action. It will then use the upper mandible as a probe to find prey, typically wood-boring cerambycid beetle larvae. As well as occupying the woodpecker (Picidae) niche, this mostly insectivorous bird also fills the role of a sapsucker* (Sphyrapicus)*, boring rows of sap "wells" in the bark of ohia trees.*

[*Hemignathus wilsoni*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]



*The bill of the **Iiwi** co-evolved with the falcate (sickle-shaped) corollas of many native flower species, such as this Kauai kolii* (Trematolobelia kauaiensis). *The Iiwi is an important pollinator of these plants, but its feeding behaviour is changing. Birds are increasingly seen to pierce corollas at the base and steal the nectar without pollinating the flower, a trait perhaps learned by feeding on the introduced banana poka* (Passiflora mollissima). *More than 50% of Iiwi nectar foraging is now done on open-faced flowers. Perhaps as a result of these changes, Iiwi bills have become perceptibly shorter over the last century.*

[*Drepanis coccinea*, Pihea trail, Kauai, Hawaiian Islands. Photo: Peter LaTourrette]

dible, the shape of the cutting edges, the shape of the outer contours (culmen and gonys), and the configuration of ridges and grooves on the palate. James found the last-mentioned feature particularly useful for classifying the recent subfossil discoveries. The huge bills of Hawaiian grosbeaks have sinuate, or curving, cutting edges and large blunt ventral ridges on the upper mandible. The exact manner in which the bill was employed is not known. The least specialized Hawaiian finch bills are those of the genus *Telespiza*, whose bills are analogues of such carduelines as the rosefinches and the House Finch (*Carpodacus mexicanus*), which have likewise relatively unspecialized feeding habits. The surviving Laysan Finch and Nihoa Finch consume everything from grass seeds to flowers and leaves to hard-shelled dry fruits. The Laysan Finch has a proportionately larger bill, with an overhang at the tip, which may have enabled it to add seabird eggs to its diet at a critical point. Up to four sympatric *Telespiza* species were present on some of the main islands; exactly how they subdivided the entire niche can only be surmised.

In profile, the akepas and the Akekee appear to have a finch-like bill similar to those of siskins and goldfinches (*Carduelis*), but the mandibles are crossed slightly at the tip. Unlike the true crossbills (*Loxia*), the only other example of this phenomenon among passerines, the akepas' crossed mandibles are not conspicuous in profile and are noticeable only from above or below. Akepas and crossbills use the bill in roughly similar ways, the former as a means of parting the scales of leaf buds, and the latter for opening the cones of coniferous trees. The bird inserts the bill between the scales to be separated, and then opens the bill, or gapes, an action that pushes the scales in opposite directions. Individual akepas are either left-billed or right-billed, in approximately equal numbers, and their jaw musculature is likewise asymmetrical, but they do not use the twisting motion hypothesized by L. P. Richards and Bock.

Several Hawaiian honeycreepers have a thick bill superficially like that of a finch, but with very different methods of use. The hooked bill of the Ou is adapted for eating small soft fruits from a variety of native and introduced plants, and its morphology has been compared to that of the bills of some tropical tanagers (Thraupidae). The bill of the Lanai Hookbill is quite bizarre, having a strongly hooked upper mandible and an upcurved lower mandible that leave an opening, or diastoma, between them when the bill is closed. The tips could be brought together like ice tongs when the bill was opened. James's team suggested that this bill might be adapted for eating land snails (Gastropoda). The one Hawaiian honeycreeper known to feed on snails, however, had a bill nothing like that of the hookbill. The bill of the Poo-uli is vaguely finch-like, but elongated somewhat like those of tanagers. The bird is a bark-picker with a variety of invertebrate prey, predominantly snails. Its closest analogue may be the Fiji estrildid the Pink-billed Parrotfinch (*Erythrura kleinschmidti*), also a bark-picker with an elongated finch-type bill. Another kind of elongated finch-like bill is found among the palmcreepers, the only historically known species of which, the Ula-ai-hawane, was never observed by scientists. It was said by Hawaiian informants to "eat" native palms (see Habitat), presumably either the nectar or the soft fruits. The bird's short bill is much weaker than the seed-cracking bills of true drepanidid finches.

As it is thick and has an overhanging upper mandible, the heavy bill of the Maui Parrotbill is often likened to those of drepanidid finches. It is, however, deployed in a manner entirely different from the seed-cracking of finches. It is laterally compressed, and thus only superficially like that of a parrot (Psittacidae). It has a strongly hooked overhanging upper mandible and a shorter lower one. Except for the fact that it is much thicker dorso-ventrally, it could well be regarded as being a heterobill (see below). The bird uses this bill in order to gouge and strip away bark and to crush dead twigs in the search for insect larvae. It sometimes uses the mandibles independently, the lower one gouging into soft wood while the upper one holds onto the substrate. Rarely, the parrotbill pecks with the lower mandible in a manner almost exactly like the pecking motion of the Akiapolaau. The bill can be used also for surface-gleaning and for probing into leaf or flower clusters, as well as for plucking small fruits. This type of bill has no exact analogue outside the Hawaiian Islands, but the Wattled Ploughbill (*Eulacestoma nigropectus*), confined to New Guinea mountains, and some of the vangas (Vangidae), a Madagascan family, have somewhat similar feeding motions.

Thin-billed Hawaiian honeycreepers all evolved from heavier-billed ancestors, and they exhibit a wide range of adap-



Equipped with a nectar-adapted tubular and brush-tipped tongue, the ***Oahu Amakihi*** *shows no preference for any particular flower, feeding readily on native or introduced species as long as the nectar is accessible. This bird is feeding on ohia-lehua* (Metrosideros polymorpha), *the single most important source of nectar for Hawaiian honeycreepers. Nectar makes up about 30% of the diet of the Hawaii Amakihi* (Chlorodrepanis virens), *the most studied member of the genus. The rest of its diet consists of soft-bodied invertebrates, some fruit, and sap from the sap wells created by the Akiapolaau* (Hemignathus wilsoni).

[*Chlorodrepanis flava*, Honolulu, Oahu, Hawaiian Islands. Photo: Michael Walther]

tations. Some of the bills are straight, whereas others are curved; some are highly specialized, while others belong to food generalists. Interestingly, curvature, or lack of it, and total length do not predict the foods taken, and most of the general morphologies can be found among both chlorodrepanines and melanodrepanines. Earlier taxonomists such as Amadon grouped birds on the basis of bill length, but more recent classifications rely more on bill shape.

Warbler-like bills, straight and with a straight or convex gonys, have evolved at least twice among Hawaiian honeycreepers, in the Anianiau and in the genus *Paroreomyza*. They are easily envisioned as derived from a finch-like ancestor by simple dorso-ventral slimming. Such bills are found in many bird families around the world, and they are possessed usually by birds that are not narrowly specialized. The Anianiau feeds mainly by leaf-gleaning, but it also takes nectar from open-faced flowers. It has a well-developed nasal operculum, a flap of skin that protects the nostrils of many nectarivorous birds. The similarly shaped bills of the alauahios and the Kakawahie are used also for gleaning prey from leaves and branches and for taking nectar, but their structural adaptations for nectarivory are different. They lack a tubular tongue (see below), and the bird forms a sucking tube by pressing the simple tongue against a medial groove in the roof of the mouth. The alauahio bill is also an efficient trap for flying insects, and snaps shut with a loud crack.

Other short bills of drepanidids tend to be downcurved, if only slightly so in some cases. The curvature is achieved mainly by a concave gonys, rather than a convex one. Nearly straight versions of this bill shape have evolved at least four different times among Hawaiian honeycreepers. Until very recently, the short bark-picking bills of the nuthatch-like Akikiki and Hawaii Creeper were regarded as homologues, but the aforementioned study by Reding and others revealed them to be independently evolved in a process of convergence. An elongated version of this shape is found in the Greater Amakihi, a species that probes in crevices. Its lower mandible exhibits particularly strong retroarticular processes that suggest the frequent use of gaping as a foraging method. Perkins observed individuals of this species as they probed in leaf axils of the ieie vine in a manner that could be similar mechanically to the feeding technique of akepas. The melanodrepanine Apapane and Akohekohe exhibit a similar bill shape, that of the Apapane a bit more curved, with prominent nasal opercula as expected in nectar-feeders, but both species are specialists on flowers with exposed nectaries, such as the ohia-lehua.

The short, strongly downcurved bills of amakihis are one of four different kinds of sickle-shaped bill found among Hawaiian honeycreepers. Indeed, the group was once known as the "Hawaiian sicklebills". This type of bill is fairly thick at the base, but tapers to a sharp tip, with only a slight overhang of the upper mandible. In the akialoas, this basic bill type is greatly elongated, so that in at least one case the bill is as long as the rest of the bird. These bills are used both for bark-probing and for taking nectar from sickle-shaped flowers. Akialoas are usually regarded as being primarily insectivores, but early authors who observed live individuals stated that nectar was an equally prominent food source. Whether the short bill of amakihis and the long bill of akialoas represent one or two basic bill shapes is debatable, inasmuch as no intermediate bill lengths are known.

A very different sicklebill morphology is that of the heterobills, which have the lower mandible much shorter than the upper one. The long extension of the upper mandible is primarily an elaboration of the horny portion of the bill, with little bone support, allowing for considerable flexibility. All of the heterobills use their mandibles independently, pecking with the lower and probing with the upper. Surprisingly, they can bring the tips of the mandibles together to pick up prey items, thanks to the swinging motion of the lower mandible. The pecking action is much more forceful in the Akiapolaau, and it seems to fill the niche of a small woodpecker (Picidae), or more specifically a sapsucker (*Sphyrapicus*), because, like the sapsuckers, it creates rows of sap wells on tree trunks (see Food and Feeding). When pecking, the Akiapolaau opens its bill to the maximum, and then hammers vigorously with the straight, chisel-like lower mandible while holding the long upper mandible out of the way. Recent videos have confirmed that the tip of the upper mandible does not strike the substrate. The bird throws its whole body into this effort, and its head and neck are strengthened for the purpose. Other feeding techniques involve use of the two mandibles together, as when the upper is inserted into an insect burrow while the lower is held

on the surface as a template for tearing open the tunnel. The bird also exhibits strong wrenching or twisting motions similar to those of the Maui Parrotbill. Whether the heterobill morphology evolved independently or from an amakihi-type or akialoa-type bill has not yet been determined.

A much heavier sicklebill, with strong underlying bone support, is possessed by the mamos and the Iiwi. It is almost certainly an independent adaptation of these nectar-feeders, driven by co-evolution with curved tubular flowers. Nasal opercula are prominent. The mamos were highly specialized on specific plants of which they were the main pollinators, but the Iiwi is not so specialized and often feeds on open flowers such as the ohia-lehua. It has even learnt to pierce curved corollas at the base and to steal the nectar without reciprocating with pollination, which negates the plant–pollinator "social contract".

The tongue is just as important as a part of the feeding apparatus as is the bill, but it exhibits much less variation. Indeed, many bill types share a similar tongue morphology. The Hawaiian finches have more or less conventional "seed-cup" tongues similar to those of cardueline finches, except for the squared-off base discussed above (see Systematics). Such tongues are thick and fleshy, with a medial furrow, and with a depression, or seed cup, near the distal end. They are strengthened on the underside by a corneous covering that may extend beyond the margin of the fleshy part as a fringe at the tip. Seed-cup tongues are found in all the drepanidid finches, including the Ou, which has a slight attenuation at the tip, but notably not in the Maui Parrotbill (see below).

L. L. Gardner's classic survey found that many insectivorous passerines, such as the various kinds of warbler and flycatcher, have a narrow, non-fleshy tongue that is divided or frayed at the tip. The ventral covering may extend as a fringe along the distal sides. Such morphology has appeared at least three separate times among Hawaiian honeycreepers. Tongues of the alauahios and the Kakawahie, because they have the rear-projecting "wings" found in most passerines, fit Gardner's generalized description almost exactly. The same can be said of the distal portion of the tongues of the Akikiki and Hawaii Creeper, but these lack the rear projections, and the lateral fringes curl upwards slightly. Despite their striking similarity and the fact that no other Hawaiian honeycreepers have a tongue like them, these two species apparently have two very different evolutionary histories (see Systematics).

A large clade of Hawaiian honeycreepers is defined primarily by its possession of a unique drepanidid tubular tongue, or a tongue derived from it. Raikow described it as being long and narrow, the distal portion forming a tube. The tube is made up by narrow projections, or laciniae, of the ventral sheath that reach upwards and interlace dorsally, and also project forwards to form a brush at the tip. The brushy tip is often yellow or straw-coloured and may be visible as an extension from the tip of the bill of an actively feeding bird. This tongue morphology is clearly an adaptation for nectarivory, but some of the species that possess it have become almost entirely insectivorous, using the brushy tip as a means of entangling prey. All of them, however, still take nectar at least occasionally. Variation is almost entirely in the length of the tube in relation to the tongue base, parallel to variation in bill length. The tubular tongue is fully developed among the akepas, amakihis, akialoas, heterobills, Anianiau, and all of the melanodrepanines (see Systematics). Although such a complex morphology may seem unlikely to be ancestral to any other form, two members of this clade have a tongue that was presumably derived from it. The Hawaii Creeper tongue, discussed above, looks as if the tube has been removed and the brush tip grafted back onto the tongue base, leaving a tongue that is virtually identical to that of the Akikiki. The Maui Parrotbill has a unique morphology with marginal laciniae that do not curl upwards. It is debatable whether this tongue represents an intermediate stage between that of the finches and the tubular tongue or whether it is derived from the latter. Zusi considered the parrotbill's tongue so complex from a variety of perspectives as to be an unlikely ancestor of any other type. Noteworthy is the fact that the nestlings of tubular-tongued species have a tongue that is not yet rolled into a tube, and the parrotbill tongue may therefore have evolved from a tubular-tongued ancestor by neoteny, the retention of juvenile features in the adult.

The tongue of the Poo-uli is unlike that of any other Hawaiian honeycreeper, or, for that matter, any other passerine. It is fleshy like a finch tongue, but elongated, with a pronounced medial groove that expands at the tip to form a spoon-shaped de-



Here seen feeding on mamane (Sophora chrysophylla)*, the* ***Apapane*** *will take nectar opportunistically from many flowers, but by far the most important source is ohia-lehua* (Metrosideros polymorpha)*, of which the Apapane is a major pollinator. Patches of ohia-lehua at their peak of flowering can be found at all times of year, and the Apapane will undertake daily foraging flights to find them, sometimes over quite long distances. Despite high densities on its home ground, the Apapane generally forages alone, although it may form loose flocks. It feeds actively, spending only a second or two on each flower before moving on to the next, and often appearing to run across the dense foliage.*

[*Himatione sanguinea*, Hosmer Grove, Maui, Hawaiian Islands. Photos: Jim Denny]



The smallest honeycreeper, and also the smallest extant native Hawaiian bird, the ***Anianiau*** *eats nectar and invertebrates in roughly equal amounts. It obtains insects by gleaning leaves and twigs. Its short, thin bill restricts it to taking nectar mostly from open-faced flowers or those with short corollas, though it steals from flowers pierced at the base by other honeycreepers. It forages from the canopy to the understorey. Small flocks sometimes gather at good nectar sources, and when not breeding, the Anianiau may also join mixed flocks with other, mostly insectivorous, honeycreepers.*

[*Magumma parva*, Kokee, Kauai, Hawaiian Islands. Photo: Jim Denny]

pression, the margins of which have some short, blunt fleshy tubercles. Bock tried to compare these tubercles to the lateral projections that interlace in the drepanidid tubular tongue, but they are part of the fleshy portion of the tongue, and not the corneous underside as in the case of the lateral laciniae, and any resemblance seems quite superficial and coincidental. Unlike most honeycreepers, the Poo-uli has at the base of the tongue prominent rearward projections covered with large backward-pointing tubercles, which possibly function as an aid in swallowing such prey items as snails.

In the distribution of feathers on the body, the pterylosis, Hawaiian honeycreepers resemble cardueline finches and many other passerines, with little variation. Like carduelines, they have a single annual post-breeding (prebasic) moult. The initial post-juvenile moult is unusually long and may extend from June to December, while subsequent moults are about a month shorter. Some Hawaiian honeycreepers in their first basic plumage resemble adults, but juveniles differ in having paler primaries and tail feathers. Others exhibit delayed plumage maturation, with second-year individuals recognizable and often referred to as subadults. Closely related species can differ in their rate of plumage maturation. For example, the Akekee in its first basic plumage looks like the adult, but males of the Hawaii Akepa (*Loxops coccineus*) have distinctive first and second basic plumages that become progressively brighter. Annual moult of most Hawaiian honeycreepers follows the peak of the extended nesting season (see Breeding), between April and July. By December, most adults are in fresh plumage and juvenile plumages have mostly been replaced. Some drepanidids appear to change colour without moulting, this being the result of feather wear. The Apapane, for example, sometimes seems to have a contrastingly brighter head compared with the rest of the body because the head is the last body part to undergo moult, and the fresh feathers are darker. Likewise, honeycreepers that have pale wingbars may nearly lose these before their next moult.

Adults of most Hawaiian honeycreepers are sexually dichromatic, although only slightly so in some species. Notable exceptions include the Poo-uli, the Kona Grosbeak, the Akikiki, the Hawaii Creeper, the Greater Amakihi, and all the melanodrepanines except the Ula-ai-hawane. With the exception of the Greater Amakihi, however, all of these have distinctive juvenile coloration. Adult males of the Maui Akepa exhibit the only case of colour dimorphism among Hawaiian honeycreepers: they are either orange-red or mustard-yellow in about equal numbers, with a few intermediates. Although they have the same feather pigments, cardueline finches and Hawaiian honeycreepers exhibit noticeably different colour patterns. Nearly all carduelines have sparrow-like streaks at some stage of their development, but among drepanidids only juvenile and female Laysan and Nihoa Finches are streaked.

Among the mainly insectivorous honeycreepers, the aforementioned "amakihi coloration" is found in many species and several genera, including all those formerly united in *Hemignathus*. It is a suite of colour characters that seem always to occur together as a unit: olive-green upperparts; paler, yellower underparts; narrowly dark lores; a dark bill with a pale base of the lower mandible; the adult female duller than the male; and juveniles and immatures greenish-grey above and whitish below, with pale wingbars. Such coloration is found among amakihis, akialoas and, in slightly modified form, the heterobills. The Maui Parrotbill has amakihi-type coloration except for its boldly demarcated yellow supercilium, dark eyestripe and pale bill colour.

The colour pattern of the Anianiau was long conflated with amakihi coloration, but males of the former are bright yellow, with no dark loral feathering, females are more greenish, immatures lack wingbars, and the bill and feet are flesh-coloured. The Hawaii Creeper is similar enough overall to some of the duller plumages of the Hawaii Amakihi to cause problems in field identification, but the details are different. As another "little green bird", the Akekee also bears a superficial resemblance to the birds with amakihi coloration, but it has a yellow cap and rump, a broad black mask, a pale bill, and no wingbars at any stage. The "red" akepas are distinctive, but females may bear a vague resemblance to amakihis. Also unique in context are the grey-and-white, pinkish-billed Akikiki, and the black-faced brown Poo-uli.

The melanodrepanine honeycreepers differ from the others not only in colour but also in feather texture, which tends to be hard and glossy, rather than soft, possibly as an adaptation for feeding on nectar. The throat feathers of the Iiwi, Ula-ai-hawane and Akohekohe are stiffened along the midrib and have sharp-pointed hard tips. Moreover, the unusual crest of the Akohekohe is likewise stiff, and apparently cannot be manipulated by the bird. It looks rather coarse when wet, but when dry it resembles a

ball of cotton stuck to the bird's forehead. Both the Iiwi and the Apapane have the outer primaries squared off, rather than tapered, a feature probably designed to enhance their "wing note" (see Voice).

Habitat

Hawaiian honeycreepers evolved as part of a disharmonic avifauna that included only eleven other bird families, six of them non-passerine (Threskiornithidae, Anatidae, Rallidae, Recurvirostridae, Accipitridae, Strigidae) and the remaining five passerine (Corvidae, Monarchidae, Sylviidae, Turdidae, Mohoidae [see page ???]). The absence from the Hawaiian Islands of several important components of continental habitats, such as land mammals, reptiles, amphibians, mosquitoes (Culicidae) and honeybees (Apidae), had a profound influence on honeycreeper evolution, as well as that of the avian community as a whole. The lack of ground predators allowed many birds, including moanalos, kiwi-ibises and rails, to become flightless; moanalos were large waterfowl that apparently filled a niche comparable to that of land tortoises (Testudinidae). These flightless species were preyed upon by terrestrial stilt-owls (*Gallistrix*), the White-tailed Sea-eagle (*Haliaeetus albicilla*), the extinct Wood Harrier (*Circus dossenus*) and the surviving Hawaiian Hawk (*Buteo solitarius*). Today, only three of the eleven species of waterfowl, the Black-winged Stilt (*Himantopus himantopus*), the hawk, the Short-eared Owl (*Asio flammeus*), which is likely a post-Polynesian arrival, the monarch-flycatchers, two of the four thrushes and one warbler survive in the wild, but they have been joined by about fifty introduced bird species, more than for any comparable area on earth. The presence of various introduced organisms renders many habitats now uninhabitable for Hawaiian honeycreepers.

Hawaiian honeycreepers evolved in all of the forest types found in the islands. Today, these are primarily upland rainforest and dry mamane–naio forest, as well as a few patches of mid-elevation temperate mixed forest, a habitat that survives only as scattered remnants in such places as Koke'e, on Kauai, and the Hawaii Volcanoes National Park, on Hawaii. Before Polynesian settlers converted most of the lowlands to agriculture (see Status and Conservation), the birds also occupied lowland dry forest, currently Hawaii's most endangered habitat. Recent finds of subfossil remains of many species show that this habitat may have been even more important in the evolution of Hawaiian honeycreepers than montane rainforest.

Only two tree species dominate Hawaiian wet forests. These are the highly variable ohia-lehua, "ohia" being the tree and "lehua" the flower, and the majestic koa (*Koa acacia*), which together account for at least 90% of the canopy. Some forests consist of almost pure stands of ohia. The brush-like lehua flowers are red, or sometimes yellow or orange; they lack petals, but a calyx cup at the base of the showy stamens and pistils collects nectar and forms a perfect chalice for nectarivorous honeycreepers. Blooming depends on elevation and rainfall, but trees are in bloom in one locality or another at any given time of the year. Related trees elsewhere can be wind-pollinated, but the Hawaiian species depends on birds to do the job of pollination. The Apapane and Akohekohe are virtual lehua specialists, while the Akekee similarly focuses on ohia leaves. The koa usually exists as scattered individual trees or small groves among the ohia trees, although it can occasionally form a nearly uniform stand. It is often an emergent forest giant, and its lichen-covered branches are favourite feeding sites for the Akiapolaau, the Maui Parrotbill, the Kauai Amakihi and other insectivorous honeycreepers. The koa's small yellow pom-pom flowers are a minor nectar source. The flattened seed pods were one of the main foods of the extinct koa finches. Koa trees exhibit two kinds of leaf: one is the sickle-shaped phyllodes, or expanded leaf stems, on mature branches, and the other the typical double-compound leaves of acacias on saplings and adventitious shoots. Much rarer canopy trees include the bird-pollinated ohe (*Tetraplasandra*) of the Araliaceae, with leathery compound leaves, and Hawaiian fan palms known as "loulu" (*Pritchardia*), which once grew as emergent patches within koa–ohia rainforest but are today quite rare. At least one poorly known honeycreeper, the extinct Ula-ai-hawane, purportedly fed on *Pritchardia* fruits, known locally as "hawane".

Under the rainforest canopy grows a rich community of smaller trees and shrubs, many with ornithophilous (bird-adapted) flowers or fleshy fruits consumed by several honeycreepers. Especially noteworthy are the liana ieie, the leaf axils of which were the main feeding site reported for the extinct Greater Amakihi, and the composite fruits of which are a favourite of the Ou; the orange-fruited pilo (*Coprosma*), eaten by the Maui Parrotbill; the tree huckleberry 'ohelo-kau-la'au (*Vaccinium calycinum*); the akala (*Rubus hawaiiensis*), a Hawaiian raspberry, whose purple flowers are often visited by the Iiwi; the kanawao (*Broussaisia arguta*) of the Hydrangeaceae, a low-growing shrub with pink flowers and deep purple fruits, which attract amakihis and Anianiau; and a number of plants with flowers that co-evolved with their bird pollinators, primarily the sickle-billed species. The presence of ornithophilous flowers in plant groups that are not usually bird-pollinated is a widespread and obvious characteristic of the Hawaiian flora. The most famous examples of the phenomenon are members of the Lobeliaceae, which in Hawaii have undergone an adaptive radiation quite as spectacular as that of the honeycreepers. Lobelioid genera with sickle-shaped flowers that fit the bills of the Iiwi, the mamos and the akialoas include *Lobelia*, *Cyanea*, *Clermontia* and *Trematolobelia*. Ornithophilous falcate corollas are found also in one Hawaiian species of *Scaevola* (Goodeniaceae), the ohe naupaka (*Scaevola glabra*), in several endemic mints (Lamiaceae), in the woody geranium nohoanu (*Geranium multiflorum*, Geraniaceae), and in others, all of which are plants of the subcanopy or the shrub layer.

Mamane–naio forest is named for its two dominant tree species, the mamane of the Fabaceae and the naio, or bastard sandalwood, of the Myoporaceae; like the koa and ohia in the rainforest, these two form nearly all of the cover in this open forest with no true canopy. The only other tree of significance in such forest is the sandalwood (*Santalum paniculatum*), which was largely logged out during the nineteenth-century trade in the fragrant wood. Mamane–naio forest is in the present day heavily invaded by alien weeds and damaged by feral grazing animals, and it survives mainly on the subalpine slopes of Mauna Kea and Mauna Loa, on Hawaii, although both of the dominant trees are found in other plant communities and on other islands. Recently discovered subfossil evidence shows that before the arrival of humans mamane–naio forest occupied lowland areas, too, and may have supported many of the prehistorically extinct honeycreepers. It remains the sole habitat of the Palila, and may have been the main home of the Kona Grosbeak, apparently a naio specialist. It also supports the highest density of the Hawaii Amakihi, with its bill so well adapted to the slightly falcate mamane flowers.

The lowland dry forest may have included both mamane and naio, but these were not dominant. It also included, surprisingly, the remarkably adaptable ohia-lehua, so that it was surely at least visited by nectarivorous honeycreepers. Two of the more important trees, the ebenaceous lama (*Diospyros sandwicensis*), an Hawaiian persimmon, and the ornithophilous coralbean wiliwili (*Erythrina sandwicensis*) of the Fabaceae, survive today as components of other plant communities or as scattered individuals in a sea of alien grasses and other "weeds". Other lowland dry-forest species, such as two ornithophilous genera, *Kokia* and *Hibiscadelphus*, of tree hibiscus (Malvaceae), are now very rare or endangered. Although they are known only from bones, the Makawehi Finch, Maui-nui Finch, Wahi Grosbeak and King Kong Grosbeak and the two *Aidemedia* gapers lived in lowland dry forest alongside historically known honeycreepers until just a few centuries ago.

The three honeycreepers on the remote islands of Laysan and Nihoa obviously adapted to a very different plant community. Laysan was nearly denuded by introduced rabbits (*Oryctolagus*) in the early twentieth century, but its typical atoll shrub-and-grass community has recovered, although without several endemics. The dominant shrub today is the beach naupaka (*Scaevola taccada*), found commonly on shorelines throughout the tropical Pacific. Two morning glories, namely *Ipomoea pescaprae* and *Ipomoea indica*, and the caper maiapilo (*Capparis sandwichiana*)





*This **Kauai Amakihi** fits the classic image of the Hawaiian honeycreeper, or nectar-feeders anywhere, as it inserts its curved bill into the corolla of a Kauai kolii* (Trematolobelia kauaiensis). *Although the destruction of native forest on Kauai has confined it to a tiny part of its original range, the Kauai Amakihi population is actually increasing. It thrives in areas invaded by the alien banana poka* (Passiflora mollissima), *a rich source of nectar to which, like other honeycreepers, it appears to be addicted. Honeycreepers obtain the nectar of the banana poka by piercing the base of the straight, tubular flowers, and this may be the origin of this increasingly common change in the feeding strategies of several honeycreeper species. The Kauai Amakihi also eats the pulp and juice of fruit, including introduced species like blackberry* (Rubus) *and plum* (Prunus). *All three amakihi species feed on invertebrates, using a variety of techniques, including leaf-gleaning and bark-picking. With a much larger bill than the other two species, the Kauai Amakihi is something of a bark specialist, creeping along branches and trunks like a nuthatch, lifting flakes of bark, hammering and probing crevices. The bird in the picture below is using its lower mandible like a fulcrum as it drags its upper mandible through the soft bark of a dead olapa tree* (Cheirodendron trigynum).

[*Chlorodrepanis stejnegeri.* Above: Pihea trail, Kauai, Hawaiian Islands. Photo: Peter LaTourrette.

Below: Kauai, Hawaiian Islands. Photo: Jack Jeffrey]

provided nectar for the Laysan Honeycreeper. Seeds of the bunchgrass kawelu (*Eragrostis variabilis*) are eaten by the Laysan Finch. Introduced Laysan Finches on Pearl and Hermes Atoll eat seeds of the puncture vine nohu (*Tribulus cistoides*), which is rare on Laysan itself. Although small, Nihoa is a "high island" with a very different shrub community. Yellow-flowered ilima (*Sida fallax*), aweoweo (*Chenopodium oahuense*) and the creeping legume ohai (*Sesbania tomentosa*) all provide seeds eaten by the Nihoa Finch.

Several plants alien to Hawaii, such as the rainforest-invasive passion vine known locally as banana poka (*Passiflora mollissima*), which strongly attracts the Iiwi, and various eucalypts (*Eucalyptus*) and the paperbark *Melaleuca quinquenervia*, the flowers of which, if they are at high enough elevation, are visited by the Apapane and amakihis, show that at least some Hawaiian honeycreepers adapt well to introduced vegetation. It seems likely that these would reinvade lowland forests, even those comprising mostly alien species, if pestilential mosquitoes were not present (see Status and Conservation).

General Habits

Most Hawaiian honeycreepers fly well, but the Laysan Honeycreeper's flight was relatively weak, and both it and the Laysan Finch prefer to walk, rather than to fly. Most flights are relatively short ones, between perches and feeding sites, but the Ou, the Apapane and the Iiwi are noted for their long-distance flights high over the forest, and they probably make inter-island flights, too, although these have never been observed directly. The two last-mentioned species exhibit the flap-and-glide flight pattern common to many of the cardueline finches, but most honeycreepers fly without undulations. Most honeycreepers on the main islands rarely descend to the ground, so that walking, hopping and running are rare, but the Iiwi, Akohekohe and Apapane often walk or run over the nearly solid outer leaf surfaces of ohia trees. The action of creeping over trunks and branches in the manner of nuthatches and treecreepers (Certhiidae) is far more common than is walking, and is the characteristic means of locomotion for the Hawaii Creeper, the Akikiki and the Maui Parrotbill, but none of these utilizes the tail as a brace. They crouch low, with the belly close to the substrate, and may proceed spirally or in a straight line, with the head facing up or down. The Maui Parrotbill may use the bill rather like a parrot, as a means of aiding locomotion among branches. Other drepanidid "creepers", such as the Poo-uli, the heterobills, the akialoas, and occasionally the amakihis and alauahios, include more hopping interspersed with true creeping. The feeding movements of the Maui Alauahio are reminiscent of those of the Black-and-white Warbler (*Mniotilta varia*).

Hawaiian honeycreepers rarely bathe in standing water, and M. P. Morin reported that Laysan Finches sometimes drown in containers that become filled with rainwater. These birds usually bathe by simply fluttering about among wet leaves, but they sometimes use water seeps and drips. Honeycreepers also sunbathe in postures similar to those observed for many other passerines. Head-scratching by drepanidids is always indirect, with the foot brought over the wing. Originally, sleeping Hawaiian honeycreepers did not tuck the bill into the back feathers or crouch down over their feet to cover them with feathers, but recently many species have adopted these postures. This new behaviour is apparently in response to the discomfort of mosquito bites as these introduced insects move into new areas (see Status and Conservation).

Many members of this family perform display-flights, in which they fly directly upwards, hover for a while, and then dart back into the foliage. They often sing their primary songs during this process, when the performance may be referred to as a song flight. Such displays have been reported for the Palila, Hawaii Amakihi, Akohekohe, Apapane, Akiapolaau, Maui Alauahio and Hawaii Akepa, the last often in groups that resemble leks. Some displays reported by early naturalists for the Ou, the Kona Grosbeak and the Kauai Akialoa (*Akialoa stejnegeri*) may have been song flights. Other species, such as the Anianiau, the Kauai Amakihi and the Iiwi, may sing in flight, but apparently not as part of a display. Aggressive displays include chasing and fighting, with foot-grappling, pecking and feather-pulling. In the case of the Maui Alauahio and the Maui Parrotbill, such encounters are sometimes accompanied by bill-snapping. Hawaii Akepa males may gather for aerial "dog-fights" involving up to eight individuals. Stationary aggressive displays, usually involving erecting of the feathers of the head and neck, have been reported for the Laysan Finch, the Akiapolaau, the Maui Parrotbill and the Poo-uli.



The Critically Endangered ***Palila*** *is found only in dry forests of mamane* (Sophora chrysophylla) *and naio* (Myoporum sandwicense). *It feeds almost entirely on immature mamane seed pods, which it holds in its feet and tears open with its heavy bill. The availability of mamane pods is very variable, and in drought years, when yields are poor, the Palila will typically not attempt to breed. Although well balanced nutritionally, mamane seeds contain high levels of toxic alkaloids. The Palila also feeds on the larvae of mamane codling moths* (Cydia), *and other caterpillars. After conservation efforts to reduce numbers of grazing mammals, the quality of mamane forests is improving, but Palila populations are not recovering.*

[*Loxioides bailleui*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]

As discussed herein, a flock is any group of more than two individuals that move about in a co-ordinated fashion. Although feeding assemblages are often referred to as flocks, they are not true flocks, because the participants come and go randomly and independently. Hawaiian honeycreepers have a variety of types of flocking behaviour. After the breeding season, many species gather in small flocks that can include several families or only juveniles. Such conspecific flocks have been observed for the Palila, Kona Grosbeak, Hawaii Amakihi, Hawaii Akepa, Akekee, Maui Alauahio, Anianiau, Apapane, Akohekohe and Iiwi. The Akikiki and the Hawaii Creeper form similar post-breeding flocks, except that they involve only single-family groups. Similarly, Akiapolaau and Maui Parrotbill families remain together for up to a year, apparently because the juveniles require a very long period in which to learn to use the bizarre bill. The Apapane forms another kind of conspecific flock as a means of overwhelming superior territorial species at feeding sites (see Food and Feeding).

Mixed-species flocks are a different phenomenon altogether. Their purpose, whether to gain protection from predators or to gain feeding advantages, or both, remains uncertain, although observations by Pratt on Pacific islands both with and without aerial predators seem to support the predator-avoidance hypothesis. Mixed-species flocks occur in the Hawaiian Islands, but may be less conspicuous now because, with the exception of the Hawaiian Hawk and the Short-eared Owl, all of the predators that may have driven their formation in the past are now extinct, as are many of the species that may have joined the flocks. This artificial situation led E. O. Willis to conclude, wrongly, that Hawaii lacked mixed-species flocks. Such flocks can be observed today on Kauai, Maui and Hawaii, and formerly occurred on Oahu, but they differ from island to island not only in the component species, but also in flock size and behaviour. Mixed flocks form mainly after the breeding season, in the second half of the year, when many juveniles are present. Each island has a different "focal species" around which the flocks assemble. On Maui, the focal species is the Maui Alauahio, which today may contribute nearly all of the flock's participants because other species are so rare. In fact, modern observers search for rare birds by following the very noticeable calls of the Maui Alauahio. A fully developed Maui flock historically would include the Hawaii Amakihi, the Maui Nukupuu (*Hemignathus affinis*), the Maui Parrotbill and the Poo-uli, with occasional participation by the Iiwi. Undoubtedly, other species would have participated in the more distant past. The only mixed flock ever described from Oahu comprised 30–50 Oahu Alauahio and other unidentified species. Now that the alauahio is very rare or extinct on that island, flocking behaviour may likewise be so. On Kauai today, the flocks are smaller and not so tightly organized, and therefore less noticeable, than those on Maui. The species involved are the non-drepanine Elepaio, along with the Akikiki, the Kauai Amakihi, the Anianiau and the Akekee, with occasional brief participation by the nectarivorous Apapane and Iiwi. Early naturalists such as Perkins described a very different situation in which nearly all the forest-dwelling birds of Kauai participated in well-organized flocks. The Kauai Akialoa and the Kauai Nukupuu (*Hemignathus hanapepe*) were seen most often in association with such flocks, with the Akikiki as the focal species. Today, that species is quite rare and by no means present in every flock, which could account for the looser organization.

On the island of Hawaii, flocking behaviour is quite different, with sometimes more than a hundred participants in much closer association than on Maui or Kauai. When present, these flocks are very conspicuous to observers and resemble the tight-knit flocks so familiar in continental tropical forests. Such flocking, however, is confined to a very narrow season in late summer and early autumn, and is often associated with balmy wet weather, though not heavy rain. The focal species on this island appears to vary and is not always readily apparent. In the vicinity of Hakalau Forest National Wildlife Refuge, on windward Mauna Kea, family groups of the Hawaii Akepa appear to be the flock-organizers, and participants include the Hawaii Creeper, the Akiapolaau, the Iiwi, the Apapane and even the introduced Japanese White-eye (*Zosterops japonicus*), but the proportions of each vary. Pratt reported one flock of around 50 Hawaii Akepa, ten Hawaii Creepers and ten Iiwi moving from tree to tree, often occupying only two or three medium-sized ohia trees. At another locality, he found flocks comprising mainly Hawaii Creepers and Akiapolaau. Exactly why these flocks form for such a short period on an island with minimal predation threat remains mysterious.

Recreational birders are often perplexed by the fact that, for the most part, Hawaiian honeycreepers do not respond to "pishing" or "squeak lures" used for attracting small birds in mainland areas, even though non-drepanids, such as the Elepaio, the Omao (*Myadestes obscurus*) and the Hawaiian Crow (*Corvus*



*This **Maui Alauahio** is searching for invertebrates, not feeding on fruit. Maui's insectivorous honeycreepers include several specialists: the Poo-uli* (Melamprosops phaeosoma) *takes mostly snails; the Maui Parrotbill* (Pseudonestor xanthophrys) *excavates for wood-boring larvae; and the Maui Nukupuu* (Hemignathus affinis) *strips bark for smaller larvae and weevils. The Maui Alauahio follows these larger birds, scavenging for disturbed and overlooked prey. In its feeding behaviour, and its appearance, it otherwise resembles a New World warbler (Parulidae), gleaning leaves and bark, and making brief aerial sallies to catch flying insects.*

[*Paroreomyza montana*, Maui, Hawaiian Islands. Photo: Jack Jeffrey]

hawaiiensis), do respond to such lures. Among Hawaiian honeycreepers, only the alauahios and the Poo-uli react to squeak lures routinely, the melanodrepanines responding only sometimes. Likewise, with the same two exceptions, Hawaiian honeycreepers do not engage in predator-mobbing, an innate behaviour that likely would have remained after the extinction of most native predators. The Maui Alauahio, on the other hand, responds vigorously to the presence of such predators as Short-eared Owls and feral cats. When an owl flies overhead, the alauahios leave their usual understorey haunts and rise into the canopy, raising a loud clamour, while other honeycreepers go silent, retreat from the canopy, and hide in the understorey. C. B. Kepler and his colleagues observed a possible example of mobbing behaviour by a Poo-uli in 1996, but the species was by then so rare that true mobbing would have been impossible. The fact that mobbing behaviour and response to artificial lures are exhibited only by the two Hawaiian honeycreepers that lack drepanidid odour (see Systematics) may not be coincidental. H. W. Henshaw suggested that the odour might serve as a predator-repellent, but no studies have been done to test the hypothesis.

Voice

Hawaiian honeycreepers are excellent vocalists, and present as varied an array of sounds as does any other passerine group. Of course, it is not possible to know what the long-lost species sounded like, and the observations that follow pertain only to those known historically. Pratt's recent CD compilation includes recordings of all known drepanidid vocalizations. Most are species-specific, but threads of similarity enable some groupings and generalizations to be made. Some songs vary individually, some geographically even within a single island, and others differ according to age and sex.

All Hawaiian honeycreepers utter short notes that are usually referred to as calls. The most common of these are contact calls, which function mainly to identify the bird's presence to others. They tend to be characteristic of a species, and are mostly short sound bursts that can be loud and far-carrying, as are those of the Ou, or quiet, as with most of the chlorodrepanine species. Some honeycreepers incorporate notes similar to their calls into their more complex territorial songs, and the Iiwi and Akohekohe noticeably blur the distinction. Males and females of the Maui Parrotbill and Akiapolaau, and perhaps other species, have gender-specific calls. Most calls are fairly stereotyped, but the Hawaii Amakihi has a highly varied repertoire of short notes that seem to proliferate in places of high population density, such as the mamane–naio forests of Mauna Kea. Several Hawaiian honeycreepers have an upslurred social or alarm call that is very reminiscent of similar calls of cardueline finches. Such calls have been reported for species across the taxonomic spectrum, including the Ou, the Maui Parrotbill, the Akiapolaau, the Hawaii Amakihi, the Akepa, the Iiwi and the Poo-uli. All species have juvenile calls, given by begging young, and those of the Akiapolaau, Maui Parrotbill, Akikiki and Hawaii Creeper are distinctive and persist into the first year of life, when fledged young are still following their parents. Distinctive juvenile calls have not been reported for the finch-type drepanidids or the melanodrepanine group. The begging calls of the Akikiki and the Hawaii Creeper are short, syncopated sequences of dry notes with quicker bursts interspersed. Those of the two species are virtually identical, and quite different from any juvenile notes of other honeycreepers, but they apparently evolved independently as a result of similar selection pressures. Young of both the Akiapolaau and the Maui Parrotbill have very long periods of dependency, lasting for up to a year, and both have what has come to be known as a "beacon call". This is a loud, persistent chirp uttered at regular intervals by a sedentary juvenile while the parents forage. Whether these calls indicate relationship or are another example of convergence has not been determined.

An intriguing question as yet unanswered is that of whether there is, for each island, a distinctive flock-cohesion note uttered by all flock-members, but given by a different focal species on each island (see General Habits). On Maui, the typical call of the Maui Alauahio is a sharp "chirk". Other species on the island have their own distinctive calls, but the Maui Parrotbill, the Poo-uli and the Hawaii Amakihi also have quite similar versions of this note, and all are, or were, flock participants. On Kauai, the cohesion note may be the typical call of the Kauai Amakihi, which, as it turns out, is not the cat-like mewing call typical of the other amakihis, but a loud piercing "chirp" that is very difficult to distinguish from similar notes uttered by the Akikiki, the Anianiau and the Akekee, all of which have their own distinctive calls. The Kauai Amakihi utters the cat-like note as a secondary species-specific call. No flock-cohesion note has been identified on Oahu or Hawaii, although notes resembling the short upslurred call of the Hawaii Creeper are given by several other species on that island.

Territorial or advertising songs of Hawaiian honeycreepers tend to be more seasonal than are the calls, but, because of very attenuated breeding seasons, there are some birds singing at almost any time of the year. The quietest period is July to September, when most species have completed one breeding cycle and have not yet started in on the next. A peculiarity of Hawaiian birds in general, the majority of which are honeycreepers, is that they do not participate in a pronounced dawn chorus. Individuals sing at dawn, but may continue at about the same level well into the day. Some species, such as the Apapane, are noteworthy for singing almost continuously throughout the day, even when not engaged in any activity, such as territory defence, that would seemingly require it. The only species reported to have a distinct dawn song is the Maui Alauahio, which is also exceptional on many other grounds.

Hawaiian honeycreeper songs mostly fall into three groupings that correspond roughly to the three main morphologically defined clusters discussed above (see Systematics). The songs of most drepanidid finches resemble those of carduelines in a general way, and the term "canary-like", referring to cardueline canaries (*Serinus*), appears often in descriptions. They are long, melodious and complex, with whistles, warbles, trills and chirps. Perhaps the most accomplished singer of this group was the now extinct Ou, the song of which was quite loud and conspicuous. Fortunately, it was recorded in 1968 by R. Gauthey and his companions and included in Pratt's CD compilation. Songs of the Laysan and Nihoa Finches are perhaps sweeter but no less varied, and the Palila has the sweetest song of all, never so loud as that of the Ou. According to Perkins, the Kona Grosbeak also had a long and sweet but quiet song. Songs of the Greater Koa



*The curved upper and straight lower mandibles of the **Akiapolaau** are independently hinged, so that despite their disproportionate lengths, the bird can bring the tips together like tweezers. It takes time to learn to manipulate this complex set of tools—the bill also serves as hammer, chisel and probe—which may explain why the Akiapolaau has one of the longest juvenile dependency periods of any passerine bird, at up to thirteen months. When foraging, the Akiapolaau has been observed to favour dead and lichen-covered branches, presumably because these hold higher numbers of beetle larvae.*

[*Hemignathus wilsoni*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]



As its alternative name, Kauai Creeper, hints, the ***Akikiki*** *forages rather like a nuthatch (Sittidae), sometimes moving head-downwards. Its rather fine, medium-length bill is most commonly used for picking small invertebrates from the bark of live and dead trees. In 2006, researchers were surprised to observe an Akikiki excavating rotten wood from the centre of a twig, presumably in search of insect larvae. Signs of older excavations suggested this was not an isolated occurrence. No other bird on Kauai is known to excavate wood in this way.*

[*Oreomystis bairdi*, Kokee, Kauai, Hawaiian Islands. Photo: Jim Denny]

Finch were described as being varied human-like or flute-like whistles, different from those of other honeycreepers.

Songs of the early offshoots of the honeycreeper family tree are, as may be expected, quite distinctive in context. The Poo-uli's song was never recorded, and apparently seldom uttered. A. Engilis and others described it as a series of short buzzy "chip" notes with an accelerating pace and rising inflection. In the genus *Paroreomyza*, only the song of the Maui Alauahio is known. It is notably variable, the two most common types being a repeated stereotyped series of whistles, reminiscent of many New World warbler songs, interspersed with the loud call note, and a more complex jumble of whistles and chirps resembling the song of the cardueline House Finch.

Among the melanodrepanines, the songs of each species are highly varied and distinctive, yet they bear an overall similarity that sets them apart as a group. Moreover, they resemble the songs of Australasian honeyeaters in that they include metallic, bell-like, reedy, flute-like, echoing and dissonant notes. Exactly how this resemblance arose is rather mysterious, in light of the recent discovery by Fleischer and his colleagues that supposed Hawaiian honeyeaters, namely the four species in the genus *Moho* and the Kioea (*Chaetoptila angustipluma*), all of which are now extinct, were not, in fact, meliphagids at all, their resemblances, vocal and otherwise, being a spectacular example of convergence. Honeyeater-like notes aside, the highly varied songs of the Apapane are rather finch-like and include complex series of whistles and trills. Their derivation from a finch ancestor requires no stretch of the imagination. Songs of the Akohekohe resemble those of the Apapane in pattern, but are much lower-pitched and slower-paced, as if the smaller bird's song was being played back at a slower speed. The song of the Iiwi is unlike that of any other living honeycreeper. It is an odd recital of short elements with long pauses, in pattern rather like the song of the American Yellow-breasted Chat (*Icteria virens*), with individual notes nearly identical to some uttered by the New Zealand Bellbird (*Anthornis melanura*) and the Tui (*Prosthemadera novaeseelandiae*). The two mamo species died out before the era of recording equipment, but both Perkins and W. A. Bryan describe their songs as being long penetrating whistles, with much less complexity than is evident in other melanodrepanine songs.

All of the remaining honeycreepers sing short, relatively stereotyped songs compared with the finch-type species and the red-and-black group. Their songs are species-specific and can be characterized as being either rapidly repeated elements (trills) or short bursts of frequency-modulated whistles (warbles). Those that utter simple trills are the amakihis, including the extinct Greater Amakihi, and the Hawaii Creeper, the Akikiki, the Anianiau and the akepas. The Anianiau may repeat elements as doublets or triplets. The Hawaii Akepa and the Akekee sing trills that shift pace and/or pitch in the middle. Apparently, on the basis of limited accounts given by early naturalists, the akialoas also had simple trilled songs. The Akiapolaau sings a warble, rather than a trill, and the other heterobills probably have similar songs, but these have never been adequately described. The Maui Parrotbill produces a series of repeated notes as in a trill, but the individual components resemble some whistles heard in the Akiapolaau warble, and the song could therefore be considered intermediate.

Those Hawaiian honeycreepers that sing short primary songs also give more lengthy vocal performances of low amplitude, the function of which remains mysterious. They are audible to humans only at a short distance. These "whisper songs" are somewhat like the subsongs uttered by many young birds during the song-learning stage, but are given by adults of both sexes in a variety of behavioural contexts. They are long and extremely complex, with a wide variety of chirps, warbles, trills and chips that may or may not resemble the primary song of the species. Indeed, the whisper songs of this family seem to resemble one another from species to species, possibly because each species may be imitating others in its locality. Whisper songs of this type are known for most of the amakihis, the Anianiau, the akepas and the Akekee, Akiapolaau, Maui Parrotbill, Kauai Akialoa, Akikiki and Maui Alauahio. All except the last two belong to the tubular-tongued clade, but whether the possession of whisper songs is phylogenetically informative has not been determined. Quiet songs have been reported also for the Palila, but they differ from the usual primary song only in amplitude. Likewise, whisper songs of the Akohekohe reported by Engilis seem to be of a different nature from the distinct class of vocalization that this term usually indicates among honeycreepers. Much remains to be learnt about the purpose and development of whisper songs and their distribution among the Drepanididae.

That Hawaiian honeycreepers engage in vocal mimicry is now fairly well established, but the phenomenon is poorly studied. Obvious imitations of both native and introduced bird species are a common element of drepanidid whisper songs. In other con-



*Despite the many morphological similarities and almost identical feeding behaviour, DNA analysis has shown that the **Hawaii Creeper** is not closely related to the Akikiki* (Oreomystis bairdi). *Outside the breeding season, Hawaii Creepers join mixed-species feeding flocks made up of other honeycreepers. The Hawaii Creeper and the Hawaii Akepa* (Loxops coccineus) *have been found to be "nuclear" species in these flocks, either or both almost always being present, and making up the highest number of individuals per species. They are unlike most nuclear species in that they lack conspicuous movements, vocalizations, or colour patterns.*

[*Manucerthia mana*, Hawaii, Hawaiian Islands. Photo: Jack Jeffrey]

texts, some species also imitate call notes of syntopic species, the purpose of which is by no means apparent. For example, the Palila sometimes imitates the whistled call of the Akiapolaau; the Iiwi imitates the onomatopoeic song of the Elepaio on Hualalai Volcano, on Hawaii, but not in other places where the two occur together; and the Hawaii Amakihi imitates the contact call of the Palila where the two live together on Mauna Kea, but not elsewhere. Like the whisper songs, vocal mimicry among Hawaiian honeycreepers is fertile ground for future study.

In addition to the various vocalizations outlined above, Hawaiian honeycreepers produce a variety of non-vocal sounds, the most intriguing of which is a very noticeable "wing note" produced by members of the melanodrepanine group. This light, cooing note, which is one of the characteristic sounds of Hawaiian native forests, was reported for the mamos and is produced by the Akohekohe, the Iiwi and the Apapane. The last two of these species have the outer primaries modified to enhance the wing note, but the sound's function is not known. It may be linked in some way with the large feeding assemblages sometimes formed by these species. Other non-vocal sounds include bill-snaps, associated not only with fly-catching but also with aggressive encounters. Both the Maui Alauahio and the Maui Parrotbill use bill-snaps in agonistic displays.

Food and Feeding

As may be expected in a group with such a varied feeding apparatus, Hawaiian honeycreepers eat virtually every kind of food exploited by passerines worldwide. Some species are highly specialized, while others are true generalists. They can be rather imprecisely divided into guilds, based on the kinds of foods eaten, but species may belong to more than one guild, and even specialists may occasionally stray from their normal diet. One guild is primarily carnivorous, but all species feed invertebrates to their nestlings. The vegetarian guilds include seed-eaters, fruit-eaters and leaf-eaters, and nectar-feeders, and another is omnivorous.

Although Hawaii has many native grasses, none of the historically known Hawaiian honeycreepers exploited this food source exclusively, and only the Laysan and Nihoa Finches eat grass seeds regularly as a part of their diet. Perhaps some of the extinct smaller *Telespiza* finches were granivores. The lack of a small-seed specialist among Hawaiian birds is particularly puzzling in the absence of native rodents. Nevertheless, drepanidid seed-eaters consume mostly large seeds extracted from larger fruits. Most are specialists on a single plant species (see Habitat), utilizing a few back-up species to get through periods of shortage of their main foods. The Palila rips out the seams to release the seeds from mamane pods, which it holds in the feet. Morin and Conant observed Nihoa Finches feeding similarly on pods of ohai. The koa finches, too, fed on legume pods, using the evenly curved cutting edges of the elongated heavy bill to slice up younger green pods and to rip into larger mature ones. Stomachs of some specimens contained finely divided green matter that the collectors thought to be young leaves. The Kona Grosbeak's feeding was never observed closely, but early collectors were able to locate these birds by the loud cracking sounds that they made as they extracted seeds from rock-hard naio pericarps.

Hawaii has several fruit-eating non-drepanidid birds, including crows (Corvidae) and solitaires (*Myadestes*), which may have largely closed off the frugivore option in the honeycreepers' adaptive radiation. Although many Hawaiian honeycreepers eat fruit opportunistically, only the Ou, so far as we can know, is a true frugivore. It fills a niche occupied by small fruit doves (*Ptilinopus*) on other Pacific islands, no columbids having been present in ancient Hawaii, and it has also been compared, both behaviourally and morphologically, with Neotropical tanagers. It was particularly adept at plucking the small components of the composite fruits of ieie, of which it was the main pollinator, a role now taken, as P. A. Cox found, by introduced birds. The Lanai Hookbill also may have been a frugivore. Munro found small fruits of a native shrub in the stomach of the one specimen, but James's team believed that the weird bill shape (see Morphological Aspects) indicated a higher degree of specialization than such foods would require. The likewise extinct Ula-ai-hawane may have eaten palm fruits, but it would have had to devour them piecemeal because most are too large for such a small bird to swallow whole. Alternatively, it may have simply pierced the soft fruits in order to extract juices with its tubular tongue, as has been observed for some other honeycreepers. Its bill somewhat resembles those of other small frugivores, such as the smaller tanagers in the genera *Tangara*, and *Euphonia*, the pardalotes (Pardalotidae) and the flowerpeckers (Dicaeidae), but the Hawaiian palmcreepers may not be ecological analogues of any of those groups. Despite earlier reports to the contrary, the Maui Parrotbill seasonally takes small soft fruits, especially those of pilo (*Coprosma*), eating the seeds and discarding the pericarps.



*The **Maui Parrotbill** commonly forages using its bill in the form of pliers, pulling heavy strips or pieces of bark away from a tree, or crushing smaller dead twigs in order to find larvae. Often a little digging may be required to loosen the bark, as appears to be happening here. Like the Akiapolaau* (Hemignathus wilsoni), *the Maui Parrotbill is capable of manipulating the two mandibles independently, although it tends to do so rather infrequently.*

[*Pseudonestor xanthophrys*, Maui, Hawaiian Islands. Photo: Jack Jeffrey]

Other Hawaiian honeycreepers that occasionally join the fruit-eating guild include the Laysan Finch, the Nihoa Finch, the Poo-uli, the Kauai Amakihi, the Hawaii Amakihi, the Akohekohe, and almost certainly others as yet unobserved.

Although many bird species are referred to as being insectivores, most of them readily take all kinds of small arthropods, molluscs and worms, in addition to insects. At one time or another, all Hawaiian honeycreepers join the carnivorous guild because of the need, seasonal or otherwise, for the concentrated protein provided by invertebrate prey. Perkins stated that the usually frugivorous Ou gorged itself on caterpillars during periodic outbreaks of the latter. Predominantly insectivorous honeycreepers include the alauahios and the Kakawahie, the akepas, the Akikiki, the Hawaii Creeper, the Poo-uli, the heterobills and the Maui Parrotbill. Those that take invertebrates along with plant foods include the amakihis, the Anianiau and the akialoas. With such a large community of insectivores, specialization is essential and involves choice of prey and substrate, as well as varied feeding methods and bill shapes. The island of Maui provides a good example of fine-tuned niche-partitioning. The Poo-uli is mainly a snail specialist, but it also takes insects from bark and crevices; it does not, however, excavate for hidden larvae, a role filled by the Maui Parrotbill, whose diet consists almost entirely of cerambycid and similar beetle larvae that bore into dead wood. The Maui Nukupuu's movements are similar to those of the parrotbill, but its bill is too weak to extract larger larvae, and the two birds do not therefore compete directly with each other. Like jackals (*Canis*) following lions (*Panthera leo*), groups of Maui Alauahio accompany these specialists and pick up the gleanings. They also capture insects in quite different ways, including leaf-gleaning and aerial flycatching. The Hawaii Amakihi seeks many of the same prey as the alauahio, but it searches more often in leaves and feeds more often on plant material, and the Maui Akepa avoids competition by specializing on tiny larvae hiding in ohia leaf buds. Each island has a distinct community of insectivores, and the roles of the players shift accordingly. For example, the island of Hawaii has no equivalent of the Poo-uli and no alauahio, but it does have the Hawaii Creeper, a short-billed nuthatch-like bark-picker, the Greater Amahiki, a nook-and-cranny foraging specialist, and the Akiapolaau as the main predator of cerambycid larvae.

Several Hawaiian honeycreepers have already been mentioned as participating in more than one feeding guild. Some species are so general and varied in their choices of foods that they form a true generalist guild. The Laysan Finch can, and does, eat virtually anything available. Morin and Conant detailed a menu of flowers, fruits, leaves, stems, seeds, seedlings, roots, carrion, invertebrates and eggs, with no one food type predominating. This species apparently survived the total devastation of the island's vegetation by feral rabbits in the early twentieth century by eating seabird eggs. The Nihoa Finch likewise has eclectic tastes and a similar list of food items, but with different species of plant and invertebrate. Interestingly, one item not in the diets of these two finches is nectar. Amakihis are perhaps the quintessential generalist feeders, and their short downcurved bill is clearly an analogue of the bills of other island generalists such as the geospizine Cocos Island Finch (*Pinaroloxias inornata*). The amakihis' list of foods is rather different from that of the Laysan and Nihoa Finches, as it contains a large component of nectar. Amakihis have a nectar-adapted tongue, but no apparent plant preferences. They will feed on any flowers, including a wide variety of introduced ones, if nectar is accessible. They attack juicy fruits by piercing the skin and sucking out the juice, and on the island of Hawaii they are frequent visitors to sap wells created by the Akiapolaau. In addition, they take a wide range of insects, both by leaf-gleaning and by bark-picking. The Kauai Amakihi is notable for its greater reliance on trunk foraging compared with the others. On Maui, at least one group of Hawaii Amakihi in Haleakala National Park learned to panhandle for handouts from picnickers, and even entered parked cars to forage for food scraps left by humans. Pratt reported that these birds ate potato chips (crisps), bread crumbs and soft drinks, taking the last from discarded cans in open recycling bins, and that they even attempted to eat dried coconut (*Cocos nucifera*). Apparently, they were finally removed to more remote areas in order to prevent these unhealthy human-induced habits from spreading in the population.

Other honeycreepers also can be regarded as generalists, but they are much more specific with regard to the various components of the diet. According to Perkins, the akialoas were well suited to feeding on certain species of native flower with curved corollas, but roughly half of their diet consisted of insects gleaned from bark. The Anianiau likewise takes insects and nectar in about equal proportions. The Maui Alauahio has a bill morphology and diet, mostly leaf and bark insects but with a small proportion of nectar, rather like that of the Cape May Warbler (*Dendroica tigrina*) of North America. Remarkably, the alauahio's adapta-



Invertebrate availability varies with the season, and nectar becomes scarce during drought, so the sap wells drilled in ohia trees by Akiapolaaus (Hemignathus wilsoni) *can be a valuable resource for other honeycreepers, like this* ***Hawaii Amakihi****. Ohia trees are evergreen, and their sap is available all the year round. The Akiapolaau defends its "aki trees" vigorously. Researchers have found that aki trees are of a rare type with much higher sap flows than other ohia trees, but how the Akiapolaau finds them, whether by trial and error or some external characteristic, remains a mystery.*

[*Chlorodrepanis virens*, Hakalau, Hawaii, Hawaiian Islands. Photo: Peter LaTourrette]

tions for nectarivory are entirely different from those of other flower-feeding honeycreepers (see Morphological Aspects). It also captures flying insects in aerial sallies, although it is not primarily a fly-catcher.

Several species of Hawaiian honeycreeper, including the amakihis and alauahios, visit natural sap fluxes, places on the trunks of living trees where sap flows continuously, often as a result of injury to the trunk. Indeed, several of the last few sightings of the Oahu Alauahio were at sap fluxes. The only honeycreeper that actively "farms" for tree sap, however, is, surprisingly, the usually insectivorous Akiapolaau. For this, it chooses ohia trees only, although its foraging for insects is done almost entirely in koa trees. It drills rows of small openings about 1 cm apart into the cambium. The sap flow stops after only a few drops, so that the wells must be reopened on subsequent visits. The Hawaii Amakihi and other honeycreepers visit and drink from the wells, but only the Akiapolaau creates them, and sap wells have not been observed on islands other than Hawaii. Whether sap-feeding is related to nectarivory, or whether tree sap is nutritionally comparable to nectar, has not been studied in Hawaii.

The guild of nectar-feeders includes many variations on the theme, based primarily on the species of flower involved. Some nectarivores will harvest nectar from any source, even unfamiliar introduced plants, while others specialize on one or a few native species. In the Hawaiian environment, nectar is a superabundant food resource, although often patchy and irregular seasonally, and nectar-feeding niches exhibit broad overlap, especially when compared with the narrow specializations of the insectivores. By far the most important nectar source is ohia-lehua (see Habitat), and even the most dedicated insectivores occasionally feed on it. Lehua blossoms produce 75% or more of the diets of the Iiwi, the Apapane and the Akohekohe, but all three feed opportunistically in a wide variety of other native and introduced flowers. Early observers reported the Apapane as feeding among coconut flowers along the beach, a phenomenon that would be impossible today (see Status and Conservation). The Laysan Honeycreeper had no ohia trees on which to feed, but it favoured the morphologically similar white flowers of maiapilo (see Habitat) before rabbits wiped it out. The generalist amakihis, Anianiau and others are not so focused on ohia, but they all certainly feed on it. In contrast to these "nectar generalists", the two mamos fed almost exclusively on the co-evolved curved flowers of lobelioids in the genera *Cyanea* and *Clermontia*, whose flowers provide a finger-in-glove fit with the birds' bills. Akialoas likewise favoured particular flowers even when other, similarly shaped ones were available. Although its bill seems better adapted to frugivory, the Ula-ai-hawane may have fed on nectar of *Pritchardia* flowers, filling the same niche as that occupied by brush-tongued lorikeets (*Vini*) on other Pacific islands.

Although nectar is usually a superabundant food resource in Hawaii, it is subject to vagaries of weather and climate far more than are insects. Normally, a variety of nectarivores can feed together on the same resource without conflict, but during nectar famines, which are of rare occurrence, the nectarivores engage in a form of niche-partitioning rather different from that of insectivores. The specialists then gain an advantage by having a small but constantly available nectar source that other species cannot exploit. The less specialized species set up feeding territories and a size-related dominance hierarchy, at the top of which were the now extinct non-drepanid oos (pronounced "oh-ohs") in the genus *Moho*. The territorial honeycreepers, in descending order of size and rank in the hierarchy, are the mamos, the Akohekohe and the Iiwi. These species are highly territorial throughout the year, and much more aggressive towards members of their own species than towards lower members of the feeding hierarchy. The non-territorial species deal with this situation in several ways. By feeding in large assemblages, Apapane groups simply overwhelm lone defenders, while the amakihis employ stealth to obtain nectar or shift to other food items. In most respects, the Hawaiian nectar-feeding community has a structure similar to those of hummingbirds (Trochilidae) and sunbirds (Nectariniidae).

When nectar resources are widely scattered in an area, several normally territorial nectar-feeders may engage in trap-line feeding, regularly patrolling a series of flowering trees in the manner of a fur-trapper checking a line of traps. Birders are well aware of this behaviour by the Akohekohe, and have learnt to wait for repeat visits at trees where this species has been seen. The birds usually return in 20–30 minutes, apparently the length of time that ohia trees require to replenish their nectar. The Iiwi also engages in trap-lining, but its cycles are less predictable because it exploits a wider variety of plant species with different nectar-recovery periods. Perkins described what might have been a form of trap-lining by mamos, which fed on widely scattered individuals of particular lobelioids.

Breeding

The Hawaiian honeycreepers are remarkably uniform in their breeding habits, especially in the context of the broad adaptive radiation of the group in other aspects. Unfortunately, the available data are based on only a small subset of species that have been studied in detail and fragments of information on others. Nothing at all is known about the breeding of the koa finches, the Kona Grosbeak, the Ula-ai-hawane, the mamos, the Greater Amakihi, the nukupuus, the Ou, and all except one of the akialoas.

Like many tropical birds, Hawaiian honeycreepers have a greatly extended breeding season. The breeding cycle begins in the winter months, sometimes as early as October, builds over the ensuing months to a peak during April–June, and then tapers off into August. Particular species may reach a peak earlier or later in the cycle, and at any given time at least a few individuals of some species are engaged in breeding. Active nests of the Hawaii Amakihi, for example, have been found in every month of the year. The insectivorous species tend to have longer breeding cycles than those of the nectar-feeders, probably because their food is available all year. The nesting season roughly follows the peak of rainfall in the islands, which varies from year to year.

Pair-bonding begins late in the year, and is usually completed in January or February. Most honeycreeper pairs are monogamous over a period of years, but the partners remain together only while actively nesting or feeding young. At first, the male defends a moving territory centred on the female. Once the nest-site has been selected, he defends only a small territory, often only a few metres in diameter. Such territoriality has been observed for the Laysan Finch, the Palila, the Hawaii Akepa, the Akekee, the Anianiau, the Kauai Amakihi, the Iiwi and the



When most of its island's native vegetation was destroyed by introduced rabbits as part of a misconceived meat-production scheme, the ***Laysan Finch*** *survived by eating seabirds' eggs, and probably also some carrion. These tenacious and adaptable finches have learned to follow humans and seize eggs as birds are flushed from their nests. They also eat invertebrates, and the seeds, flowers, leaves and even roots of indigenous plants. The introduced populations on Pearl and Hermes Atoll appear to have evolved larger, different shaped bills to deal with the hard-skinned fruit of nohu* (Tribulus cistoides).

[*Telespiza cantans*, Laysan, Hawaiian Islands. Photo: Mark J. Rauzon]



*The **Maui Alauahio** nests in a variety of native and introduced trees, whereas most species are restricted to one or two tree species; it also chooses sites nearer the ground than most. So far as is known, the Maui Alauahio is the only honeycreeper in which adults are helped at the nest by the young of the previous year. As in most other species, the female alone builds the nest, and seven different nest types have been identified, based on size and materials. The typical honeycreeper clutch is two eggs. Breeding success is low, not helped by the chicks' habit of jumping from the nest when disturbed, a consequence of evolving at a time when there were no ground predators.*

[*Paroreomyza montana*, Haleakala National Park, Maui, Hawaiian Islands. Photo: Michael Walther]

Apapane, and is characteristic also of cardueline finches. Much larger territories are typical of those species that remain in family groups throughout the year, such as the Akiapolaau and the Maui Parrotbill, or those that defend feeding territories or home ranges such as the Maui Alauahio, the Akohekohe and, in some places, the Hawaii Amakihi. Hawaii Amakihi territories vary in size with habitat, being smaller in mamane–naio forest and larger in ohia–koa rainforest. Surprisingly, neither the Akikiki nor the Poo-uli have exhibited any territory-defence behaviour at active nests.

As they are usually performed in concealment, the mating displays of Hawaiian honeycreepers are poorly known, although all species presumably have them. Those that have been described are species-specific, but there are some underlying similarities between them. Two such displays that seem to be common to all species are sexual chasing and courtship feeding. In sexual chases, individuals fly erratically through the forest while giving loud vocalizations. Females solicit courtship feeding by crouching, quivering the wings, and uttering calls that sound like the begging notes of juveniles. They use a similar posture when submitting to copulation, which is usually instigated by the male in a display in which he hops back and forth while singing near the female (see Voice).

Nearly all Hawaiian honeycreepers that live in ohia forest build their nests high in a dense terminal leaf cluster of a non-blooming ohia tree. In mamane–naio forest, the Palila and the Hawaii Amakihi favour mamane, but nest in both dominant trees. Birds living in open habitats use grass clumps, as illustrated by the Laysan Finch and Laysan Honeycreeper, or rock crevices, as typified by the Nihoa Finch. The Hawaii Creeper, the Akiapolaau and the Apapane sometimes nest in cavities, and the Hawaii Akepa always does so. The existence of suitable cavities is probably a limiting factor for the last-mentioned species. The Maui Alauahio tends to nest nearer the ground than other honeycreepers, and it uses, in addition to ohia, a wide variety of tree and shrub species, including such unlikely trees as introduced conifers, but it eschews readily available introduced eucalypts. The Apapane has the most varied list of nest-sites of any honeycreeper, including ohia trees, cavities, lava tubes, low shrubs, tree-ferns and koa trees.

All nests of Hawaiian honeycreepers are built by the female, sometimes with help from the male, which delivers materials to the female for placement in the nest. The nests have a coarse outer wall and a neatly lined inner cup, but they vary widely, even within species, in terms of the materials used and the style of construction. The Hawaii Amakihi has five nest types, and the Maui Alauahio has seven described variations. Virtually any available plant material, or even man-made fibres with the appropriate texture, may be utilized in the construction. Nests of the alauahios and the Kakawahie differ from those of other Hawaiian honeycreepers in being bound together with spider (Araneae) silk.

Eggs of all of the members of this family are white, variably spotted and blotched with brown and purple, these markings often forming a wreath around the larger end. The typical clutch consists of three eggs, but can be of one to five, and some species never lay more than two eggs in a clutch. Incubation takes 14 to 18 days, typically lasting for 16 days, and is carried out entirely by the female; during this time the male feeds her by regurgitation, either on the nest or off it. Hatching takes place usually in the morning, and the nestlings are nearly naked at first. They are brooded by the female, especially during rainy weather or darkness. Both sexes feed the young, but the female takes a more prominent role. As with nest-building materials, the male may bring food items to the female, which then feeds the chicks.

The nestlings of more than half of the members of the family have been described. On hatching, they have only some sparse down of a grey colour, although that of the Palila is black, and Akikiki nestlings apparently have white down. The skin is pink or pinkish-orange, sometimes more reddish or with a yellow tinge, the mouth is pink to reddish, but sometimes more purplish, and the rictal flanges are yellow. The chicks develop and grow at a normal rate. Taking the young liwi as an example, the eyes open on the fourth day, the feathers begin to break through the sheath on the seventh day, and after 12–14 days the chick will jump from the nest at the slightest disturbance. In the case of the larger Palila, the eyes open on the seventh day, when the chick is able to stand in the nest; on the ninth day its grasping reflex is evident, and by day 15 it starts to preen vigorously; by day 21 wing-flapping starts. The hatchlings of the much smaller Hawaii Creeper open the eyes from the fifth day, the pin-feathers appear at 5–8 days, and the chick is fully feathered by 11 days. Kauai Amakihi hatchlings open the eyes on day 4, and the feathers begin to break from the sheath on day 7, a schedule similar to that of the Apapane, the chick of which is fully feathered by 14 days.

Nestling periods vary from 15 days to 27 days, the shortest being those of the Hawaii Amakihi and the Maui Parrotbill, and



*Among the Critically Endangered species in this family is the **Akekee**, which halved in numbers from an estimated 7800 to 3500 between 2000 and 2007. It faces a combination of threats, including alien species and habitat destruction by humans and hurricanes, but perhaps the most deadly is disease. Avian malaria and avian pox are carried by introduced mosquitoes. Most of the individuals that survive are found at cooler, higher altitudes than mosquitoes will tolerate, but the mosquitoes are showing signs of adapting to lower temperatures, even before the range-extending potential of global warming is factored in.*

[*Loxops caeruleirostris*, Kokee, Kauai, Hawaiian Islands. Photo: Jim Denny]

the longest those of the Akohekohe and the Laysan Finch. The parents keep the nest clean by carrying away faecal sacs. This behaviour is continued by the melanodrepanines and the Maui Alauahio throughout the breeding cycle. In the case of the finch-type species, the Maui Parrotbill and some chlorodrepanines, however, faecal sacs are removed only until the time when the young are old enough to defecate over the side of the nest; from then onwards, faeces accumulate on the outside of the nest until it sometimes becomes completely caked. The fledglings of most of the species are fed for up to four months, but those of the Maui Parrotbill are fed for 5–8 months and fledglings of the Akiapolaau are tended for more than a year.

C. R. Eddinger discovered an unexpected response by Hawaiian honeycreepers to predators that was at the time perplexing. In the later stages of the nestling period, the young chicks are extremely sensitive to any sort of disturbance of the nest, and jump out at the slightest vibration. Once on the ground, they may be neglected by the parents and are particularly vulnerable to terrestrial predators. Nevertheless, some survive. Students of honeycreeper breeding biology have coined the term "jumplings" for such nest fugitives. Why would such a seemingly disadvantageous trait have developed? The answer lies in the fact that, before humans, Hawaii had no terrestrial predators, but did have an array of aerial bird-hunters. Thus, the act of bailing out to the ground was better than falling prey to a hawk or an owl. This once adaptive behaviour is now a disadvantage and may be contributing to the long list of problems facing surviving Hawaiian honeycreepers (see Status and Conservation).

Helpers at the nest are a very rare phenomenon among Hawaiian honeycreepers, but the seemingly always exceptional Maui Alauahio routinely has them. If available, one or two offspring from the previous year help to feed the adult female, the nestlings and the fledglings. In poorer habitats with low reproductive success, however, less than a third of the pairs may have such helpers.

Movements

Hawaiian honeycreepers are not migratory, and many of them, especially the insectivores, are quite sedentary. Early naturalists observed seasonal altitudinal movements by some species, but no such regular movements are apparent today. Nectarivorous species move about irregularly, following the blooming of certain trees such as the ohia and mamane. Ohia flowering often follows an elevational gradient, and the Akohekohe and the Apapane move in response to the pattern of blooming. Both the Iiwi and the Apapane frequent mamane forest when the trees are in bloom, but they seldom nest there and they retreat to more familiar territory at night. Because blooming depends largely on rainfall patterns, which are notoriously variable from one year to the next, these movements are not very predictable.

On the island of Hawaii, the Apapane and Iiwi perform daily altitudinal movements on the slopes of Mauna Loa, flying down to lower elevations to feed during the day and returning to higher levels to roost. Such flights can involve thousands of birds and are conspicuous in some localities. Whether these movements have always been made as a means of gaining thermal advantages, the lower slopes being more frequently foggy at night, or whether they have developed in response to the presence of night-flying mosquitoes at lower elevations is a still unsettled debate. On Mauna Kea, evening flights are reversed, the birds leaving the higher mamane–naio forest, where night-time lows approach freezing, to roost in mid-elevation ohia forest.

Another form of altitudinal movement occurs in response to severe storms such as hurricanes. During violent weather, honeycreepers may leave the high-elevation forests and take shelter in lowland valleys. This once adaptive strategy is now, like the jumpling phenomenon (see Breeding), maladaptive because of the presence of disease-carrying mosquitoes in these lowland "refuges" (see Status and Conservation). Conant and her colleagues suggested that this behaviour might have delivered the final blow to several species, including the Ou, during severe hurricanes on Kauai, in 1983 and 1992.

Relationship with Man

Despite their disastrous effects on honeycreepers in general (see Status and Conservation), Hawaiian people held certain species in high regard as a source of feathers. Polynesian cultures valued red and yellow feathers, rare in most of Polynesia, as a medium of exchange, and the first settlers must therefore have viewed Hawaii as a place where money "grew on trees". Ultimately, feathers became an important part of Hawaiian material culture and were collected for payment of taxes. They were used for the

creation of beautiful feather artefacts, including sacred images and garments worn by the 'ali'i (nobility), such as full-length cloaks, waist-length capes, helmets, small aprons, and leis (garlands). Conant examined a large number of such objects and determined that the red and yellow feathers came primarily from the Iiwi, the Hawaii Mamo and the non-drepanid oos. Apapane feathers were used secondarily. After western man made contact with the human residents, many feather garments were constructed as gifts for foreigners, and they lost some of their elite status. Many authors have suggested that feather-collecting played a prominent role in the extinctions of some honeycreepers, but, despite the fact that the famous all-yellow Kamehameha cloak required the feathers of about 80,000 Hawaii Mamo individuals, Conant found no evidence to support such a claim. For one thing, the Iiwi, which was by far the most heavily exploited, was abundant at the time of western contact, and remained so until very recently. Moreover, the feathers were collected over many years and were cherished heirlooms, so that the "harvest" in any one year would probably have been sustainable.

The term "honeycreeper" came into use at a time when most species included in the group were nectar-feeders. Later, when scientists realized that other non-nectarivorous morphotypes were closely related to the nectarivores, the name was too entrenched to change. Some have proposed calling the entire group "Hawaiian finches" but that term, suggestive of a heavy, seed-crushing bill, is best restricted to those Hawaiian honeycreepers that retain finchlike morphology and habits, and would hardly be appropriate for the thin-billed species.

Status and Conservation

From the first landfall made by Polynesian voyaging canoes in the Hawaiian Islands around 1500 years ago, the relationship between honeycreepers and humans has been one of tragedy for the birds. The first Hawaiians purposely brought dogs, pigs and chickens, as well as a long list of food and fibre plants, and inadvertently introduced such hitch-hikers as skinks (Scincidae), geckos (Gekkonidae) and Polynesian rats (*Rattus exulans*). They directly exploited the flightless waterfowl known as moanalos and other flightless birds, as well as nesting seabirds, for food, but far more devastating were the ecological changes brought about by their agriculture. Over the centuries, Hawaiians developed a complex society and a large population that on some islands may have exceeded that of today. By the time when western people first visited the islands, in 1778, virtually all of the Hawaiian lowlands were deforested, seabirds were restricted to offshore islets, and half of the original avifauna, including many honeycreepers, had disappeared.

The number of species of Hawaiian honeycreeper known to science has more than doubled in the last few decades, with a number of discoveries, in caves, sinkholes, and lithified sand dunes, of remains of birds that survived until just a few centuries ago but died out following the arrival of Polynesian settlers in the Hawaiian Islands, long before the islands became known to the rest of the world. Although often referred to as fossils, these remains are not mineralized, and some even contain traces of DNA. The birds they represent lived until just a few centuries ago alongside those known historically. Following an initial overview of these discoveries in 1982, Olson and James of the Smithsonian Institution described them in a series of publications beginning with a two-volume monograph in 1991. New forms are still being found today. These species cannot be pictured in colour and and we can only infer some possible aspects of their natural history, but they would have been just as much part of the modern Hawaiian avifauna as all those species that survived human colonization of the islands, and no general discussion of Hawaiian honeycreepers would be complete without reference to their existence.

By 1778, then, the Hawaiians and their environment had reached something of an equilibrium, but western contact ushered in a new cataclysm. Virtually all of the new changes resulted from the introduction of alien organisms. For example, purposeful logging had a relatively minor impact in terms of habitat loss, but feral cattle destroyed vast tracts of forest, which had never before been grazed. In drier areas, feral goats did the same, and in mamane–naio forest the culprits, along with cattle, were feral sheep and mouflon (*Ovis musimon*), the latter introduced for the purposes of hunting. The first Hawaiian pigs were small and were usually kept penned, and feral animals did not penetrate deep into the forest. Europeans brought in huge hogs, the ancestors of today's highly destructive feral pigs, which have in recent decades penetrated even the most remote forests. The decline of the Poo-uli can be attributed in part to destruction of its understorey habitat by feral pigs, which also create breeding sites for disease-carrying mosquitoes. Rats, especially the black rat (*Rattus rattus*), have also been implicated in the demise of Hawaiian honeycreepers, and are certainly the reason for the extinction of the introduced population of Laysan Finches on Midway Atoll during World War II. Small Indian mongooses (*Herpestes auropunctatus*) are now abundant on all islands of the Hawaiian chain except Kauai and Lanai, and are a major threat to ground-nesting birds, but their effect on honeycreepers has apparently been minimal. Feral cats are a more serious threat, and are a major predator of the gravely threatened Palila. Cats also carry diseases, such as toxoplasmosis, that can infect birds. Domestic rabbits turned loose on Laysan eventually destroyed all vegetation on the island and caused the extinction of the Laysan Honeycreeper and the endangering of the Laysan Finch. W. E. Banko and P. C. Banko suggested that introduced predatory insects such as ants and parasitoid wasps might be depleting native insects and thus depriving insectivorous honeycreepers of food, and studies are under way to test this hypothesis. In Hawaii, introduced birds have largely filled in the gaps where native ones have retreated, and most do not compete with Hawaiian honeycreepers. A few species do penetrate the deepest forests and may be depleting food resources or serving as disease reservoirs. S. Mountainspring and J. M. Scott found that the generalist Japanese White-eye can displace the Iiwi and the Hawaii Amakihi from portions of their ranges, and L. Freed and colleagues of the University of Hawaii recently published evidence that, they believe, shows that Japanese White-eyes have, by depleting food supplies, directly caused a recent population crash of the Hawaii Akepa and declines of other native species in Hakalau Forest National Wildlife Refuge. Freed's team also found that, since 2000 the Hawaii Akepa has been plagued by unusually high numbers of introduced chewing lice (Mallophaga), which these scientists also attribute to food depletion. They have even predicted the extinction of the Hawaii Akepa in about a decade unless measures are taken to control white-eyes. Other independent researchers, as well as



Of three known ***Poo-uli*** *surviving in 1998, one died in captivity in 2004 and the remaining two have not been seen since the same year. Mosquito-borne disease is thought to have wiped out lowland birds, and feral pigs destroyed the bird's understorey habitat, while rats and introduced garlic snails* (Oxychilus alliarius) *have been blamed for the decline of native snails on which the Poo-uli largely depends. The Poo-uli is currently listed as Critically Endangered (Possibly Extinct). The search goes on, but it is thought unlikely that any individuals now remain.*

[*Melamprosops phaeosoma.* Photo: Alan Lieberman/ San Diego Zoo]

refuge biologists using different methodologies, have detected no declines in akepa populations in the refuge, and T. Dawson reports that recent researchers have found only minimal dietary overlap between akepas and white-eyes. Freed's apocalyptic pronouncements have ignited heated public debate, but as of 2010 no measures to control Japanese White-eyes at Hakalau have been implemented.

None of the alien organisms discussed so far can explain the catastrophic events that led to the extinction of many of the historically known honeycreepers during the late nineteenth and early twentieth centuries. Beginning with Oahu in the 1860s or earlier, and proceeding island by island, Hawaiian honeycreepers and some other native forest birds experienced sudden and catastrophic population crashes in many areas where the habitat had hardly been touched since western contact. These events were totally mysterious to naturalists of the day. The Oahu Nukupuu (*Hemignathus lucidus*) was reported as being common in 1860, but it had disappeared by 1890. In that year, the Oahu Akepa, the Ou and the Oahu Akialoa (*Akialoa ellisiana*) could still be found in very low numbers, but none survived into the twentieth century. Henshaw was particularly perplexed by the absence of the Ou there, because it remained abundant on the other islands at the time. On Hawaii, S. B. Wilson, H. C. Palmer and Munro, all collecting for Lord Rothschild, and Perkins found birds of most species to be abundant in the late 1880s and early 1890s, but Henshaw, following on their heels in the late 1890s, found vast tracts of seemingly pristine forest devoid of birds. For example, Perkins considered the Kona locality where the koa finches and the Kona Grosbeak had been collected in 1892 to be a "collector's paradise", but the finches had disappeared by the time when Henshaw visited, less than five years later. Perkins was the last to observe the Hawaii Akialoa (*Akialoa obscura*) and the Hawaii Mamo, both of which had been common in 1892 but neither of which was ever reported in the twentieth century. He also saw the Greater Amakihi, which was still locally common, but this species too was doomed, the last report coming from 1901.

Molokai's birds survived the turn of the century, but again some just barely so. The Black Mamo and the Akohekohe, common when Perkins visited in 1892, were extremely rare when Bryan followed, in 1907, and neither species was ever seen again on the island. The Ou and the Kakawahie, still common in 1907, were not found in surveys during the 1930s, although the latter survived in very low numbers into the 1960s. On Maui, which may have lost species prior to being explored ornithologically in the 1880s, the Ou was common in 1890 but had been extirpated by 1900, and the Maui Parrotbill, Maui Nukupuu and Akohekohe became so rare that they were believed extinct for half a century. The Lanai Akialoa (*Akialoa lanaiensis*) was rare in 1893 and never seen afterwards, and the Lanai Hookbill was seen only at the time of its discovery, in 1916, but Lanai's other honeycreepers were doing well into the early 1920s, when Lanai City was built at the base of the native forest. By 1940, the Iiwi, the Maui Alauahio and the Ou were extirpated from the island. Kauai's historically known honeycreepers fared a bit better, none having become extinct during the original holocaust, but populations were greatly reduced and the Kauai Nukupuu and Kauai Akialoa were not seen between 1900 and 1960, when they were rediscovered by F. Richardson and J. Bowles. Unfortunately, the akialoa did not live out the decade of its rediscovery. After these initial population crashes, surviving honeycreepers underwent slower declines, gradually withdrawing from lower elevations. The Ou was regarded as one of the commonest honeycreepers on Hawaii and Kauai in 1900, but by the middle of the century it had become rare, and by the 1990s it had disappeared completely. The range contractions to ever-higher elevations continue to the present day, with a few exceptions, for all honeycreepers.

Bryan called the sudden disappearances of birds from seemingly suitable habitat "one of the wonder tales of ornithology", and Henshaw could offer "no reasonable explanation" for the phenomenon, even though he remarked about the unusually high numbers of dead birds found in the forests and described the finding of scores of dead or moribund birds in the lowlands after severe storms. All collectors in the 1890s described birds with swellings or lesions on their bare parts, and Perkins tells of finding a Kauai Akialoa and two Kakawahie that were so ill that they could be touched by human hand. Munro, who lived out his life in Hawaii and closely witnessed the events on Lanai, was convinced that the evidence pointed to some kind of epizootic disease, probably spread by mosquitoes, but he was not taken seriously until R. E. Warner's classic study essentially proved the case. Warner showed that healthy birds transported from high elevations or from mosquito-free Laysan to lowland sites in the main islands survived well if shielded from mosquitoes, but after exposure to these insects most died quickly from two mosquito-transmitted diseases, namely avian malaria and avian pox. Warner also pointed out that native birds were found essentially only above 600 m, the upper limit for mosquitoes in the 1950s. He also showed that the islands that had suffered the greatest species loss, Oahu, Molokai and Lanai, were those with the smallest amounts of land above 600 m. Much of Warner's report was anecdotal, but the pioneering US Fish and Wildlife Service surveys led by Scott in the late 1970s, the results of which were published in 1986, found sharp decreases in the numbers of native birds at 1500 m elevation, in forests that exhibited no detectable ecological difference from others except that they harboured mosquitoes. Alarmingly, in two decades, mosquitoes had more than doubled their elevational range. Today, mosquitoes are the primary factor limiting the distribution and population of Hawaiian honeycreepers.

The southern house mosquito (*Culex quinquefasciatus*) is said to have been introduced into the Hawaiian Islands when the ship *Wellington* emptied containers holding water from the west coast of Mexico into a freshwater stream at Lahaina, on Maui, in 1826. This mosquito species is the vector for the avian malaria parasite *Plasmodium relictum* and is also an effective transmission agent for bird pox. The virus that causes avian pox, *Poxvirus avium*, probably came to the islands in domestic fowl shortly after western contact. It causes chronic lesions and swellings, as well as more debilitating systemic symptoms, is often fatal, and is spread by contact as on the proboscis of biting insects. Until recently, scientists, including Warner, had assumed that migratory shorebirds and waterfowl had always provided a reservoir for avian malaria in Hawaii, but it is now known that the form of malaria in Hawaii, *P. r. capistranoae*, has never been found in waterfowl or other birds that migrate to the islands. While mosquitoes may not have transmitted malaria when they first arrived, they undoubtedly aided the spread of avian pox among Hawaiian honeycreepers, and were likely well established on most islands by the time when *Plasmodium relictum* was introduced.

Exactly when the malaria parasite appeared in Hawaii is not known, but circumstances suggest that it may have come in with two bird species, the Spotted Dove (*Streptopelia chinensis*) and the Scaly-breasted Munia (*Lonchura punctulata*), introduced on Oahu from South-east Asia, a malaria epicentre, in the 1860s. University of Hawaii studies conducted by C. Shehata, R. Cann and others found that, even today, these two species are among those with the highest prevalence of avian malaria on Oahu, the others being species introduced in the late twentieth century. These alien birds spread throughout Oahu by 1880, and to the outer islands by 1900, and are notable for following roads and trails into otherwise forested areas. The observed pattern and timing of bird die-offs closely matches the hypothesized spread of these two malaria-reservoir species. So far, researchers have not found direct evidence of avian malaria in nineteenth-century bird specimens, and the population crashes of that era remain somewhat mysterious. C. van Riper and his colleagues believe that malaria did not reach epizootic levels in Hawaii until the 1920s, and that avian pox alone may have caused the earlier demise of native birds; avian pox, however, is a slow-acting disease, one that does not explain the acute illnesses of birds driven to the lowlands by storms and other malaria-like symptoms reported by Henshaw and Perkins. Whatever the history, the slower declines of the twentieth century, and the withdrawal to ever-higher elevations by Hawaiian honeycreepers, are almost certainly related to the presence and effects of avian malaria and pox and the gradual adaptation of southern house mosquitoes to cooler temperatures, probably accelerated in recent decades by global temperature rise.



Laysan Island, home to the endemic ***Laysan Finch****, is part of the Hawaiian Islands National Wildlife Refuge. No one lives permanently on the island, and researchers who visit are carefully inspected to ensure they do not accidentally introduce seeds, eggs or insects via their clothes or equipment. A habitat restoration project was started in 1992. The alien sandbur* (Cenchrus echinatus) *appears to have been eradicated, allowing the bunch-grass kawelu* (Eragrostis variabilis)*, the finch's preferred nesting substrate, to recover, and there are plans to reintroduce native species which survive elsewhere in the Hawaiian Islands. Because the bird's range is so small, a single cataclysmic event could wipe it out, and the Laysan Finch is listed as Vulnerable. Other islands are being assessed with the aim of creating additional populations. However, numbers have crashed at Pearl and Hermes Atoll, following an initially successful introduction in 1967. The invasive golden crownbeard* (Verbesina encelioides)*, first seen on Pearl and Hermes in 1998, provided sheltered nesting habitat and food for the opportunistic finches, but had a devastating effect on endangered seabirds, which became entangled in the dense stands of the plant when they returned to their nests. Crownbeard also threatens the finches in the longer term, by replacing native plants. On Southeast Island, which holds the largest part of the introduced population, the loss of native vegetation is almost total, and when the annual crownbeard dies back, the finches are left with little or no food. Finch numbers fell during the first attempt to eradicate crownbeard, but the US Fish and Wildlife Service hope they will climb again when native vegetation recovers from the seedbank. Meanwhile, the tenacious and aggressive weed is making a comeback.*

[*Telespiza cantans*, Laysan, Hawaiian Islands. Photo: Mark J. Rauzon/ VIREO]

Mosquitoes have now rendered Molokai, Lanai and Oahu, with respective maximum elevations of 1515 m, 1027 m and 1233 m, essentially uninhabitable for all except a few honeycreepers. On Kauai, which rises to 1576 m, US Geological Survey (USGS) researchers C. Herrmann and T. Snetsinger detected mosquitoes in the mid-1990s at the Koae Stream site where Richardson and Bowles had camped in 1960, when they found all of the island's historically known birds. In the 1990s, mosquito numbers there were low and the nearest breeding sites were 7 km away, at 1130 m. Currently, Kauai is experiencing a precipitous honeycreeper decline, closely resembling the well-documented historical crashes on Hawaii and Lanai, in its former highland-forest refugium. Between 2002 and 2007, the Akekee went from being uncommon to being rare and the already rare Akikiki disappeared completely in Kokee State Park. Both species are now "cornered" in the very highest parts of the Alakai Plateau, and are rapidly running out of places in which to escape the pestilence. Modelling by T. L. Benning and colleagues showed that only a slight temperature rise would destroy the remaining high-elevation refugium on Kauai. Hawaii and Maui have much larger tracts of high-elevation mosquito-free forest, but these disease refugia may not last through the present century.

Given their sad history, it should come as no surprise that all but two of the drepanidid species that survived into the 1980s are now globally threatened. Nine are listed as Critically Endangered, four as Endangered, and five as Vulnerable. Due to differing taxonomy, three of the species recognized herein have not been individually assessed by BirdLife International, but all three are definitely threatened, at best, and indeed may actually be extinct already, as may three of those currently listed as Critically Endangered. Overall, therefore, of the 23 species recognized here, 18 are formally listed as threatened, while three others need to be added to the list; of this total of 21, six are probably already extinct. On top of this come a further 16 species known to have become extinct in historical times, and some 16 more known only from bones. All added together, this means that of at least 55 species so far known to have occurred on the islands when humans first reached them, a miserable total of two can be said to survive with some degree of security for the future.

Of the six species herein treated as extant but in reality probably extinct, the last accepted sightings of four were in 1985 for the Oahu Alauahio, 1988 for the Maui Akepa, 1989 for the Ou, and 2004 for the Poo-uli, although rumours persist of their continued existence. In the case of the Poo-uli, a single captive bird died from avian malaria in 2004, and the two others thought to remain have not been seen since 2003 and 2004 respectively, despite intensive searches. The Kauai Nukupuu and Maui Nukupuu, both commonly considered conspecific with the Oahu Nukupuu (and together classed as a single Critically Endangered species by BirdLife), are also probably extinct, but present a more perplexing case. T. K. Pratt and R. L. Pyle found that all but a handful of published reports of either species in the twentieth century could be dismissed as misidentifications, based on the published descriptions themselves. Most reports come from observers with less than a week's experience in the islands, while seasoned veterans of the Hawaiian forest seem unable to find these birds. No report since 1900 has been confirmed by a follow-up sighting or any physical evidence. A supposed recording from Maui was later lost, and no useful photographs have been taken. Nevertheless, an impeccably detailed unpublished report from a visiting birder on Kauai in 2007 is intriguing, as are some observations on Maui in the 1990s. In many ways, the nukupuu situation is comparable to that of the Ivory-billed Woodpecker (*Campephilus principalis*) in North America, with occasional seemingly believable sightings that can be neither refuted nor repeated, and no physical documentation.

The US Endangered Species List does not match BirdLife's assessments exactly, primarily because four of BirdLife's Vulnerable species, namely the Oahu Amakihi, the Kauai Amakihi, the Anianiau and the Iiwi, as well as two Critically Endangered ones, the Akikiki and the Akekee, are not on the US list. The last two are currently under consideration for listing, following the recent population crashes. Five members of this family are included among the world's 190 "most threatened birds" in BirdLife's *Rare Birds Yearbook 2009*. These are the Nihoa Finch, the Maui Parrotbill, the Akikiki, the Akekee and the Akohekohe, all of which survive in sufficient numbers, their populations being in the hundreds to the low thousands, to have a fair chance of at least short-term survival. Whether any Hawaiian honeycreepers will survive the present century, however, is an open question.

Efforts to conserve the endemic avifauna came late to Hawaii, but today many varied programmes are operating in an attempt to save remaining forest birds. National and state parks and refuges, as well as state and private preserves, have dramatically increased and expanded. Co-operative agreements promoted largely by The Nature Conservancy, including Maui's East Maui Watershed Partnership, Hawaii's Three Mountain Alliance, and the Kauai Watershed Alliance, now involve federal, state and private landowners in managing entire watersheds for the benefit of native flora and fauna, as well as forest resources. As a result, most of the essential habitat for Hawaiian honeycreepers currently enjoys some sort of conservation management. These lands are being actively managed to control feral pigs and other ungulates, and large tracts on Maui and Hawaii are now fenced. Efforts are also under way to restore native plants and control invasive weeds. The recovery of forest understorey in managed areas is already documented on Hawaii and Maui.

The Hawaii Forest Bird Interagency Database Project now provides an umbrella group to co-ordinate research efforts. University, governmental and museum-based research is active and ongoing, but chronically underfunded, and, at the federal level, the needs of Hawaiian threatened species are often neglected in favour of less needy but higher-profile mainland ones. D. A. Leonard found that, although Hawaiian species make up a third of the endangered birds on the US Endangered Species List, they received only 4·1% of the expenditure on all listed birds during 1996–2004. Part of the problem is that the threats to Hawaiian birds are much more difficult to manage, some seeming virtually intractable, and serious efforts are potentially very expensive for the foreseeable future.

Patently, the slow and inexorable elevational advance of the disease-bearing southern house mosquito trumps all other threats to Hawaiian honeycreepers, and is among the world's most difficult conservation problems. As laudable, necessary and beneficial as habitat-conservation efforts are, they will, if they do not mitigate the spread of avian malaria and pox, amount to little more than repainting the decks on a sinking ship. On the agency website, USGS/Pacific Islands Ecosystems Research Center researchers S. I. Jarvi and C. T. Atkinson make the following statement: "Continued decline in numbers, fragmentation of populations, and extinction of species that are still relatively common will likely continue without new, aggressive approaches to managing avian disease. Methods of intervention in the disease cycle, such as vector control, chemotherapy or vaccine development, are not entirely feasible because of the efficient immune-evasion strategies evolved by the parasite, technical difficulties associated with treating wild avian populations and the increased risk of selection for more virulent strains of the parasite." These difficulties may be insurmountable, at least in time for Kauai's endemic honeycreepers, but a current research project, described by B. L. Woodworth and her colleagues, involving the USGS, three universities and the Smithsonian Institution, is looking at the problem from every angle. In this grave situation, captive-breeding and the maintenance in captivity of such species as the Akikiki and the Akekee may be the only recourse until their natural range can be rehabilitated. Fortunately, since 1993 the Hawaiian Endangered Bird Conservation Program, a co-operative effort of the Zoological Society of San Diego (under Alan Lieberman), the Hawaii Division of Forestry and Wildlife and the US Fish and Wildlife Service, has had considerable success in breeding Hawaiian honeycreepers, and has released captive-reared birds to bolster wild populations of the Hawaii Akepa, the Hawaii Creeper and the Palila.

In a few cases, the birds have responded to the situation on their own. Three species, the Oahu Amakihi, the Hawaii Amakihi and the Apapane, are developing resistance to diseases and are reappearing in long-abandoned lowland habitats. A few others, the Kauai Amakihi and the Anianiau being two examples, may

EXTINCT SPECIES
(see page 69)

1. **Kakawahie**
(*Paroreomyza flammea*)
[= *Loxops maculata flammea*]
2. **Lanai Hookbill**
(*Dysmorodrepanis munroi*)
[long treated as aberrant form of *Psittirostra psittacea*]
3. **Oahu Akepa**
(*Loxops wolstenholmei*)
[= *Loxops coccinea rufa*]
[= *Loxops coccinea wolstenholmei*]
4. **Oahu Nukupuu**
(*Hemignathus lucidus*)
[= *Heterorhynchus lucidus*]
5. **Oahu Akialoa**
(*Akialoa ellisiana*)
[= *Hemignathus obscurus ellisianus*]
[= *Hemignathus obscurus lichtensteinii*]
6. **Lanai Akialoa**
(*Akialoa lanaiensis*)
[= *Hemignathus obscurus lanaiensis*]
[= *Hemignathus ellisianus lanaiensis*]
7. **Laysan Honeycreeper**
(*Himatione fraithii*)
[= *Himatione sanguinea freethi*]
8. **Ula-Ai-Hawane**
(*Ciridops anna*)
Plumage patterns of adult male and female only recently identified (Olson & Hume, 2009). Bird depicted in HBW7 now recognized as juvenile moulting into adult plumage.

Also extinct (already illustrated in HBW7, page 58)

Lesser Koa Finch
(*Rhodacanthis flaviceps*)
[= *Rhodacanthis palmeri flaviceps*]
[= *Loxioides flaviceps*]
[= *Psittirostra flaviceps*]
Greater Koa Finch
(*Rhodacanthis palmeri*)
[= *Loxioides palmeri*]
[= *Psittirostra palmeri*]
Kona Grosbeak
(*Chloridops kona*)
[= *Loxioides kona*]
[= *Psittirostra kona*]
Greater Amakihi
(*Viridonia sagittirostris*)
[= *Hemignathus sagittirostris*]
[= *Loxops sagittirostris*]
Kauai Akialoa
(*Akialoa stejnegeri*)
[= *Hemignathus obscurus procerus*]
[= *Hemignathus ellisianus stejnegeri*]
Hawaii Akialoa
(*Akialoa obscura*)
[= *Hemignathus obscurus obscurus*]
Hawaii Mamo
(*Drepanis pacifica*)
Black Mamo
(*Drepanis funerea*)



be on the threshold of a comeback. Nevertheless, one cannot rely on natural selection to solve the problem for all species. Iiwi individuals experimentally infected with malaria exhibit nearly 100% mortality, leaving little for evolution to select, and species with populations already reduced to a few thousands have small gene pools less likely to produce disease-resistant mutations. Recent research by A. M. Kilpatrick has suggested that indirect measures, such as control of rats, that bolster populations might facilitate the evolution of disease resistance by increasing the size of the gene pool, but that seems a very long-range solution to a problem that requires immediate action.

The totality of problems facing Hawaiian honeycreepers appears overwhelming, and new threats, such as West Nile virus, are constantly looming. Even so, if, by luck or through research, an ecologically sound method of controlling mosquitoes in remote forests is found, vast areas of protected suitable habitat would be open to repopulation and many species could recover. Then, future vacationers on Waikiki Beach may thrill at the sight of the Apapane and the Iiwi feeding in the ornamental plants around the hotels. One can dream.

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PLATE 48

inches 3

cm 8

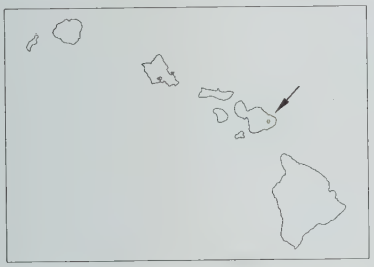
Genus *MELAMPROSOPS* Casey & Jacobi, 1974

1. Poo-uli

Melamprosops phaeosoma

French: Po-o-uli masqué **German**: Weißwangen-Kleidervogel **Spanish**: Poo-uli
Other common names: Black-faced Honeycreeper

Taxonomy. *Melamprosops phaeosoma* Casey and Jacobi, 1974, Maui.
Affiliation uncertain and has been questioned. Membership of honeycreeper clade supported by DNA analysis; apparently a basal offshoot of main evolutionary line. Monotypic.
Distribution. Upper Hanawi watershed, in E Maui, in Hawaiian Is.



Descriptive notes. 14 cm; 25·5 g. A dumpy, short-tailed passerine with thick, elongated, slightly downcurved bill. Plumage is brown above, pale brown to off-white below; sharply defined triangular black mask encircles bill, extending to point behind eye, bordered above by grey and below broadly by white (white forming bold auricular/neck patch); grey above mask darkens gradually into olive-brown on back; side tinged olive or tawny, darkening to deep cinnamon on thigh and crissum; iris brown; bill and legs black. Sexes similar. Immature has smaller mask lacking grey tones above, redder upperparts, buffier underparts, and may have pink tip on lower mandible. Voice. Call a sharp "chit-chit-chit", sometimes in quicker bursts, "chit-chit-chu-chit", when alarmed; also a more whistled "chee-up" or "tschew" call similar to a call of *Pseudonestor xanthophrys*. Song a jumbled series of similar notes, accelerating and rising in pitch.
Habitat. Understorey of dense montane ohia (*Metrosideros polymorpha*) rainforest between 1400 m and 2100 m. Was apparently widespread in mesic and dry forests before the arrival of humans.
Food and Feeding. Snails (Gastropoda), insects, spiders (Araneae); rarely, small fruits (*Cheirodendron trigynum*). Foraging sites twigs (51% of observations), branches (43%) and foliage (6%). Hops over substrate; captures prey by leaning, reaching, hanging, probing, and bark-peeling.
Breeding. Two nests found in Mar and Apr. Courting male, while singing vigorously, circles female in canopy of nest tree or adjacent trees; courtship feeds her throughout nesting cycle. Nest built by both sexes, an open cup with base of mosses and bare twigs of *Styphelia tameiameae*, inner cup of delicate fern rootlets, average outside diameter of two nests 15·8 cm, depth 10 cm, inner cup 7·8 × 6 cm, depth 4·5 cm; placed 15 m above ground in terminal leaf cluster of ohia tree. Clutch 1 or 2 eggs, white with brown spots; incubation by female alone, no information on duration of incubation period; eggs hatch in late morning, possibly with 2-day interval; male feeds both female and chicks, female passes food to chicks; one chick left nest at 21 days.
Movements. Sedentary.
Status and Conservation. CRITICALLY ENDANGERED. Possibly Extinct. Restricted-range species: present in Central Hawaiian Islands EBA. Not discovered until 1973; population estimated to number 150 individuals in 1981. In surveys in 1990s only four individuals located, and by 1997 only three known to survive; one of these three died (from avian malaria) in captivity in Nov 2004, and the other two have not been seen since 2003 and 2004, respectively, despite dedicated searches. Understorey habitat severely altered by feral pigs, the activities of which increased nearly five-fold during 1970–1997. Subfossil evidence suggests that this species may have been more widely distributed before the arrival of humans, when its range probably encircled the Haleakala Volcano.
Bibliography. Anon. (2009i), Baker (2001), Berger (1981), Butchart & Stattersfield (2004), Casey & Jacobi (1974), Engilis (1990), Engilis *et al.* (1996), Fleischer *et al.* (2001), Groombridge *et al.* (2004), Hirschfeld (2007), Kepler *et al.* (1996), Mountainspring *et al.* (1990), Porter *et al.* (2006), Powell (2008), Pratt, H.D. (1992a, 1994, 2005, 2009a), Pratt, H.D. *et al.* (1987), Pratt, T.K., Kepler & Casey (1997), Reynolds *et al.* (1995), Rosa *et al.* (1998), Spiva-Evans (2005), Stattersfield & Capper (2000), VanderWerf, Groombridge *et al.* (2006), VanderWerf, Malcolm *et al.* (2003).

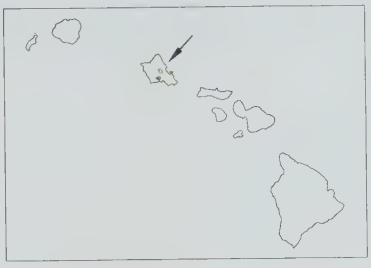
Genus *PAROREOMYZA* Perkins, 1901

2. Oahu Alauahio

Paroreomyza maculata

French: Alauahio d'Oahu **German**: Oahuastläufer **Spanish**: Alauahio de Oahu
Other common names: Alauahio, Alauwahio, Creeper

Taxonomy. *Himatione maculata* Cabanis, 1851, Oahu.
Placement of genus in present family questioned, but DNA studies indicate that it is a very early branch of the family. This species was in the past sometimes placed in genus *Loxops*. Has been considered conspecific with *P. montana*, and both were until recently combined in a single species with *P. flammea* (now extinct), *Oreomystis bairdi* and *Manucerthia mana*. Monotypic.
Distribution. Oahu, in Hawaiian Is.
Descriptive notes. 11 cm. A small parulid-like passerine with short, straight bill. Male is yellow-green above, yellow below; forehead and supercilium yellow, lores black, postocular stripe olive-green; iris brown; bill horn-grey above, lower mandible paler, especially near base; legs dull brown. Female is drab greyish-olive above, yellowish-white below, latter colour extending to well above eye; lores white, thin postocular stripe greyish-olive; outer webs of flight-feathers narrowly edged with yellowish-white, median and greater upperwing-coverts tipped white (prominent wingbars). Juvenile is similar to female, but tinged yellow below, wingbars more buffy, and tertials narrowly edged white. Voice. Loud "chirk" or "chip", similar to calls of *P. montana*. Song apparently unknown.



Habitat. Mesic to wet forests with dense undergrowth, including non-indigenous kukui (*Aleurites moluccana*) groves. Favours koa trees (*Acacia koa*) more than congeners.
Food and Feeding. Not well documented. Diet includes insects, gleaned from surface or from beneath bark, and sap, taken from fluxes. Forages higher in canopy than congeners.
Breeding. Little known. Season Jan–Jun. Two nests described; an open cup of twigs, lichens and moss, bound with spider silk and egg cases, inner cup of rootlets, twigs and leaf bits, placed in native or introduced tree/shrub, one 2·5 m above ground and the other at 7 m. Eggs cream, with pale brown and reddish-brown spots concentrated at larger end; no information on clutch size. No other information.
Movements. Apparently sedentary, except for wandering by post-breeding flocks.
Status and Conservation. CRITICALLY ENDANGERED. Possibly Extinct. Restricted-range species: present in Central Hawaiian Islands EBA. Last well-documented sighting in 1985. Not found during any recent searches made by observers with local experience. Was formerly widespread, but by 1900 restricted to Waianae and Koolau Mts above 500 m; persisted in Koolau Range into 1970s. Possibly already driven to extinction by disease spread by introduced mosquitoes (Culicidae); unless a small disease-resistant population survives in some unexplored locality, species is likely to be extinct.
Bibliography. Anon. (2009i), Baker, P.E. & Baker (2000), Berger (1981), Bremer (1986), Bryan (1905), Butchart & Stattersfield (2004), Fleischer *et al.* (2001), Hirschfeld (2007), Perkins (1903), Pratt (1992b, 1994, 2005), Pratt *et al.* (1987), Shallenberger & Pratt (1978), Shallenberger & Vaughn (1978), Stattersfield & Capper (2000), Tarr & Fleischer (1995).

3. Maui Alauahio

Paroreomyza montana

French: Alauahio de Maui **German**: Mauiastläufer **Spanish**: Alauahio de Maui
Other common names: Alauahio, Maui/Lanai Creeper, Creeper

Taxonomy. *Himatione montana* S. B. Wilson, 1890, Lanai.
Placement of genus in present family questioned, but DNA studies indicate that it is a very early branch of the family. This species was in the past sometimes placed in genus *Loxops*. Has been considered conspecific with *P. maculata*, and both were until recently combined in a single species with *P. flammea* (now extinct), *Oreomystis bairdi* and *Manucerthia mana*. Somewhat duller-backed birds on Maui described as race *newtoni*, distinct from those on Lanai (where now extinct), but differences only slight and probably represent fragments of a former cline. Monotypic.
Distribution. Maui, in Hawaiian Is.



Descriptive notes. 11 cm; male 11·4–16·4 g, female 8·9–15·4 g. A parulid-like passerine with a short, straight bill. Male is bright golden-yellow on head and underparts, duller towards vent; above olive-green, blending smoothly on nape into yellow of head; black loral spot; iris dark; bill yellowish-pink, dusky culmen; legs pinkish-brown to dark greyish. Female is similar in pattern to male, but much duller yellow, with greyish-green of back extending onto crown and diffusely defining pale yellow supercilium; some have single pale wingbar. Juvenile and first-year immature are dull greyish-green above, off-white below with no yellow, and two creamy wingbars; second-year yellower, especially on face, with less prominent wingbars. Voice. Call a loud "cheek" or "chit"; alarm note with more whistled quality. Juvenile begging call a monotonous "chi-chi-chi-chit". Advertising song often given in dawn chorus, highly variable and mostly seasonal (Mar–Jul); one form with regular pattern, "chip, whichy-wheesy-whurdy-chew, chip, whichy-wheesy-whurdy-chew" and so on, repeated many times, sometimes reminiscent of song of Common Yellowthroat (*Geothlypis trichas*); another more jumbled like song of House Finch (*Carpodacus mexicanus*), sometimes uttered in flight.
Habitat. Dense ohia–koa (*Metrosideros polymorpha–Acacia koa*) rainforest with well-developed understorey including pilo (*Coprosma*), alani (*Melicope*), pukiawe (*Styphelia tameiameiae*), kolea (*Myrsine lessertiana*), ohelo (*Vaccinium*) and olapa (*Cheirodendron trigynum*); also plantations of non-indigenous eucalypts (*Eucalyptus*) and conifers; dry forest and subalpine brush with mamane (*Sophora chrysophylla*), pukiawe, hinahina (*Geranium cuneatum*) and naenae (*Dubautia*). Above 1000 m; above 1400 m on N & E slopes of Haleakala Volcano; wanders above tree-line.
Food and Feeding. Eats mainly arthropods; small amount of nectar taken from ohia, ohelo, mamane and *Cyrtandra*. Arthropods mostly gleaned from leaves and bark, occasionally captured in aerial sallies. May follow *Pseudonestor xanthophrys* to glean scraps. Forages mainly in understorey. Family groups occupy home range throughout year.
Breeding. Season Mar–Aug. Monogamous, in permanent pairs. Second-year offspring serve as helpers at nest; in prime rainforest habitat most pairs have helpers, but in marginal habitat (e.g. non-native vegetation) only c. 20% do so. Mating displays of male accompany song, may be in flight or perched, in latter case male pacing back and forth with tail cocked; female solicits by raising bill and tail, fluttering wings, and giving begging calls. Nest-site chosen by female, she also builds nest, sometimes a funnel-shaped structure, seven different nest types based on size and materials, all bound with spider silk, materials depend on availability and can include such oddities as horsehair, pine (*Pinus*) needles and nylon fibre; placed among upper branches (but not attached and not supported from below) of native or introduced tree, including conifers, but never eucalypt; defended

On following pages: 4. Laysan Finch (*Telespiza cantans*); 5. Nihoa Finch (*Telespiza ultima*); 6. Palila (*Loxioides bailleui*); 7. Ou (*Psittirostra psittacea*); 8. Akikiki (*Oreomystis bairdi*); 9. Anianiau (*Magumma parva*); 10. Hawaii Akepa (*Loxops coccineus*); 11. Maui Akepa (*Loxops ochraceus*); 12. Akekee (*Loxops caeruleirostris*).

territory mainly the nest itself. Clutch 2 eggs, white, blotched with lavender, grey and brown, mostly at larger end; incubation 16–18 days; chicks fed by both parents and helpers, nestling period 17–19 days, may flee nest earlier if disturbed; nest cleaned throughout breeding cycle; offspring may remain with parents for up to 20 months. First breeding not before third year.
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Central Hawaiian Islands EBA. Population estimated c. 35,000 individuals in 1980, early 1990s and 1997; relatively stable, but range contracting upwards with spread of mosquitoes (Culicidae), exacerbated by feral pigs. Shows high susceptibility to avian malaria (transmitted by mosquitoes). Formerly occurred in all forested areas of Maui and Lanai; now extinct on Lanai, where last seen 1937, and W Maui population extirpated before 1970s. Survives in three discrete populations on Haleakala Volcano, in E Maui: abundant in rainforest belt above 1400 m on N & E slope from Hosmer Grove to Kipahulu Valley; common in forestry plantation at Polipoli Springs, on W slope; and scarce in relict dry forest at Kahikinui, on SW slope. Nearly all of range in conservation-managed areas, including East Maui Watershed Partnership (Haleakala National Park, Waikamoi Preserve, Hanawi Natural Area Reserve) and Polipoli Springs State Park. E Maui mostly now fenced to control pigs.
Bibliography. Amadon (1950), Anon. (2009i), Baker, H. & Baker (2000), Berger (1981), Butchart & Stattersfield (2004), Carothers (1982), Fleischer *et al.* (2001), Jacobi & Atkinson (1995), Loope & Medeiros (1995), Mounce *et al.* (2007), Munro (1960), Perkins (1903), Pratt (1992b, 2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), van Riper *et al.* (1986), Stattersfield & Capper (2000), Tarr & Fleischer (1995).

Genus *TELESPIZA* S. B. Wilson, 1890

4. Laysan Finch

Telespiza cantans

French: Psittirostre de Laysan **German**: Laysankleidervogel **Spanish**: Palila de Laysan
Other common names: Laysan Finchbill/Honeycreeper

Taxonomy. *Telespyza* [sic] *cantans* S. B. Wilson, 1890. Midway Island; error = Laysan Island.
Genus sometimes subsumed into *Loxioides* and has been included in *Psittirostra*. Probably forms a superspecies with *T. ultima*, and formerly considered conspecific. Monotypic.
Distribution. Laysan Atoll, in NW Hawaiian Is. Introduced Pearl and Hermes Atoll.



Descriptive notes. 19 cm; male 34·4 g, female 32·2 g, juvenile (both sexes) 34·5 g. A large finch with heavy, slightly but distinctly hooked bill. Male is bright golden-yellow on head and breast, shading to dull white posteriorly, flanks grey-tinged, crown slightly olive-tinged; upper mantle grey (forming band), lower mantle, upper back and upperwing-coverts greyish-gold, scapulars partly grey distally, lower back grey, shading to greyish-yellow on rump and uppertail-coverts; flight-feathers brownish-black, outer webs edged greyish-gold, greater coverts broadly edged golden-yellow (forming broad patch or wingbar); iris dark brown, orbital ring black; bill brownish-grey; legs black. Female is like male, but duller throughout, with scattered dark streaks on flanks, dark spots on scapulars and lower back, and darker olive tinge streaked with black on crown, nape and auriculars; progressively brighter with each moult, some individuals eventually approaching male colour. Juvenile is dull yellow, heavily streaked dark brown (darker on male) on head, back, breast and sides; streaking reduced progressively in first and second years, reaching adult pattern by third year. Voice. Calls include a frequency-modulated whistle resembling calls of *Loxioides bailleui*, and a short "chirp chi-deet" or "cheet"; distress call louder, similar to call of Bristle-thighed Curlew (*Numenius tahitiensis*). Song long and complex, including upslurred and downslurred whistles, warbles, and rapidly repeated harsh notes and chirps; may incorporate mimicry.
Habitat. Atoll vegetation of low shrubs, bunch-grasses and forbs. Prefers beach naupaka (*Scaevola sericea*) shrubs, the bunch-grass kawelu (*Eragrostis variabilis*), and beach vines alena (*Boerhavia repens*), pohuehue (*Ipomoea pescaprae*) and puaokama (*Sicyos maximowiczii*).
Food and Feeding. Omnivorous. Most frequent food items include invertebrates (10·8%); seeds of kawelu (8·7%), alena (8%), the sedge makaloa (*Cyperus laevigata*) (8%), sandbur (*Cenchrus echinatus*) (6·8%), pigweed (*Portulaca*) (6·2%) and akulikuli (*Sesuvium portulacastrum*) (5%); flowers of puaokama (8·3%) and akulikuli (4%); and fruits of puaokama (2·5%). Also takes roots and leaves of all of the aforementioned and other indigenous and naturalized plants. Preys on bird eggs, including those of now extinct nominate race of Millerbird (*Acrocephalus familiaris*) on Laysan and those of seabirds; learns to follow humans in order to seize eggs as birds are flushed from nests. Pearl and Hermes population has developed larger bill for feeding on hard pericarps of the puncture vine nohu (*Tribulus cistoides*).
Breeding. Pairs begin to form in Jan; nest-building from Mar, peak in May; renesting occurs if first nest lost. Monogamous; partners remain together for more than one year. Courtship display (both sexes) involves rapid raising and lowering of wings and tail and a distinctive vocalization; members of pair defend each other. Nest built by female only, an open cup of kawelu parts, outside diameter c. 16 cm, internal diameter c. 7 cm, placed near ground in kawelu clump or beach vines; territory only the immediate surroundings of nest. Clutch 3–5 eggs, light cream or white, with brown and maroon spots mostly on larger end; incubation by female only, period 16 days, hatching sequential; chicks fed mostly by male, faecal sacs accumulate on nest rim after 16 days, nestling period 22–26 days; fledglings continue to beg for up to 40 days after leaving nest.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Laysan Island EBA. Has very small global range, and considered at risk from meteorological perturbations or accidental introduction of alien organisms. Prehistoric remains from Oahu and Molokai indicate much wider former distribution. Highly susceptible to mosquito-borne avian malaria and pox; droughts cause near-total breeding failure in some years. Populations fluctuate by as much as 50% from one year to the next; Laysan population ranged from 5000 to 20,000 individuals during the period 1968–1990. Introduced and naturalized since 1967 on Pearl and Hermes Atoll (NW of Laysan I), where 772 individuals present in 1986, but population had decreased to 30–50 by start of 21st century. Introduced on Midway Atoll in 1905, but population there succumbed to predation by black rats (*Rattus rattus*) during World War II, and was extirpated by 1944. Laysan is protected within Papahanaumokuakea Marine National Monument; weed control ongoing, with recent eradication of sandbur. Recovery goals include establishing one or more additional populations of this honeycreeper within the island group.
Bibliography. Anon. (1985, 2009i), Banks & Laybourne (1977), Berger (1981), Butchart & Stattersfield (2004), Conant (1988), Conant *et al.* (1981), Ely & Clapp (1973), Fisher & Baldwin (1946), James & Olson (1991), Morin (1992a, 1992b), Morin & Conant (1994, 2002), Munro (1960), Olson (1996), Pratt (2005, 2009a), Pratt *et al.* (1987), Stattersfield & Capper (2000), Warner (1968).

5. Nihoa Finch

Telespiza ultima

French: Psittirostre de Nihoa **German**: Nihoakleidervogel **Spanish**: Palila de Nihoa
Other common names: Nioha Honeycreeper

Taxonomy. *Telespiza ultima* Bryan, 1917, Nihoa Island.
Genus sometimes subsumed into *Loxioides* and has been included in *Psittirostra*. Probably forms a superspecies with *T. cantans*, and formerly considered conspecific. Monotypic.
Distribution. Nihoa, in NW Hawaiian Is.



Descriptive notes. 17 cm; 21–28 g (in captivity). A medium-sized finch with proportionally smaller bill than *T. cantans*, lacking hook at tip. Male is yellow on head and breast, with crown and nape olive-tinged, underparts below breast yellowish-white with blue-grey flanks; back with triangular central patch of dull gold surrounded by bluish-grey, lower rump and uppertail-coverts tinged yellow; upperwing-coverts dark brown, broadly edged yellow (on greater coverts forming broad golden-yellow patch or wingbar); flight-feathers and rectrices dark brownish-black, narrowly edged yellow on outer webs, tertials edged blue-grey; iris dark brown; bill brownish-grey; legs black. Female is very heavily streaked yellow and dark brown on head, breast and back, dark streaks often coalescing to form dark patch on lower throat and upper breast and/or dark malar streak; rump cinnamon-yellow with narrow dark streaks on lower part, uppertail-coverts blackish-brown with buffish-yellow edges; lower underparts buffy white, flanks tinged grey or cinnamon. Juvenile is similar to female, but darker on crown and back, and much less heavily streaked; immature like female, but less heavily streaked, with bold dark malar streak; adult plumage acquired in second year. Voice. Call a whistled "teu-eee" or "chewee-teu-eee" and a shorter "chidit". Song includes these notes and also other slurred whistles and chirps; simpler than song of *T. cantans*.
Habitat. Shrubby vegetation dominated by aweoweo (*Chenopodium oahuense*), popolo (*Solanum nelsonii*), ilima (*Sida fallax*) and the bunch-grass kawelu (*Eragrostis variabilis*).
Food and Feeding. Omnivorous. Eats insects, leaves, flowers and fruits of aweoweo, unripe seeds of endemic ihi (*Portulaca villosa*), seeds and leaf buds of ilima, seeds of the grass kakonakona (*Panicum torridum*), and green seeds of the legume ohai (*Sesbania tomentosa*); also small bird eggs (cannot crack larger eggs). Birds unsuccessfully introduced on French Frigate Shoals (W of Nihoa) ate seeds of plants not found on Nihoa, e.g. introduced ironwood (*Casuarina equisetifolia*), puncture vine (*Tribulus cistoides*) and the grass *Lepturus repens*. Gains access to seeds of ohai by holding pods in feet and using bill to rip out seams. Learns to follow people who flush birds from nests, thus exposing eggs.
Breeding. Nesting season in first half of year, peak not determined. Monogamous, but no information on duration of pair-bond. Male courtship display involves singing while partially extending, raising and quivering wings in hunched posture, or song flight. Both sexes contribute nesting material, but whether both build unknown; nest an open cup of twigs, grasses and larger seabird feathers, placed in niche or crevice in rock or rock pile, one nest described as loose and sprawling, with diameter 22·9 cm, height 12·7 cm; apparently more territorial than *T. cantans*, male defends radius of 3–5 m around nest. Clutch 2–5 eggs, average 3, whitish with brown and maroon spots, apparently similar to those of *T. cantans* but smaller; no information on incubation and nestling periods in wild; in captivity, female did not begin incubation until clutch complete, female fed on nest by male, only successful egg hatched after 15 days 9 hours of continuous incubation, chick fledged at 24 days.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Nihoa Secondary Area. Has tiny global range, confined to a single island of c. 63 ha in extent, and estimated population of 2100–3550 individuals, but numbers vary widely from year to year, probably because of periodic droughts and storms. As many as 6686 estimated in 1968; most recent estimate, based on surveys made in 2007, gives population of 2807 (± 744) individuals. Overall trend may be slightly downward. Prehistoric remains from Molokai indicate much wider former distribution. Introduced on French Frigate Shoals, c. 400 km w of Nihoa, in 1967, but did not survive there beyond 1984. Accidental introduction of predatory mammals, certain non-native plants or insects, or an avian disease on Nihoa, or a catastrophic weather event (such as a severe hurricane), could rapidly bring about this species' extinction. Nihoa protected as part of Papahanaumokuakea Marine National Monument, with access strictly controlled to prevent introduction of foreign organisms. Current plans are to establish a back-up population at Midway Atoll, although lack of suitable nest-sites there may be problematic.
Bibliography. Amerson (1971), Anon. (1985, 2009i), Banks & Laybourne (1977), Berger (1981), Bryan (1917), Butchart & Stattersfield (2004), Clapp *et al.* (1977), Dill & Bryan (1912), Hirschfeld (2007, 2008), James & Olson (1991), Morin & Conant (2002), Munro (1960), Pratt (2005, 2009a), Pratt *et al.* (1987), Richardson (1954), Stattersfield & Capper (2000).

Genus *LOXIOIDES* Oustalet, 1877

6. Palila

Loxioides bailleui

French: Psittirostre palila **German**: Schwarzmasken-Kleidervogel **Spanish**: Palila de Hawai

Taxonomy. *Loxioides bailleui* Oustalet, 1877, Hawaii.
Genus closely related to *Telespiza*. In past sometimes lumped into an expanded genus *Psittirostra*. Monotypic.
Distribution. N Hawaii, in E Hawaiian Is.



Descriptive notes. 19 cm; male 38·1 g, female 37·6 g, juvenile male 38·4 g, juvenile female 38·7 g. A large finch with relatively small blunt, arched bill like that of a bullfinch (*Pyrrhula*). Male has head and breast golden-yellow, black lores; back bluish-grey, paler on rump; upperwing-coverts gold with dark centres, primaries, secondaries and rectrices blackish-brown, edged gold on proximal outer webs (folded secondaries forming gold panel across wing), tertials edged grey; underparts below breast white, sometimes with grey-tinged flanks; iris dark brown; bill and legs blackish. Female is similar to male, but yellow less golden, lores dark grey, grey of back extending through nape to crown and shading into yellow on forehead, gold in wings muted, secondary panel reduced. Juvenile and immature resemble female, but with green tips on median and greater coverts (double wingbar), bill dull yellow in juvenile, gradually darkening to black; adult plumage achieved by second year. Voice. Call an onomatopoeic "pa-léé-la" or variations thereof, often with inquisitive quality. Song very complex, with highly frequency-modulated whistles; often regarded as sweet or pleasing, but not very loud. True subsong or whisper song similar, but may include mimicry.
Habitat. High-elevation open-canopy mamane–naio (*Sophora chrysophylla–Myoporum sandwicense*) forest, mamane predominating, but proportion of naio increases where forest heavily grazed by feral ungulates. Other trees, usually found as scattered individuals, include sandalwood (*Santalum paniculatum*), akoko (*Chamaesyce olowaluana*) and pilo (*Coprosma montana*); shrubs include the lambs'-quarters aheahea (*Chenopodium oahuense*), the hopseed aalii (*Dodonaea viscosa*) and the climbing mint *Stenogyne microphylla*. Introduced weeds and grasses form most of ground cover. Present at c. 2000–3000 m.
Food and Feeding. Main food taken is green mamane seeds; consumes also caterpillars, naio fruits, mamane flowers. Young are fed with caterpillars and also mamane parts. Mamane pods are plucked, then held in the feet against a branch and ripped open along the seams, enabling the seeds to be extracted.
Breeding. Nests in first half of year. Occasional helpers at nest recorded. Male courtship includes low flutter-and-glide display-flights and courtship feeding; female solicits copulation by wing-fluttering. Female selects nest-site, she also does most of building work, assisted by male; nest base of mamane twigs (gathered from nest tree), bowl of grasses or other available materials, lined with *Usnea* lichens, rootlets and fine grass, outer diameter 15 cm, height c. 8 cm, inner cup 7·5 cm wide and 4 cm deep, placed on horizontal branch or terminal fork of mamane (rarely naio) tree; male defends female and immediate vicinity of nest by singing and chasing intruders, female sometimes also defends nest. Clutch 1–3 eggs, usually 2, white, with reddish-brown spots on larger end, dimensions 25 × 17 cm, laid one each morning until clutch complete; incubation by female alone, period c. 16 days; chicks fed by regurgitation, mostly by female (63%), less by male and by any nest helpers present, faecal sacs not removed after 4 days (nest becomes caked with faeces), nestling period long, 21–29 days.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Hawai'i EBA. Has tiny global range, within which population has declined rapidly and steeply; 96% of total population confined to core area of less than 30 km^2. Historically confined to island of Hawaii, where once widespread on the three main volcanoes between 1500 m and tree-line (c. 3000 m); discontinuous populations now restricted to narrow belt between 2000 m and 2750 m on W slope of Mauna Kea. Prehistoric remains indicate prior occurrence in lowland sites on Oahu and Kauai. Massive decline believed due mainly to habitat degradation caused by introduced ungulates. Numbers, monitored continuously since 1980, exhibited wide but statistically insignificant year-to-year fluctuations (1300–6900 individuals). Steady significant decline began in 2003, with recent population estimates of 5337 (in 2005), 4601 (in 2006), 3862 (in 2007) and 2640 (in 2008). Core-area population declined by 58% during 2003–2008. Present trajectory would lead to extinction by 2013. Current decline not clearly correlated with any known threats, and habitat has actually improved recently as a result of conservation efforts to control feral ungulates, feral cats and rats (*Rattus*). Chronic drought may be a factor, as also may diseases attacking mamane trees and parasitoid wasps (Hymenoptera) depleting caterpillars. In 1996, a captive-breeding programme was set up at Keauhou Bird Conservation Center. Efforts presently under way to reintroduce this species to portions of former range by translocating wild individuals and releasing captive-reared ones.
Bibliography. Anon. (2006b, 2009i), Banko, Johnson *et al.* (2002), Berger (1981), Brenner *et al.* (2002), Burney *et al.* (2001), Butchart & Stattersfield (2004), Fancy, Snetsinger & Jacobi (1997), Fancy, Sugihara *et al.* (1993), Fleischer *et al.* (1994), Gardner & Trujillo (2001), Hess *et al.* (1999), Jacobi *et al.* (1996), James & Olson (2006), Jeffrey *et al.* (1993), Laut *et al.* (2003), Leonard *et al.* (2008), Lieberman (2003, 2005b), Lindsey *et al.* (1995), Oboyski *et al.* (2004), Pletschet & Kelly (1990), Pratt, H.D. (1999a, 2005, 2009a), Pratt, H.D. *et al.* (1987), Pratt, T.K., Banko *et al.* (1997), van Riper (1980), Scott *et al.* (1986), Scowcroft & Conrad (1988), Stattersfield & Capper (2000).

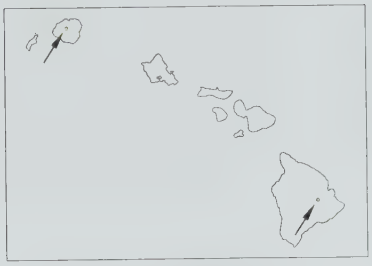
Genus *PSITTIROSTRA* Temminck, 1820

7. Ou

Psittirostra psittacea

French: Psittirostre psittacin **German**: Gelbkopf-Kleidervogel **Spanish**: Ou

Taxonomy. *Loxia psittacea* J. F. Gmelin 1789, Sandwich Islands = Hawaiian Islands.
Birds from Oahu and Molokai (extinct on both) described as respective races *deppei* and *oppidana*, but specimens fall within normal range of variation of species. Monotypic.
Distribution. Kauai and Hawaii, in Main Hawaiian Is.
Descriptive notes. 17 cm. A medium-sized rather pot-bellied finch-like bird having elongated heavy bill with strongly hooked upper mandible. Male has head bright golden-yellow, sharply demarcated from mostly olive-green body, shading to greyish on breast and belly, olive-yellow on sides, and off-white on undertail-coverts; iris dark brown; bill and legs orange-pink. Female is similar to male, but head same colour as body, and undertail-coverts have olive-grey centres (producing scaly look). Juvenile and immature resemble female, but median and greater upperwing-coverts tipped off-white (producing wingbars). Voice. Calls loud, drawn-out, far-carrying human-like whistles slurred up or, less commonly, down. Song long, loud and complex, with protracted whistles, short warbles and trills; sometimes described as like that of a canary (*Serinus*).



Habitat. Found in all habitats, at least seasonally; very wet ohia (*Metrosideros polymorpha*) rainforest festooned with ieie (*Freycinetia arborea*) lianas, of which present species was main pollinator, believed to be the most favourable habitat.
Food and Feeding. Primarily frugivorous, but caterpillars also taken during seasonal outbreaks. Diet includes flowers, composite fruits and leaf bracts of ieie; when these unavailable, other small soft fruits taken from olapa (*Cheirodendron trigynum*), the woody nettle mamaki (*Pipturus albidus*), Hawaiian holly kawau (*Ilex anomala*), haha (*Clermontia*) and others, including such introduced plants as mountain-apple (*Syzygium malaccense*), guava (*Psidium guajava*) and bananas (*Musa*). Swallows small fruits whole; tears larger ones into pieces before consumption.
Breeding. Season apparently in spring, with begging juveniles present into Aug. No other information.
Movements. Nomadic. Wanders widely, following food resources; although never directly observed, probably moved between islands.
Status and Conservation. CRITICALLY ENDANGERED. Possibly Extinct. Restricted-range species: present in Central Hawaiian Islands EBA and Hawai'i EBA. No definite sightings on Kauai since 1989 and none on Hawaii since 1987; not found during recent dedicated searches, and feared extinct. On Hawaii, heart of last population hit by Mauna Loa lava flow in 1984; last confirmed sighting in 1987 in Olaa Tract, and unconfirmed audio report in 1996. On Kauai, a few hundred birds in 1970s dwindled to just a few individuals in 1982, when island hit by hurricane "Iwa"; last confirmed sighting in 1989, and only unconfirmed voice-only reports in 1990s. Probably succumbed to avian malaria and pox after being driven into mosquito-infested lowlands by storms or lava flows. This species was originally one of the most widespread and abundant forest birds in Main Hawaiian Is (Kauai, Oahu, Molokai, Lanai, Maui, Hawaii), ranging from sea-level to tree-line. Underwent precipitous declines on one island after another: on Oahu, rare by 1890s and not seen in 20th century; on Maui, common at 1300 m in 1901, not reported since; on Molokai, numerous in 1907, not observed since; on Lanai, common in 1923, extirpated by 1931. On Hawaii survived through 1970s in low numbers above 800 m in Hawaii Volcanoes National Park, especially the Olaa Forest, and scattered kipukas (forest remnants surrounded by lava flows) N to Saddle Road. On Kauai, persisted into 1980s in remotest parts of Alakai Plateau.
Bibliography. Anon. (2009i), Berger (1981), Bryan (1908), Butchart & Stattersfield (2004), Conant (1981), Conant *et al.* (1998), Engilis & Pratt (1989), Gauthey *et al.* (1968), Henshaw (1902), Hirschfeld (2007), Mull & Mull (1971), Munro (1960), Perkins (1903), Pratt (1994, 2005, 2009a), Pratt *et al.* (1987), Reynolds & Snetsinger (2001), Scott *et al.* (1986), Snetsinger *et al.* (1998), Stattersfield & Capper (2000).

Genus *OREOMYSTIS* Stejneger, 1903

8. Akikiki

Oreomystis bairdi

French: Akikiki de Kauai **German**: Weißkehl-Kleidervogel **Spanish**: Akikiki de Kauai
Other common names: Kauai/Baird's Creeper

Taxonomy. *Oreomyza bairdi* Stejneger, 1887, Kauai.
Long combined with the *Paroreomyza* species and *Manucerthia mana* as a single species, under the name *Loxops maculatus* or *Paroreomyza maculata*. Monotypic.
Distribution. Kauai, in Hawaiian Is.



Descriptive notes. 13 cm; 11·5–17 g. A small grey-and-white passerine with relatively short tail and short, slightly downcurved bill. Plumage is olive-grey above, white below, underparts sometimes washed with yellowish-cream, flanks tinged grey; iris dark brown; bill and legs pink. Sexes alike. Juvenile and immature have broad white ring encircling eye, eyerings sometimes meeting over bill, and sometimes pale wingbars. Voice. Adult calls are variable, and often indistinguishable from those of syntopic *Magumma parva* and *Loxops caeruleirostris*; most distinctive is a quiet upslurred "tsweet" or "chwit". Juveniles following parents utter syncopated series of sharp notes: "chi-di-dit, chi-dit, chit-chi-dit" etc. Advertising song consists of trills each of 6–8 notes, terminal notes variably different from initial ones; very similar to some songs of *Chlorodrepanis stejnegeri*, but without distinctive introductory note.
Habitat. Montane ohia and ohia–koa (*Metrosideros polymorpha–Acacia koa*) rainforest, codominant trees including ohia-ha (*Syzygium sandwicensis*), lapalapa (*Cheirodendron platyphyllum*) and olapa (*Cheirodendron trigynum*); dense understorey, with many low shrubs festooned with epiphytic lichens, ferns and mosses. Wet ohia forest may not be optimal habitat. Inhabited temperate mixed forest and koa forest in recent past.
Food and Feeding. Eats mostly arthropods, including adult insects, caterpillars, spiders (Araneae) and centipedes (Chilopoda); takes nectar very rarely. Picks items from bark of living or dead trunks and branches of mainly ohia and koa trees; forages occasionally also on kawau (*Ilex anomala*), kalia (*Elaeocarpus bifidus*), olapa and haha-aiakamanu (*Clermontia fauriei*). Feeding movements

resemble those of nuthatches (Sittidae), but tail not used as brace; may proceed with head up or head down, often peering around and beneath branches. Also excavates rotten wood of small branches. May be a nuclear species for roaming mixed flocks.
Breeding. Season Jan–Jul, peak Mar–Jun; may attempt second nest in season even if first successful. Female fed by male throughout nesting cycle, but she also forages independently. Nest built predominantly by female, made mostly from moss, sometimes with bark strips, inner cup lined with fine strips of ohia and olapa bark and rootlets, placed 4–12·5 m above ground in ohia or ohia-ha; no territorial behaviour observed. Clutch size uncertain, one nest held two nestlings, another one; one egg white, with brown spots on larger end, 18·3 × 23·3 mm; female alone incubates, both sexes bring food to nest, but only female feeds chicks; no information on duration of incubation and nestling periods.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny global range, with estimated population in 2007 of c. 780–1840 individuals. Originally found commonly throughout Kauai, but range contracted to elevations above 1440 m by 1960s; in 1973 occupied area of 88 km² in Kokee State Park and the Alakai Plateau, but by 2000 had disappeared from Kokee and occupied only 36 km². Total population declined from c. 7000 individuals in 1970 to c. 1400 in 2000, and surveys in 2007 revealed further decline and retreat to highest portions of SE Alakai Plateau, as mosquitoes (Culicidae) carrying avian malaria and pox move inexorably higher, a situation probably exacerbated by rising global temperatures. Disease evidently the primary limiting factor, but invasive alien vegetation and other introduced taxa also a problem; hurricanes damage habitat at higher elevations occupied by this honeycreeper, as e.g. in 1982 and 1992. In 2008, officially proposed for addition to US Endangered Species list. Current range protected by State of Hawaii's Alakai Wilderness Preserve.
Bibliography. Amadon (1950), Anon. (2006c, 2008d, 2009i), Benning *et al.* (2002), Berger (1981), Bryan & Seale (1901), Butchart & Stattersfield (2004), Conant *et al.* (1998), Eddinger (1972b), Foster, Scott & Sykes (2000), Foster, Tweed *et al.* (2004), Herrmann & Snetsinger (1997), Hirschfeld (2007, 2008), Holmer (2008), Mitchell *et al.* (2005), Olson & James (1982b), Perkins (1903), Pratt (1992b, 1994, 2001, 2005, 2009a), Pratt *et al.* (1987), Reding *et al.* (2009), Richardson & Bowles (1964), Scott *et al.* (1986), Stattersfield & Capper (2000), Tweed *et al.* (2005), VanderWerf & Roberts (2008).

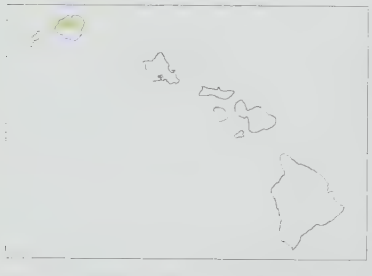
Genus *MAGUMMA* Mathews, 1925

9. Anianiau

Magumma parva

French: Anianiau de Kauai **German**: Gelbkleidervogel **Spanish**: Anianiau
Other common names: Lesser Amakihi

Taxonomy. *Himatione parva* Stejneger, 1887, Kauai.
Under differing taxonomic treatments, has at times variously been placed in one or other of genera *Hemignathus*, *Loxops*, *Chlorodrepanis* or *Viridonia*, but morphological and genetic studies indicate that it represents independent branch of family, lacking any sister-species. Monotypic.
Distribution. Kauai, in Hawaiian Is.



Descriptive notes. 10 cm; 8–11 g. Smallest Hawaiian honeycreeper, with short, thin and slightly downcurved bill. Male is mostly bright yellow with slight mustard tinge, a little darker on crown, back and rump; wing and tail feathers dark brownish-grey, broadly edged yellow (folded wing contrasts little with body feathering); iris dark brown (appearing black); bill brownish-pink, paler below; legs pale brownish-grey. Female is similar in pattern to male, but base colour greenish-yellow. Juvenile is dull olive-green, with yellow tinge on throat and breast. VOICE. Distinctive call of two or three syllables upslurred, "tew-weet" or "see-u-weet"; other calls resemble those of several other Kauai flock-forming species, and not always distinguishable, include a sharp "tseet". Advertising song variable, lively, sweet trills with repeated elements usually multisyllabic, "weesity-weesity-weesity...", "see-twee-see-twee-see-twee..." or "weesee-weesee-weesee...", sometimes slower and resembling song of Common Yellowthroat (*Geothlypis trichas*). Whisper song long and complex, similar to those of other drepanidids.
Habitat. Mostly temperate mixed forest and ohia–koa (*Metrosideros polymorpha–Acacia koa*) rainforest with understorey of *Cheirodendron*; mainly above 600 m, locally down to 100 m. Originally found in all native forest types.
Food and Feeding. Nectar and invertebrates taken in about equal amounts; occasionally juice of fruits. Forages in outer canopy and in understorey of shrubs, vines and ferns. Takes nectar from, and pollinates, short or open-face flowers of trees ohia-lehua and koa; smaller trees and shrubs ohelo (*Vaccinium*), kanawao (*Broussaisia arguta*), alani (*Melicope*), and introduced blackberry (*Rubus argutus*); and native mint species (of genera *Stenogyne* and *Phyllostegia*). Steals nectar from flowers pierced at base by *Drepanis coccinea* and *Chlorodrepanis stejnegeri*, including ohe naupaka (*Scaevola glabra*), haha-aiakamanu (*Clermontia fauriei*), and introduced banana poka (*Passiflora mollissima*). Gleans insects, spiders (Araneae) and other invertebrates from leaves and branches mostly of ohia-lehua and olapa (*Cheirodendron trigynum*). Occasionally extracts juice from soft fruits of olapa and kanawao. Joins wandering mixed flocks.
Breeding. Breeds mainly in first half of year. Monogamous. Courting male holds wings parallel to ground, hops up and down, and sings; female repeatedly chases male from tree, eventually following; whisper song sung during copulation, advertising song afterwards; male courtship feeds mate before and during nest construction. Both sexes build, female doing more of the work, nest made of mosses and liverworts (Bryophyta), *Usnea* lichens, leaves, twigs and bark strips from ohia and pukiawe (*Styphelia tameiameiae*), fibres of grasses and sedges, and rootlets, placed 3·3–9·5 m above ground and woven around vertical branches in terminal leaf cluster of ohia tree; territory comprises only immediate vicinity of nest. Clutch 2–4 eggs, usually 3, white, with tan and red-brown spots around larger end, average 18 × 22 mm; incubation by female alone, period 14 days; chicks brooded by female, at first continuously, later only during rainstorms, fed by both sexes, female providing c. 60% of food; nestling period 18 days, but chicks may jump from nest after 11 days if disturbed.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny global range, less than 15% of original range. Formerly at all elevations, but now only above 600 m, with most of population above 1100 m in Kokee region and Alakai Plateau; still found as low as 100 m into 1980s. In surveys during 1968–1973, population estimated at 24,230 individuals, mostly restricted to upper elevations; surveys of Kokee region and Alakai Plateau in 2000 produced estimate of c. 34,500 individuals; in 2003, total population 44,359 individuals. Population apparently stable, although recent declines rumoured. Main threats are disease borne by mosquitoes (Culicidae) and degradation of habitat by alien weeds, insects and mammals. In ex-situ experiments, found to suffer high mortality from induced avian malaria and pox. Hurricanes can destroy much of the species' habitat at high elevations. Most of remnant range protected in Kokee State Park and Alakai Wilderness Preserve.
Bibliography. Amadon (1950), Anon. (2006c, 2009i), Berger (1981), Bryan & Seale (1901), Butchart & Stattersfield (2004), Conant *et al.* (1998), Eddinger (1970), Foster *et al.* (2004), Lepson (1997), MacMillen (1974), Mitchell *et al.* (2005), Munro (1960), Perkins (1903), Pratt (2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), Richardson & Bowles (1964), Scott *et al.* (1986), Stattersfield & Capper (2000), Warner (1968), Wilson & Evans (1890–99).

Genus *LOXOPS* Cabanis, 1847

10. Hawaii Akepa

Loxops coccineus

French: Loxopse d'Hawaï **German**: Hawaii-Akepakleidervogel **Spanish**: Akepa de Hawai
Other common names: (Common) Akepa, Akakane, Akakani, Akepeuie

Taxonomy. *Fringilla coccinea* J. F. Gmelin, 1789, Sandwich Islands = Hawaii.
Until recently considered conspecific with *L. ochraceus* and *L. wolstenholmei* (latter, confined to Oahu, now extinct), but very recent DNA studies reveal genetic distances among the three to be equivalent to that between them and sister-species *L. caeruleirostris*; formerly regarded as conspecific also with *L. caeruleirostris*. Monotypic.
Distribution. Hawaii, in E Hawaiian Is.



Descriptive notes. 10 cm; 9·2–13 g. A very small finch-like passerine with a conical bill; tips of mandibles slightly crossed, mainly by deflection of upper mandible to right or left (roughly equal proportions). Male is brilliant red-orange or vermilion, including on shoulder; primaries, secondaries and their coverts and tail feathers contrastingly brownish-black, narrowly edged red on outer webs; iris very dark brown (appearing black), orbital ring black; bill pale grey to straw-yellow, sometimes with dark tip; legs black, toe pads grey. Female is dark grey-green above, much paler below, with pale face and diffuse supercilium, and broad pale yellowish-orange breastband. Juvenile of both sexes is olive-grey above, pale cream or off-white below and on face and supercilium, darker wing feathers edged olive-grey, bill brownish-grey; second-year male orange-brown above, irregularly blotchy dull orange, yellow and vermilion below, bill becoming irregularly lighter; male reaches adult plumage in three years. VOICE. Typical call a short warble, "teedle-ee-dee" or "teedleee", also a short upslurred "sweet" very similar to call of *Manucerthia mana*; sometimes in rapid series in response to hawk (Accipitridae) or owl (Strigidae) overhead. Advertising song a highly variable trill that may shift cadence or pitch, often with strong up-and-down component, often sounding listless or lackadaisical and fading out at end as if running out of energy. Whisper song long and complex, with chirps, warbles and trills, very similar to whisper songs of other members of family.
Habitat. Mainly old-growth forests of ohia (*Metrosideros polymorpha*) and koa (*Acacia koa*) at 1100–2100 m, mostly above 1500 m. Inhabited also temperate mixed forest in recent past.
Food and Feeding. Diet mainly invertebrates, including caterpillars, spiders (Araneae), psyllids (Psyllidae) and planthoppers (of family Delphacidae), lacewings (Neuroptera), and damsel bugs (Nabidae); rarely, nectar of ohia-lehua. Probes deliberately and methodically in terminal leaf clusters of ohia and seed pods and leaves of koa (with no twisting motion of head as once hypothesized); apparently opens leaf buds by probing, and then gaping. Occasionally forages in naio (*Myoporum sandwicense*), Hawaiian raspberry (akala) (*Rubus hawaiensis*), pukiawe (*Styphelia tameiameiae*), pilo (*Coprosma*), aalii (*Dodonaea viscosa*), and tree ohelo (*Vaccinium calycinum*). Is a major component of roaming post-breeding mixed flocks.
Breeding. Egg-laying in Mar–Jun. Monogamous, with long-lasting pair-bond. In pre-breeding group displays, males sing and engage in aerial dog-fights to 100 m above ground; perched display involves hopping and singing. Both sexes search out potential nest-sites, but do not choose until pair-bond formed; female builds open-cup nest of rootlets, twigs, moss, *Usnea* lichens, bark strips and grasses, outer diameter c. 8·4 cm (in certain circumstances up to 20 cm), height 3 cm, inner cup 5·3 cm, in natural or man-made cavity in very old koa or ohia tree, in wood, underneath bark, or in bark crevice; may reuse cavity for subsequent nesting attempts; nest-site undefended, male practises moving-mate defence throughout breeding cycle. Clutch 1–2 eggs, rarely 3, white, with black and brown spots around larger end, average 18 × 13·7 mm; incubation by female alone, period 14–16 days; chicks brooded by female for first 8 days, fed by both parents by regurgitation, faecal sacs removed until just before chicks depart (when some sacs accumulate on nest rim), nestling period 16–20 days.
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Central Hawaiian Islands EBA and Hawai'i EBA. Has tiny global range, extent of which continuing to decrease. Numbers apparently declining in some places, possibly stable in others. Once found throughout Hawaii in suitable habitat, but by 1980s occupied only 10% of former range. Currently has fragmented distribution above 1100 m, with three largest segments on windward (E) slope of Mauna Kea, on E flank of Mauna Loa, and in Ka'u Forest Reserve (on S flank of Mauna Loa); also, two tiny relict populations in C Kona (W slope of Mauna Loa) and one on N slope of Hualalai Volcano. Total population at end of 20th century c. 14,000. At Hakalau Forest National Wildlife Refuge, a University of Hawaii team claims a huge population crash has occurred since 2000, caused by

introduced organisms, particularly Japanese White-eyes (*Zosterops japonicus*), that have depleted akepa food supplies and thereby reduced nesting success and fledgling survival, and biased the sex ratio so that males far outnumber females in some age classes. Studies by refuge biologists and others have not been able to corroborate these findings, and have found no drastic declines since 2000 and no negative correlation with white-eye populations or indications of food competition with them. Independent panel in 2008 concluded that management of feral ungulates was a higher priority than management of white-eyes in the wildlife refuge.

Bibliography. Amadon (1950), Anon. (2006c, 2009i), Berger (1981), Butchart & Stattersfield (2004), Collins (1984), Dalton (2008), David & Gosselin (2002b), Freed (2001), Freed & Cann (2010), Freed, Cann & Bodner (2008), Freed, Cann & Diller (2009), Freed, Fretz & Medeiros (2007), Fretz (2002), Gorresen *et al.* (2005), Hart (2001), Knox (1983), Lempinen (2008), Lepson & Freed (1997), Lieberman (2005a, 2007), McCarthy (2006), Medeiros & Freed (2009), Mitchell *et al.* (2005), Munro (1960), Perkins (1903), Pratt (1989b, 2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), Ralph & Fancy (1994), Reding *et al.* (2010), Richards & Baldwin (1953), Richards & Bock (1973), Scott, Horne & Garton (2009), Scott, Mountainspring *et al.* (1986), Stattersfield & Capper (2000).

11. Maui Akepa

Loxops ochraceus

French: Loxopse de Maui **German**: Maui-Akepakleidervogel **Spanish**: Akepa de Maui
Other common names: Akakane, Akepeuie, Ochraceous Akepeuie

Taxonomy. *Loxops ochracea* Rothschild, 1893, Maui.
Hitherto considered conspecific with *L. coccineus* and *L. wolstenholmei* (latter, confined to Oahu, now extinct), but very recent DNA studies reveal genetic distances among the three to be equivalent to that between them and sister-species *L. caeruleirostris*; this, coupled with colour and apparent nesting differences, appears to support treatment as separate species. Monotypic.
Distribution. E Maui, in Hawaiian Is.



Descriptive notes. 10 cm. Small honeycreeper with conical bill, mandibles crossed at tip. Male yellow morph is bright mustard-yellow, except for dark brown primaries, secondaries, wing-coverts and tail feathers, all of which edged yellow; iris dark brown; bill pale grey to straw-yellow, sometimes dark tip; legs black. Red-morph male has yellow parts of plumage replaced with red-orange; 10% of males intermediate between the two morphs. Female is dull grey-green, darker on crown and back, with wing and tail dark brownish-grey, edged grey-green; some are tinged yellow on throat and upper breast. Juvenile is like female, but without yellow on throat; intermediate plumages not well known. Voice. Little information; said to be similar to that of *L. coccineus*.
Habitat. Ohia rainforest, ohia–koa (*Metrosideros polymorpha–Acacia koa*) rainforest, and drier koa forest.
Food and Feeding. Diet arthropods, mostly caterpillars and small spiders (Araneae) taken from leaf buds of ohia and koa leaves bound together with spider or caterpillar silk; very rarely, nectar from ohia-lehua. Uses asymmetrical bill to pry apart bud scales and bound leaves.
Breeding. Little information (all from 1903). A probable aerial display like that of *L. coccineus* observed. One pair seen while building nest in terminal leaf cluster of ohia; material was pulu, a brown fibrous or cottony product of *Cibotium* tree-ferns.
Movements. Resident.
Status and Conservation. Not assessed. Probably Extinct. Restricted-range species: present in Central Hawaiian Islands EBA. All 62 specimens in world collections taken between 1879 and 1900. Very few reports in 20th century, the last in 1988. Possible audio reports from surveys in mid-1990s unconfirmed, and survey results inconclusive. Probably present on all of Maui in prehistoric times, but by 1880s restricted to upper elevations of Haleakala Volcano; last reports from N & E slopes.
Bibliography. Amadon (1950), Anon. (2009i), Berger (1981), Butchart & Stattersfield (2004), Conant (1981), David & Gosselin (2002b), Engilis (1990), Henshaw (1902), Perkins (1903), Pratt (1989b, 2005), Pratt *et al.* (1987), Reynolds & Snetsinger (2001), Scott *et al.* (1986), Stattersfield & Capper (2000), Wilson & Evans (1890–99).

12. Akekee

Loxops caeruleirostris

French: Loxopse de Kauai **German**: Kauai-Akepakleidervogel **Spanish**: Akepa de Kauai
Other common names: Kauai Akepa, Ou-holowai

Taxonomy. *Chrysomitridops caeruleirostris* S. B. Wilson, 1890, Kauai.
Formerly considered conspecific with *L. coccineus*, but differences in coloration, voice, nest placement, ecology and genetics reveal it to be a separate species. Monotypic.
Distribution. Kauai, in Hawaiian Is.



Descriptive notes. 10 cm; c. 11 g. Small finch-like passerine with notched tail and conical bill, mandibles crossed at tip. Male is olive-green on hindcrown, nape and back, bright yellow on rest of body (including forehead, forecrown and rump), with triangular black mask from bill base to just behind eye; wing and tail dark greyish-brown, edgings concolorous with back; iris dark brown; bill pale blue to blue-grey, sometimes darker tip; legs brown to black. Female is very like male, but duller throughout, yellow parts paler and slightly greenish, mask not encircling bottom of bill, and bill more often grey than blue. Juvenile is much less yellow than adult, with mask indistinct; adult plumage acquired in first year. Voice. Typical call a loud ringing "peek!" or "sweet!"; other calls, possibly flock contact notes, sometimes indistinguishable from those of *Magumma parva*, *Chlorodrepanis stejnegeri* and *Oreomystis bairdi*. Advertising song variable energetic trills, almost always with shift of speed or pitch. Whisper song closely resembles similar songs of other members of family.
Habitat. Montane ohia, ohia–koa (*Metrosideros polymorpha–Acacia koa*), and temperate mixed forest.
Food and Feeding. Diet arthropods, including spiders (Araneae), psyllids (Psyllidae) and caterpillars. Forages in outer leaf clumps of ohia canopy, very rarely in other plants such as ohelo (*Vaccinium*), kolea (*Myrsine lessertiana*) and ohia-ha (*Syzygium sandwicensis*). Separates imbricated scales of ohia leaf buds by inserting bill and gaping to abduct lower mandible, and then inserts brush-tipped tongue to entangle prey. Joins roaming mixed flocks outside breeding season.
Breeding. Season at least Mar–Apr, possibly Feb–Jun. In courtship display, male hops back and forth in front of female while uttering single-note calls. Nest built by both sexes, from *Usnea* lichens and moss, lined with fine grass or soft bark strips, one with outer diameter c. 9·5 cm, height 11·3 cm, inner diameter c. 5·5 cm, depth 4·4 cm, placed 9–12 m up in terminal crown of ohia tree, woven around and wedged between vertical branches. Clutch size uncertain; 2 eggs were white, with brown spots around larger end, size c. 16·6 × 13·2 mm. No other information.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny global range, and has suffered extremely rapid population decline since turn of century. Population increased significantly in 1973–2000, but since then surveys by Hawaii Division of Forestry and Wildlife confirmed anecdotal reports of rapid population collapse (c. 8000 individuals in 2000, 5700 in 2005, 3500 in 2007) and withdrawal from much of recent range. Was once widespread and locally common in montane portions of Kauai, and by 1970 occupied 88 km² in Kokee and Alakai regions above 1000 m; following significant range contraction after 2000, has disappeared from Kokee State Park and retreated to highest SE sector of Alakai Wilderness Preserve. Proposed for addition to US list of Endangered Species in 2008. Most significant threat is ongoing advance of disease-bearing mosquitoes (Culicidae) into Kauai's highest reaches, probably exacerbated by rising global temperatures. Secondary threats include habitat degradation by invasive alien plants and feral pigs. Urgent action is required to halt the decline of this species, which until relatively recently was considered fairly common.
Bibliography. Amadon (1950), Anon. (2006c, 2008d, 2009i), Benkman (1989c), Benning *et al.* (2002), Berger (1981), Bryan & Seale (1901), Butchart & Stattersfield (2004), Conant *et al.* (1998), Eddinger (1972a), Foster *et al.* (2004), Herrmann & Snetsinger (1997), Hirschfeld (2008), Holmer (2008), Lepson & Pratt (1997), Munro (1960), Perkins (1903), Pratt (1989b, 2002b, 2005, 2009a), Pratt *et al.* (1987), Richardson & Bowles (1964), Scott *et al.* (1986), Stattersfield & Capper (2000).



Genus *MANUCERTHIA* H. D. Pratt, 2009

13. Hawaii Creeper

Manucerthia mana

French: Grimpeur d'Hawaï **German**: Hawaiiastläufer **Spanish**: Akikiki de Hawai

Taxonomy. *Himatione mana* S. B. Wilson, 1891, Hawaii.
Long combined with the *Paroreomyza* species and *Oreomystis bairdi* as a single species, under the name *Loxops maculatus* or *Paroreomyza maculata*. Has been placed in *Oreomystis* and regarded as sister-species to *O. bairdi*, but recent DNA studies indicate that it is basal in a clade with *Loxops* and *Chlorodrepanis*. Monotypic.
Distribution. Hawaii, in E Hawaiian Is.
Descriptive notes. 11 cm; 12·5–16 g. Small nondescript, short-tailed passerine with conical, slightly downcurved bill. Plumage is greyish-green above, olive-yellow below, shading to paler undertail-coverts; side of head and diffuse supercilium olive-yellow, mask from base of bill to point behind eye dark grey, throat white; iris dark brown; bill pale horn colour, often approaching white; legs dark horn. Sexes alike. Juvenile is much paler than adult, greyer above, nearly white (with little yellow) below, broad diffuse supercilium white, dark mask narrower; first-year resembles adult, but paler below, with narrower mask and better-defined supercilium. Voice. Call a quiet "sweet". Song a rapid rattling descending trill. Whisper song includes short notes, song fragments, and mimicry of such species as Elepaio (*Chasiempis sandwichensis*) and *Drepanis coccinea*. Young following adults utter series of notes in syncopated bursts, "whit-whit, whi-whi-whit, whit-whit," etc.



Habitat. Mostly wet ohia and ohia–koa (*Metrosideros polymorpha–Acacia koa*) forest with large emergent trees and subcanopy of hapuu tree-ferns (*Cibotium*), olapa (*Cheirodendron trigynum*), Hawaiian raspberry (akala) (*Rubus hawaiiensis*), pukiawe (*Styphelia tameiameiae*), ohelo (*Vaccinium*), kolea (*Myrsine lessertiana*) and Hawaiian holly (kawau) (*Ilex anomala*); at 1000–2300 m, mainly 1500–1900 m. Formerly occurred in drier koa forest, mamane–naio (*Sophora chrysophylla–Myoporum sandwicense*) forest, ohia–tree-fern forest, and temperate mixed forest; occasionally wanders into these habitats in present times.
Food and Feeding. Diet mainly arboreal invertebrates, including spiders (Araneae), adult and larval insects (Lepidoptera, Coleoptera, Homoptera, Hemiptera, Neuroptera, Diptera, Hymenoptera), pseudoscorpions (Pseudoscorpiones), annelid worms, and land snails. Creeps in manner of

nuthatch (Sittidae), without bracing with tail, over tree trunks and branches of c. 20 cm in diameter, probing, pecking, prying and pulling at bark to reveal prey. Joins post-breeding roaming mixed flocks.
Breeding. Season Jan–Aug, peak Feb–May. Monogamous; partners remain together for several years. In mating display, male, usually while singing whisper song, hops or flies back and forth in front of female. Open-cup nest built by female, with a little help from male, materials vary with locality and include ohia bark strips, twigs, moss, fern fibres and rootlets, pulu (soft cottony material produced by *Cibotium* tree-ferns), and rarely spider silk, exterior decorated with lichens and moss, supported from below and placed usually in ohia, sometimes in koa; site variable, e.g. horizontal branch, crotch, cavity, space between trunk and bark, or terminal leaf cluster; territory a 20-m radius around nest (large for a drepanidid). Clutch usually 2 eggs, bluish-white, larger end splotched brown, mean dimensions 19·65 × 14·35 mm; incubation by female, fed by male off nest, she also forages independently, incubation period 13–17 days; chicks brooded by female, fed mostly by male, either directly or via female, faecal sacs removed throughout cycle, nestling period 18–20 days.
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Hawai'i EBA. Has very small, greatly fragmented and contracting range, with continuing habitat loss and degradation. In surveys during 1976–1983, population estimated at c.12,500 individuals (2100 in Kau, 10,000 in Hamakua, 75 in C Kona, and 200 on NW Hualalai Volcano); has since declined, and currently thought to number fewer than 1000 individuals. Originally present essentially throughout island, but withdrew from lower elevations following human settlement. By 1900, found mostly above 600 m; still present below 1000 m in Hawaii Volcanoes National Park in 1940s, but extirpated from park 20 years later; persisted in Kohala District into 1970s, but not found in 1980s; relict population on Hualalai Volcano into 1980s now extirpated. Currently found between 1000 m and 2300 m in three disjunct populations: Hamakua (between Hakalau Forest National Wildlife Refuge and Kulani), Kau Forest Reserve, and Kona (W slope of Mauna Loa). Probably greatest threat is upwardly advancing mosquitoes (Culicidae), which transmit avian pox and malaria. Habitat degradation by feral pigs exacerbates disease threat. Highest densities at Hakalau Forest National Wildlife Refuge, where management of pigs ongoing. Captive-bred birds being released to bolster populations in localities showing recent declines.
Bibliography. Amadon (1950), Anon. (2009i), Baldwin (1953), Berger (1981), Butchart & Stattersfield (2004), Dunmire (1961), Gorresen *et al.* (2007), Henshaw (1902), Lepson & Woodworth (2002), Lieberman (2007), McCarthy (2006), Munro (1960), Perkins (1903), Pratt (1992b, 1994, 2001, 2005, 2009a, 2009b), Pratt *et al.* (1987), Ralph & Fancy (1994), Reding *et al.* (2009), Scott *et al.* (1986), Snetsinger (1996), Stattersfield & Capper (2000), VanderWerf (1998), Woodworth *et al.* (2001).

Genus *CHLORODREPANIS*

S. B. Wilson & Evans, 1899

14. Kauai Amakihi

Chlorodrepanis stejnegeri

French: Amakihi de Stejneger **Spanish**: Amakihi de Kauai
German: Kauai-Amakihikleidervogel
Other common names: Amakihi

Taxonomy. *Himatione stejnegeri* S. B. Wilson, 1890, Kauai.
Genus for many years subsumed into *Loxops*, and later merged into *Viridonia* or an enlarged *Hemignathus*. Previously considered conspecific with *C. flava* and *C. virens*; on basis of suite of potential isolating mechanisms, bolstered by DNA evidence, all now treated as separate species. When present species placed in *Hemignathus*, species name is preoccupied, and taxon must then be known as *H. kauaiensis*. Monotypic.
Distribution. Kauai, in Hawaiian Is.



Descriptive notes. 11 cm; 15–19·5 g. Small Hawaiian honeycreeper with medium-length sickle-shaped bill proportionately much larger than that of congeners. Male is olive-yellow, slightly darker on upperparts, including crown and nape, producing diffuse pale supercilium, lores narrowly dark grey, undertail coverts light dingy grey; iris dark brown; bill pale horn-coloured, blacker on culmen and tip, paler (approaching white) at base; legs dark horn to purplish-grey. Female is similar to male, but less yellow. Immature resembles female. Voice. Typical call a loud "tseet", very similar to calls of *Magumma parva*, *Loxops caeruleirostris* and *Oreomystis bairdi*; also a nasal mewing note resembling calls of *C. flava* and *C. virens*. Advertising song variable short loud trills, usually with distinct initial note. Whisper song long and complex, with trills, chirps and short warbles; often includes mimicry of syntopic species, both native and introduced.
Habitat. Mainly wet ohia forest, ohia–koa (*Metrosideros polymorpha–Acacia koa*) forest, and temperate mixed forest, often with large introduced plant component; thrives in places heavily invaded by alien banana poka (*Passiflora mollissima*). Probably originally occurred in all native forest types.
Food and Feeding. Omnivorous, but more specialized than congeners. Takes invertebrates and plant foods in roughly equal amounts, mainly in forest understorey. Insects, especially beetle larvae (Coleoptera) and caterpillars, picked from bark of trunks and branches in acrobatic manoeuvres; also creeps in manner of nuthatch (Sittidae) and gleans from leaves. Takes nectar and occasionally fruit from variety of native plants, e.g. ohia-lehua, kanawao (*Broussaisia arguta*), ohe naupaka (*Scaevola glabra*), Kauai kolii (*Trematolobelia kauaiensis*) and akia (*Wikstroemia*), and introduced ones, e.g. banana poka, blackberry (*Rubus argutus*), domestic plums (*Prunus* hybrid). Inserts bill into flowers with curved corolla, serving as pollinator, but steals nectar by piercing base of straight tubular flowers (i.e. banana poka). Joins wandering loose mixed-species flocks.
Breeding. Season extended. Courting male flits up and down on branches below female. Nest built by female, with some help from male, nest body (diameter 11·4 cm, height 6·3 cm) of ohia twigs and aerial rootlets, uluhe fern (*Dicranopteris linearis*) stems, moss, leaves and lichens, inner cup (diameter 6·3 cm, depth 3·8 cm) lined with shredded bark and grass, placed in dense terminal leaf cluster of tree crown or branch cluster near trunk of non-blooming ohia tree; territory radius around nest 5·5 m. Clutch 3 eggs, white, covered with brown spots (concentrated at larger end), mean dimensions 24·1 × 18·8 mm; incubation by females, fed by male, period 14 days; chicks brooded by female, fed by both parents, 73% of provisioning by female, nestling period c. 19 days.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny range, confined to part of single island. Once found throughout the island in suitable habitat, but by 1960s restricted to elevations above 450 m, and by 1970s only above 600 m in Kokee region and Alakai Plateau; isolated population in Makaleha Mts apparently stable to present. Numbers currently increasing, especially in W portion of range, where banana poka common. Suffered high mortality from experimentally induced avian malaria and pox in early ex-situ experiments, but persists in areas now invaded by pathogens and vectors, suggesting recent evolution of disease tolerance. Estimated total population of 15,000–20,000 in early 1980s had increased dramatically to c. 42,000 in 2000. Most of range protected in Kokee and Waimea Canyon State Parks and Alakai Wilderness Preserve.
Bibliography. Amadon (1950), Anon. (2009i), Berger (1981), Butchart & Stattersfield (2004), Conant *et al.* (1998), Eddinger (1970), Foster *et al.* (2004), Lindsey *et al.* (1998), Munro (1960), Perkins (1903), Pratt (1989a, 2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), Richardson & Bowles (1964), Scott *et al.* (1986), Stattersfield & Capper (2000), Tarr & Fleischer (1994), Warner (1968), Wilson & Evans (1890–99).

15. Oahu Amakihi

Chlorodrepanis flava

French: Amakihi d'Oahu **German**: Oahu-Amakihikleidervogel **Spanish**: Amakihi de Oahu
Other common names: Amakihi

Taxonomy. *Nectarinia flava* Bloxam, 1827, Oahu.
Genus for many years subsumed into *Loxops*, and later merged into *Viridonia* or an enlarged *Hemignathus*. Previously considered conspecific with *C. stejnegeri* and *C. virens*; on basis of suite of potential isolating mechanisms, bolstered by DNA evidence, all now treated as separate species. When placed in genus *Viridonia*, current species name is preoccupied, and taxon must then be known as *V. chloris*; latter specific name has also erroneously been applied when taxon placed in other genera. Monotypic.
Distribution. Oahu, in Hawaiian Is.



Descriptive notes. 11 cm; 10·8–17 g. Small honeycreeper with short, downcurved bill. Male is yellow-olive above, including top of head down to bill; lores black, narrow sharply defined supraloral line yellow; cheek, throat and entire underparts golden-yellow; iris dark brown; bill brown to black, shading to pale blue or fleshy pink base of lower mandible; legs dark horn-coloured to purplish-grey. Female is duller than male, greener above, shading more gradually into olive-yellow of underparts, undertail-coverts off-white, lores dark grey, narrow yellow supraloral line, upperwing-coverts with broad pale buff to white tips (prominent wingbars). Juvenile is patterned like female, but greyish-green dorsally, dirty white below, tinged or streaked with yellow on breast, and with loral line and wingbars white; plumage development not well known. Voice. Call a mewing raspy or buzzy "schee", very similar to call of *C. virens*. Advertising song variable loud trills, sometimes dropping in pitch and somewhat slower than those of *C. virens*, with notes more distinct. May have a whisper song.
Habitat. Native forests; also forests dominated by introduced trees and shrubs, especially guava (*Psidium guajava*) and kukui (candlenut) (*Aleurites moluccana*), and increasingly found in ornamental vegetation of suburban parks and subdivisions. Originally showed preference for forests with many koa trees (*Acacia koa*).
Food and Feeding. Dietary generalist, taking nectar, sap, fruit, and invertebrates. Forages in both outer canopy and understorey. Observed while feeding in such introduced plants as kukui (candlenut), eucalypts (*Eucalyptus*), the paperbark *Melaleuca quinquenervia*, Formosan koa (*Acacia confusa*), hibiscus (*Hibiscus*), octopus tree (*Brassaia actinophylla*) and coralbean (*Erythrina variegata*). Foraging techniques as varied as foods, and include leaf-gleaning, bark-picking and flower-probing; drinks from natural sap flows. Moves in response to blooming cycles; probably joined roaming mixed-species flocks in earlier times.
Breeding. Little studied; only three certain nests observed. Nest similar to that of *C. virens*, with outer body of grasses and twigs, inner cup lined with fine fibres such as rootlets and cotton-like pulu from tree-ferns, outside diameter 7·3–15 cm, inner cup 4·5–6 cm, cup depth 2·7–3·1 cm, placed 7–10 m up in terminal leaf clump, one each in native koa and ohia (*Metrosideros polymorpha*), the third in introduced lychee (*Litchi chinensis*). No other information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny global range, restricted to parts of a single island. Originally occurred throughout Oahu, but disappeared early from lowlands as a result of deforestation. Now confined to the island's two mountain ranges: above 500 m in Waianae Mts, and at 50–300 m in Koolau Range. Recently extended range into heavily populated areas around Honolulu, in some suburban communities at elevations as low as 30 m. Locally common in forests, and reclaiming lowlands from which long absent. Estimated population 20,000–60,000 individuals; declining until mid-1980s, now probably increasing. Apparently tolerant of avian malaria.
Bibliography. Anon. (2009i), Berger (1981), Bryan (1905), Butchart & Stattersfield (2004), Cann & Douglas (1999), Eddinger (1984), Howarth (1984), Lindsey *et al.* (1998), Mitchell *et al.* (2005), Perkins (1903), Pratt (2002b,

On following pages: 16. Hawaii Amakihi (*Chlorodrepanis virens*); 17. Kauai Nukupuu (*Hemignathus hanapepe*); 18. Maui Nukupuu (*Hemignathus affinis*); 19. Akiapolaau (*Hemignathus wilsoni*); 20. Maui Parrotbill (*Pseudonestor xanthophrys*); 21. Apapane (*Himatione sanguinea*); 22. Akohekohe (*Palmeria dolei*); 23. Iiwi (*Drepanis coccinea*).

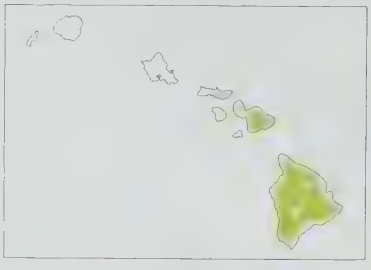
2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), Russell & Ralph (1981), Scott *et al.* (1986), Shallenberger & Pratt (1978), Shallenberger & Vaughn (1978), Stattersfield & Capper (2000), Tarr & Fleischer (1994), VanderWerf (1997).

16. **Hawaii Amakihi**

Chlorodrepanis virens

French: Amakihi familier **German**: Hawaii-Amakihikleidervogel **Spanish**: Amakihi de Hawai
Other common names: Common Amakihi

Taxonomy. *Certhia virens* J. F. Gmelin, 1788, Kona, Hawaii.
Genus for many years subsumed into *Loxops*, and later merged into *Viridonia* or an enlarged *Hemignathus*. Previously considered conspecific with *C. stejnegeri* and *C. flava*; on basis of suite of potential isolating mechanisms, bolstered by DNA evidence, all now treated as separate species. Proposed races *kalaana* (Molokai) and *chloridoides* (Lanai) not separable from *wilsoni*. Two subspecies recognized.
Subspecies and Distribution.
C. v. wilsoni (Rothschild, 1893) – Molokai and Maui, in Hawaiian Is.
C. v. virens (J. F. Gmelin, 1788) – Hawaii I, in E Hawaiian Is.



Descriptive notes. 11 cm; 10·5–16·2 g. Small honeycreeper with short, downcurved bill. Male nominate race is yellowish olive-green, paler below and on face, forehead and supercilium, but colour boundaries diffuse; lores black; wing and tail feathers dark brownish-grey, edged olive-green; iris dark brown, appearing black; bill brown to black, shading to pale blue at base; legs dark horn-coloured. Female is similar to male, but duller. Juvenile and immature are much duller than adult, olive-grey and dull white, with only trace of yellow below, tips of upperwing-coverts dull white (two narrow wingbars). Race *wilsoni* is very like nominate, but male on average slightly paler below, female greyer (differences not apparent in field). Voice. Calls highly variable, most commonly a cat-like buzzy "tscheew"; also short chirps and chips, and a rising whistle or squeak, "quee-ee". Where this species occurs within range of *Loxioides bailleui*, imitates latter's "pa-léé-la" call, but with rising inflection at end. Advertising song variable loud vigorous trills that swell in amplitude. Whisper song long and complex, like those of other small members of family.
Habitat. Virtually all forest types, including those heavily invaded by introduced trees. On Hawaii reaches highest densities in drier forests, but on Maui more numerous in wet forests. Found also in subalpine brush above tree-line on both islands.
Food and Feeding. Dietary generalist, c. 30% of food nectar, the rest mostly soft-bodied invertebrates (caterpillars etc.); trace component of fruit and tree sap, latter from natural flows and from sap wells created by *Hemignathus wilsoni*. Invertebrates gleaned from bark or leaves. Most frequent native nectar sources are ohia-lehua (*Metrosideros polymorpha*), mamane (*Sophora chrysophylla*) and wiliwili (*Erythrina sandwicensis*), but feeds at any flowers, native or introduced, with accessible nectar; readily steals nectar from inappropriately shaped flowers such as nasturtium (*Tropaeolum*). May become "park-tame" at picnic grounds, and sometimes solicit handouts. A component of post-breeding mixed-species flocks, but not a nuclear species. Moves in response to peaks of blossoming.
Breeding. Season extended; active nests found in every month of year. Monogamous; partners remain together for several years. Courtship involves chasing flights and hopping or flitting displays, sometimes accompanied by whisper song. Open cup-nest built by female, materials vary with locality, coarser outer body, inner cup lined with fine fibrous material, mean dimensions 10·9 × 9 cm, height 6·9 cm, internal diameter 5·2 cm, depth 3·5 cm, placed in terminal or lateral fork of dominant tree for area, including mamane (88%) and naio (*Myoporum sandwicense*) (12%) on Mauna Kea, ohia in wet forest, and conifer in tree plantations; unlike most other members of family, defends large territory. Clutch 1–4 eggs, mean 2·5, creamy white with purple and brown spots, mostly on larger end, mean size 19 × 13·9 mm; incubation by female, period 14 days; chicks fed by both parents, female more than male, by regurgitation, nest sanitation varies, faecal sacs removed throughout cycle at most nests on Hawaii, but accumulate on rim of most Maui nests after 14 days; average nestling period 16·8 days, chicks may jump from nest at 14 days if disturbed.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Hawaiian Islands EBA and Hawai'i EBA. Common to locally abundant on Hawaii and Maui; locally common on Molokai. Formerly present also on Lanai (race *wilsoni*), but now extirpated there. Lowland populations exhibit significant tolerance of avian malaria, and apparently derive from relict local populations, rather than from immigration from higher elevations, where resistance is low. No special conservation measures taken or apparently needed; reintroduction on Lanai is a possibility.
Bibliography. Amadon (1950), Atkinson, Dusek & Lease (2001), Atkinson, Dusek, Woods & Iko (2000), Baldwin (1953), Berger (1981), Foster *et al.* (2007), Gaudioso *et al.* (2008), Henshaw (1902), Hirai (1978), Jarvi *et al.* (2001), Kern & van Riper (1984), Kilpatrick *et al.* (2006), Lindsey *et al.* (1998), MacMillen (1974), McCarthy (2006), Mitchell *et al.* (2005), Perkins (1903), Pratt (1999b, 2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), Ralph (1990), Reynolds *et al.* (2003), van Riper (1984, 1987, 1991a), van Riper *et al.* (1986), Scott *et al.* (1986), Spiegel *et al.* (2006), Tarr & Fleischer (1994), Woodworth *et al.* (2005).

Genus *HEMIGNATHUS*

M. H. C. Lichtenstein, 1839

17. **Kauai Nukupuu**

Hemignathus hanapepe

French: Nukupuu de Kauai **German**: Kauai-Sichelkleidervogel **Spanish**: Nukupuu de Kauai
Other common names: Nukupuu

Taxonomy. *Hemignathus hanapepe* S. B. Wilson, 1889, Kauai.
Genus sometimes listed as *Heterorhynchus*, but this name is an objective synonym of current genus name; unclear which name published earlier, and current genus name was adopted using Principle of First Reviser. Species long considered conspecific with *H. affinis* and now extinct *H. lucidus*, but plumage differences and genetic distances suggest that treatment as three separate species more appropriate. Monotypic.
Distribution. Kauai, in Hawaiian Is.



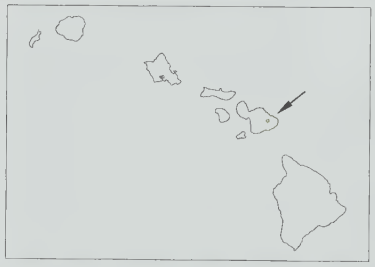
Descriptive notes. 14·5 cm; 27 g. Medium-sized honeycreeper having long, downcurved bill with lower mandible half length of upper one ("heterobill"), thinner at base than bill of *Chlorodrepanis stejnegeri*. Male is bright golden-yellow on head, breast and rump, shading to white on belly and undertail-coverts; lores black, back yellow-green; upperwing and tail feathers dark brownish-black, edged yellow-green; iris very dark brown; bill and legs intense black. Female is grey above, including crown and auriculars, with white supercilium (sometimes tinged yellow anteriorly), dark grey lores; white below, sometimes tinged yellow on throat; flight-feathers and tail as on male. Juvenile and immature resemble female. Voice. Call a whistled 2-note "keeewit". Song a short warble, apparently similar to that of *H. wilsoni* but quieter.
Habitat. Mesic to wet ohia–koa (*Metrosideros polymorpha–Acacia koa*) forest.
Food and Feeding. Food insects and other invertebrates. Forages in canopy of ohia and koa trees, and in understorey trees such as kalia (*Elaeocarpus bifidus*) and olapa (*Cheirodendron trigynum*). Moves along upper surface of branch, reaching down to sides, rarely hanging upside-down. Picks items from bark of trees. Often taps with lower mandible, apparently to disturb prey, but does not excavate with bill. Joined wandering mixed-species flocks led by *Oreomystis bairdi*.
Breeding. No information.
Movements. Resident.
Status and Conservation. Not assessed. Almost certainly Extinct. Restricted-range species: present in Central Hawaiian Islands EBA. Occurred over whole island before arrival of man; by 1900 restricted to area between Waialae Stream and R Hanapepe above 600 m. No substantiated reports in 20th century. Reported rediscovery in 1960 was a fleeting glimpse of two birds; most other reports, including some from reputable observers, fail to exclude *Chlorodrepanis stejnegeri* as a possibility. Most recent credible-but-unconfirmed report was in 2007. Measures taken to benefit other Kauai endangered species would also benefit this one if any individuals still exist. Potential range entirely within Alakai Wilderness Preserve.
Bibliography. Amadon (1950), Anon. (2009i), Berger (1981), Burney *et al.* (2001), Butchart & Stattersfield (2004), Conant *et al.* (1998), Munro (1960), Olson & James (1995), Perkins (1903), Pratt, H.D. (1994, 2005), Pratt, H.D. & Pratt (2001), Pratt, H.D. *et al.* (1987), Pratt, T.K. & Pyle (2000), Pratt, T.K., Fancy & Ralph (2001), Reynolds & Snetsinger (2001), Richardson & Bowles (1964), Rothschild (1893–1900), Scott *et al.* (1986), Stattersfield & Capper (2000), Wilson & Evans (1890–99).

18. **Maui Nukupuu**

Hemignathus affinis

French: Nukupuu de Maui **German**: Maui-Sichelkleidervogel **Spanish**: Nukupuu de Maui
Other common names: Nukupuu

Taxonomy. *Hemignathus affinis* Rothschild, 1893, Maui.
Genus sometimes listed as *Heterorhynchus*, but this name is an objective synonym of current genus name; unclear which name published earlier, and current genus name was adopted using Principle of First Reviser. Species long considered conspecific with *H. hanapepe* and now extinct *H. lucidus*, but plumage differences and genetic distances suggest that treatment as three separate species more appropriate. Monotypic.
Distribution. Maui, in Hawaiian Is.



Descriptive notes. 14 cm; 23 g. Medium-sized honeycreeper (but smaller than congeners) having long, downcurved bill with lower mandible half length of upper ("heterobill"). Male is greyish-olive above, with yellow-green rump, darker colour extending through nape to mid-crown; lores black; upperwing and tail dark sepia-brown, edged olive-yellow; throat and underparts entirely bright yellow, tinged olive on flanks; iris dark brown; bill and legs coal-black. Female is similar to male, but paler below and greyer above, with the dark colouring extending to top and side of head; well-defined yellow supercilium. Immature resembles female. Voice. Call a whistled 2-note "keeewit". Song a short warble, apparently similar to that of *H. wilsoni* but quieter; another said to resemble song of House Finch (*Carpodacus mexicanus*).
Habitat. Wet ohia forest and mesic ohia–koa (*Metrosideros polymorpha–Acacia koa*) forest with dense understorey.
Food and Feeding. Insectivorous; one bird reported taking nectar of pukiawe (*Styphelia tameiameiae*). Often accompanies heavier-billed *Pseudonestor xanthophrys*, apparently to take advantage of latter's disturbance of smaller prey. Joins roaming mixed-species flocks led by *Paroreomyza montana*.
Breeding. No information.
Movements. Resident.
Status and Conservation. Not assessed. Probably Extinct. Restricted-range species: present in Central Hawaiian Islands EBA. Probably occurred throughout the island before arrival of man; historically restricted to zone between 1220 m and 2100 m on N slope of Haleakala Volcano, extending around E to Kipahulu Valley. Considered uncommon to rare in 1890s, followed by 70-year gap in sightings. Many recent reports have lacked essential details, but a few seem credible; most are from Hanawi Natural Area Reserve, now fenced to exclude feral pigs. No reports since mid-1990s.

Bibliography. Anon. (2009i), Banko (1968), Berger (1981), Butchart & Stattersfield (2004), Engilis (1990), Munro (1960), Olson & James (1995), Perkins (1903), Pratt, H.D. (1994, 2005), Pratt, H.D. & Pratt (2001), Pratt, H.D. *et al.* (1987), Pratt, T.K. & Pyle (2000), Pratt, T.K., Fancy & Ralph (2001), Reynolds & Snetsinger (2001), Reynolds, Camp *et al.* (2003), Reynolds, Snetsinger & Pratt (1995), Rothschild (1893–1900), Scott *et al.* (1986), Stattersfield & Capper (2000).

19. Akiapolaau

Hemignathus wilsoni

French: Hémignathe akiapolaau **German**: Hawaii-Sichelkleidervogel **Spanish**: Akiapolaau
Other common names: Hawaii Nukupuu

Taxonomy. *Heterorhynchus wilsoni* Rothschild, 1893, Hawaii.
Genus sometimes listed as *Heterorhynchus*, but this name is an objective synonym of current genus name; unclear which name published earlier, and current genus name was adopted using Principle of First Reviser. Some authors expand genus to include *Chlorodrepanis*, in which case current species name becomes invalid for this taxon, because preoccupied; present species then adopts name *H. munroi*. Monotypic.
Distribution. Hawaii I, in E Hawaiian Is.



Descriptive notes. 14 cm; male 19·8–37 g, female 17–35 g. Medium-sized honeycreeper with combination-tool bill, upper mandible long and downcurved, lower mandible about half length of upper and straight with attenuated chisel tip; closed bill usually shows small gap between mandibles. Male is bright golden-yellow on face, including supercilium, and throat and underparts, except for whitish undertail-coverts; darker golden-olive on upperparts and on upper and rear edge of auricular patch, not sharply separated from yellow areas; lores black; flight-feathers dark sepia-brown, edged golden-olive; iris dark brown; bill and legs black. Female is duller than male, greyer above and paler below, yellow of breast not extending so far back, and darker colour extending to side of face, with ill-defined yellow supercilium; bill smaller than male's. Juvenile is yellowish-grey dorsally, with yellowish-tawny rump, pale yellow or off-white tips of wing-coverts (indistinct wingbars), pale olive-grey below, flanks tinged tawny and breast mottled with indistinct darker feather tips, bill dull straw-yellow at base; immature lacks breast mottling, loses wingbars by second year and resembles female, but less yellow in throat and breast; adult plumage not gained until third year. Voice. Calls include a 2-note to 4-note whistle, "cheerdle-ee", a 2-note upslurred whistle, "teerweee" or "chew-weee", and single-note upslurred "squeet", or quiet "swit". Advertising song a lively quick warble, usually ending in a pair of rising and then falling notes: "tu-tu-whéé-wheer-tu-du-whéé-you". Whisper song (or subsong) a quieter version of advertising song with added trills and warbles. Juvenile and immature "beacon call" for parental contact a distinct, evenly paced single "tseoop" or "cheerp".
Habitat. Mainly in mesic to wet ohia–koa (*Metrosideros polymorpha–Acacia koa*) forest and ohia rainforest, but until recently found also in dry mamane–naio (*Sophora chrysophylla–Myoporum sandwicense*) forest; 1340–2700 m. Prefers forests dominated by koa, including secondary forest plantations. Originally inhabited native forests of every type.
Food and Feeding. Diet includes spiders (Araneae), grubs and adult beetles (Coleoptera), lacewing larvae (Neuroptera), and caterpillars (Lepidoptera), especially those that burrow in dead wood or hide in bark; also nectar, and ohia tree sap. Forages in kolea (*Myrsine lessertiana*), mamane and naio, as well as in koa and ohia. Sexes differ somewhat in foraging habits, male preferring trunks and larger branches, female smaller branches and leaf clusters, both favouring lichen clumps. Uses mandibles independently, pecking with lower one while holding upper one out of the way, and probing and raking with upper mandible while using lower as a fulcrum. Hammering motion distinctive. Obtains tree sap by drilling and revisiting rows of sap wells similar to those made by sapsuckers (*Sphyrapicus*); such "aki trees" often clustered and defended. Family groups may associate with roaming post-breeding mixed-species flocks in home range.
Breeding. Breeds any time of year, peak Feb–Jul. Monogamous, partners remaining together for several seasons in stable populations. Defends large home range throughout year. Nest built by female, with minor help from male, materials mainly ohia bark strips and parts of *Cibotium* tree-ferns, ohia bark strips 2 cm wide protrude vertically 5 cm from top of nest (looking like a miniature fence), external dimensions 11 × 14 cm, height 15 cm, internal cup diameter 6·5–7·9 cm, depth 4·5 cm, placed 7–22 m above ground in terminal leaf clump of ohia tree, rarely in cavity. Clutch usually 1 egg, very rarely 2 or 3, one was pale cream, with brownish-red splotches mostly at larger end, size 22·7 × 17 mm; incubation by female, no information on duration of incubation period; young brooded by female, one chick left nest at 21 days; dependency period of young unusually long, 4–13 months, parents may feed chicks from two seasons simultaneously.
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Hawai'i EBA. Has very small, highly fragmented range. Once widespread, but now confined to upper elevations on slopes of Mauna Kea and Mauna Loa Volcanoes. Main populations in Hamakua District (centred on Hakalau Forest National Wildlife Refuge), the Keauhou-Kulani area (NE of Hawaii Volcanoes National Park), and in Kau District in Kau Forest Reserve, Kapapala Forest Reserve and the Kahuku section of the national park. Range contracting and population declining overall, although increasing locally. Estimates vary widely, apparently because of different censusing techniques, but current population probably fewer than 2500 individuals. Small relict populations in Kona and mamane–naio forests of windward Mauna Kea extirpated in past decade, remaining three populations isolated by unsuitable habitat. Elevational restriction undoubtedly a result of mosquitoes (Culicidae) and the diseases that they transmit at lower elevations. Current upland populations threatened by predation by rats (*Rattus*) and feral cats, and habitat deterioration caused by grazing of feral ungulates, especially feral cattle and mouflon sheep (*Ovis musimon*). Regeneration of koa forests after removal of grazers led to recovery of this honeycreeper's numbers in some places, showing benefits of ungulate control. Most of remaining populations are in areas managed for forest birds (Hakalau Forest National Wildlife Refuge, Three Mountain Alliance). Pu'u Wa'a Wa'a Forest Bird Sanctuary, on Hualalai Volcano, now fenced as a potential reintroduction site.
Bibliography. Anon. (2009i), Banko & Williams (1993), Berger (1981), Butchart & Stattersfield (2004), Henshaw (1902), Pejchar *et al.* (2005), Perkins (1903), Pratt, H.D. (2005, 2009a), Pratt, H.D. *et al.* (1987), Pratt, T.K., Fancy, Harada *et al.* (1994), Pratt, T.K., Fancy & Ralph (2001), Pratt, T.K., Tweed & Fretz (2009), Ralph & Fancy (1996), Sakai & Ralph (1980), Scott *et al.* (1986), Stattersfield & Capper (2000).

Genus *PSEUDONESTOR* Rothschild, 1893

20. Maui Parrotbill

Pseudonestor xanthophrys

French: Pseudonestor de Maui **German**: Papageischnabel-Kleidervogel **Spanish**: Pseudonestor
Other common names: Parrot-billed Koa-Finch, Pseudonestor

Taxonomy. *Pseudonestor xanthophrys* Rothschild, 1893, Maui.
Long regarded as being allied with *Psittirostra psittacea*, but data from varied sources suggest closer relationship with *Hemignathus*. Monotypic.
Distribution. E Maui, in Hawaiian Is.



Descriptive notes. 14 cm; male 22·4–28·5 g, female 16·5–23·5 g. Medium-sized passerine with relatively huge but laterally compressed bill. Male is olive-green above, sharply separated from golden-yellow below, with paler, yellowish-white central belly and undertail-coverts; lores black, broad olive-green postocular stripe connecting with dark colouring on side of neck, broad and sharply defined yellow supercilium; iris dark brown; upper mandible dark brown to black along culmen, changing abruptly to yellowish or pinkish-ivory at base of maxilla and on entire lower mandible; legs dark slate. Female is similar to male, but with smaller bill, yellow less golden, and undertail off-white. Juvenile has yellow areas of adult replaced with dingy white, and some have pale wingbars and grey-mottled breast; plumage maturation not well known, probably requires three years to reach adulthood. Voice. Calls include loud "cheek" or "chick", very similar to typical call of *Paroreomyza montana* but louder and more slowly paced, a thin "squeee" similar to some calls of *Chlorodrepanis virens*, a 2-note upslurred human-like whistle, "tew-wee", and a 3-note whistled "tee-oo-eee". Advertising song a melancholy or plaintive descending and fading trill with distinctive introductory notes, "tickety-chwéé-chwee-chwee-chwee-chwee", reminiscent of song of Canyon Wren (*Catherpes mexicanus*) or Ivory-billed Woodcreeper (*Xiphorhynchus flavigaster*). Whisper song (or subsong) incorporates quiet versions of advertising song and call notes with short warbles and whistles. Fledgling's "beacon call" for parental contact a distinct, evenly paced downslurred "tseeoop!" given at intervals of 2–3 seconds.
Habitat. Ohia–koa (*Metrosideros polymorpha–Acacia koa*) rainforest, at 1200–2350 m; montane koa forest reported as prime habitat. Originally found also in lowland dry forest and probably other dry to mesic forests.
Food and Feeding. Diet almost 80% wood-boring beetle larvae (Coleoptera), also caterpillars (Lepidoptera) and other invertebrates; occasionally takes nectar from ohia-lehua (*Metrosideros polymorpha*), the Hawaiian raspberry akala (*Rubus hawaiensis*) and ohelo (*Vaccinium*). Observed to take berries of pilo (*Coprosma ochracea*) and discard pericarps, but whether eating pits/stones or searching for fruit-boring larvae is not known. Feeding movements slow and deliberate, and mandibles often used independently. Upper mandible serves separately as plough, scraper or hammer, or with lower one as pliers or nut-cracker. Lower mandible used for gouging rotten wood, for pecking (with upper mandible held out of the way, as with *Hemignathus wilsoni*), or for chiselling twigs held in place by upper mandible. May join mixed flocks that move through its home range.
Breeding. Season Nov–Jun. Monogamous, partners remaining together for several years. Courtship involves sexual chasing and courtship feeding, the latter continued throughout year as pair-bond maintenance. Nest built by female, materials mostly *Usnea* lichen and moss, braced with pukiawe (*Styphelia tameiameiae*) twigs, outer diameter 10·7 cm, height 7·5 cm, inner cup diameter 5 cm, depth 3·3 cm, placed 12 m above ground and 5 m below leaves in branch fork of ohia canopy; defends large territory, including much of home range. Clutch 1 egg, rarely 2, off-white, flecked all over with black, splotched with lavender-brown around larger end, 21·7 × 15·4 mm; incubation by female, period c. 16 days; chick brooded by female, fed mostly by male, faecal sacs accumulate on nest rim after 9 days, nestling period 18–22 days.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny range, within which habitat being seriously degraded by introduced feral ungulates. Originally found throughout Maui (and prehistorically also Molokai), but by 1890s restricted to elevations above 1000 m on Haleakala Volcano. Now confined to areas above 1200 m from Waikamoi Preserve E to Kipahulu and Manawainui valleys. Population of c. 500 individuals apparently stable since mid-1970s; in latest survey, in Sept 2009, population thought possibly to be increasing. Entirety of range within East Maui Watershed Partnership area, fenced at c. 1070 m to control feral ungulates. In portions controlled by Haleakala National Park, Hanawi Natural Area Reserve and Waikamoi Preserve (Nature Conservancy), efforts under way to eliminate feral pigs and prevent invasion of weeds, and in one place to control rats (*Rattus*). Captive-bred birds may be used in an attempt to repopulate a restored forest on S slope of Haleakala.
Bibliography. Amadon (1950), Anon. (2009i), Banko (1968), Berger (1981), Berlin, Simon, Pratt, Banko & Kowalsky (2001), Butchart & Stattersfield (2004), Henshaw (1902), Hirschfeld (2007, 2008), Hopper *et al.* (1993), James & Olson (1991), Lockwood *et al.* (1994), Mountainspring (1987), Olson & James (1982b), Perkins (1903), Pratt, H.D. (2005, 2009a), Pratt, H.D. *et al.* (1987), Pratt, T.K., Simon *et al.* (2001), Reynolds & Snetsinger (2001), Richards & Baldwin (1953), Rothschild (1893–1900), Scott *et al.* (1986), Simon, Baker & Baker (1997), Simon, Pratt *et al.* (2000), Stattersfield & Capper (2000), Zusi (1989).

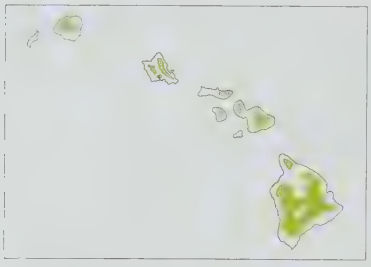
Genus *HIMATIONE* Cabanis, 1851

21. Apapane

Himatione sanguinea

French: Picchion cramoisi **German**: Apapanekleidervogel **Spanish**: Apapane
Other common names: Akakani, Apakane

Taxonomy. *Certhia sanguinea* J. F. Gmelin, 1788, Sandwich Islands = Hawaii.
Long regarded as conspecific with extinct Laysan species *H. fraithii*, but treated by recent taxonomists as separate species on basis of a suite of potential isolating mechanisms and osteological differences. Monotypic.
Distribution. Main Hawaiian Is: Kauai, Oahu, Lanai, Molokai, Maui and Hawaii.



Descriptive notes. 13 cm; male 16 g, female 14·4 g. Medium-sized honeycreeper with short, downcurved but not sickle-shaped bill. Most of head and body, including shoulders and upperwing-coverts, is bright crimson-red; rest of wing and tail black, tertials narrowly edged crimson, primaries narrowly edged white on outer web; belly and rear flanks grey, undertail-coverts bright white; iris dark brown; bill and legs black. Sexes alike in plumage, female slightly smaller than male. Juvenile has upperparts and breast tawny with dusky spots (densest on breast), upper back darker, top of head and auriculars heavily streaked dark brown, face and throat variably tinged orange-red, wing and tail black, upperwing-coverts broadly edged tawny or buff, shading to white at tips of greater coverts, secondaries and tertials, posterior underparts white; moulting juvenile may be blotchy, with irregular patches of crimson; first-year immature resembles adult, but retains juvenile flight-feathers. Voice. Call a loud downslurred "tewp" or "teerp", often uttered in flight. Song almost infinitely varied, loud and conspicuous, usually long and resembling that of a canary (*Serinus*), but with mechanical-sounding, reedy and dissonant notes; sometimes only 2–3 notes.
Habitat. Ohia-lehua (*Metrosideros polymorpha*) forest.
Food and Feeding. Mostly nectar from crimson ohia-lehua flowers (of which this species is a major pollinator), also insects gleaned from flowers and foliage. Secondarily takes nectar and insects opportunistically from wide variety of native trees and shrubs, as well as introduced flowers, in earlier times including coconut (*Cocos nucifera*). Perches conspicuously on outside of canopy, often appearing to run across dense ohia foliage.
Breeding. Breeds in most months of year. Monogamous. Male courtship display includes singing while hopping from branch to branch, with tail cocked to display white undertail. Nest built by both sexes, mainly from moss, with lichens, rootlets, bark and ohia twigs and leaves, inner cup lined with fine grass and sedge fibres, external diameter 9·5 cm, height 10·2 cm, inner cup diameter 5·1 cm, depth 3·8 cm, placed usually in terminal leaf cluster of ohia canopy, but sometimes in upper branches of Hawaiian holly kawau (*Ilex anomala*), koa (*Acacia koa*) or hapuu tree-fern (*Cibotium*), or in lava tube or tree cavity; nest-sites the most varied of any Hawaiian honeycreeper; both sexes defend small territory in immediate vicinity of nest. Clutch 1–4 eggs, usually 3, white, blotched mostly around larger end with various shades of brown, mean dimensions 24·1 × 18·4 mm; incubation by female alone, period c. 13 days; chicks brooded by female, provisioned by male off nest, both sexes feed chicks, female providing 70% of feeds, faecal sacs removed throughout cycle, nestling period probably c. 14–15 days.
Movements. Resident. Wanders in search of nectar resources. On Hawaii, makes daily flights to lowland feeding sites, with return upslope overnight.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Hawaiian Islands EBA and Hawai'i EBA. Abundant. Densities of 4000/km², among highest for any non-colonial bird, but declining locally. On Kauai, population in heart of Alakai Plateau stable, but elsewhere on island declined by 50% 1973–2000; remains widespread and common, despite losses. Major populations above 1250 m on Kauai, Maui and Hawaii; on Oahu, above 300 m in Koolau Range and above 600 m in Waianae Mts; relict populations at highest reaches of Lanai and Molokai. Genetic uniformity and nomadism likely prevent establishment of genetically distinct local populations, slowing evolution of disease tolerance; populations at sea-level on Hawaii apparently maintained by immigration from higher elevations. No specific conservation measures planned, but all populations would benefit from control of disease-carrying mosquitoes (Culicidae).
Bibliography. Amadon (1950), Baldwin (1953), Berger (1981), Carothers (2001), Eddinger (1970), Fancy & Ralph (1997), MacMillen & Carpenter (1980), Olson & Ziegler (1995), Perkins (1903), Pratt (2005, 2009a), Pratt & Pratt (2001), Pratt *et al.* (1987), Ralph & Fancy (1995), van Riper (1973), Sakai (1983), Scott *et al.* (1986), Walther (2006), Ward (1964), Warner (1968), Yorinks & Atkinson (2000).

Genus *PALMERIA* Rothschild, 1893

22. Akohekohe

Palmeria dolei

French: Palmérie huppée **German**: Haubenkleidervogel **Spanish**: Akohekohe
Other common names: Crested Honeycreeper

Taxonomy. *Himatione dolei* S. B. Wilson, 1891, Maui.
Some authors suggest transferring present species to genus *Himatione*, from which differentiated largely on basis of plumage. Monotypic.
Distribution. E Maui, in Hawaiian Is.



Descriptive notes. 18 cm; male 26·5–31 g, female 20·6–28 g. A fairly large, strikingly plumaged honeycreeper with sharp, slightly downcurved bill. Plumage is mainly black, with grey undertail-coverts; crest of stiff recurved feathers on forehead buff-tinged white with dusky tips, auriculars densely spotted silver; feathers of back and underparts with silver shaft streaks and terminal spots anteriorly, spots changing to orange on flanks and back, with some tips bicoloured (altogether imparting streaky and spangled look); broad patch around eye red-orange, fading to orange-buff above, rear edge sometimes connecting to brilliant scarlet nape patch of sharply attenuated, often rather "unkempt", feathers; scapulars orange-red, sometimes mottled with black and white, median upperwing-coverts broadly edged red (forming upper wingbar), greater coverts tipped white (forming lower wingbar); primary coverts and flight-feathers (including tertials) narrowly edged white, white broader at tip; tail with broad white terminal band; thighs orange-buff; iris dark brown; bill and legs black. Sexes alike. Immature is mainly sooty brown, shading to dull buff on belly and undertail-coverts, with buff shaft streaks on lower breast, flanks and belly; short bristly crest, malar region and side of throat tinged grey, area above eye and auriculars tinged orange, upperwing-coverts broadly edged orange-brown, primaries and secondaries narrowly edged orange-brown to white. Voice. Contact call a quick upslurred human-like whistle, easily imitated; secondary call (or short song) 4 "eerie" echoing whistles followed by low-pitched dry mechanical-sounding squawk, "pee-ter-pee-ter-skeerrrr-tck". Song loosely organized and very low-pitched jumbles of reedy whistles, cowbell-like notes, grunts, guttural squawks, vowel-less ticking or smacking sounds like human tongue-clicking "tsk-tsk", and muffled sounds like Mel Blanc's Donald Duck imitating *Himatione sanguinea*: "ahrrr-quoit-quoit-quoit" or "gree-tork-tork-chick-tic-turr-r-r-r" or "ahh-ko-heh-ko-heh" (the last onomatopoeic).
Habitat. Rainforest dominated by ohia-lehua (*Metrosideros polymorpha*) with scattered koa trees (*Acacia koa*) and dense understorey of olapa (*Cheirodendron trigynum*) and Hawaiian holly (kawau) (*Ilex anomala*), heavily overgrown with epiphytes, mosses and lichens. At 1100–2300 m; almost all above 1500 m.
Food and Feeding. Ohia nectar specialist, feeding also (when ohia bloom fails) on nectar of other flowers, including Hawaiian raspberry (akala) (*Rubus hawaiiensis*), pukiawe (*Styphelia tameiameiae*), ohelo (*Vaccinium*), kolea (*Myrsine lessertiana*) and kanawao (*Broussaisia arguta*); also gleans caterpillars, flies (Diptera) and spiders (Araneae) from leaves and branches of ohia. Often engages in trap-line feeding, visiting particular blooming trees on a regular cycle based on nectar-recovery periodicity. Defends feeding territories throughout year.
Breeding. Season Nov–Jun; usually two broods. Semi-colonial, with many adjacent territories in small area. Displays include spectacular aerial acrobatics by up to six singing males as much as 50 m above forest canopy; courtship feeding throughout breeding cycle. Nest built mostly by female, base made from twigs of ohia, pukiawe and olapa, topped with moss and lichens, inner cup lined with ohia stamens and fern rootlets, outer diameter c. 14 cm, height 8·1 cm, inner diameter c. 6 cm, depth 3·3 cm, placed c. 14 m above ground in upper fifth of canopy layer with dense foliage above; defends territory of 160–240 m diameter in dense ohia stand. Clutch 1 egg (30%) or 2 eggs (70%), dull grey, with brown streaks, spots and splotches concentrated at larger end, mean dimensions 24·2 × 25·3 mm; incubation by female, provisioned by male, period 14–19 days; chicks brooded by female, fed by both parents by regurgitation, faecal sacs removed throughout cycle, nestling period c. 21 days.
Movements. Resident. After breeding season, some follow elevational shifts in timing of ohia blooming.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Central Hawaiian Islands EBA. Has tiny global range, in which habitat degraded by feral ungulates. Estimated total population in 1980 c. 3800 individuals; believed stable. Historically known only from middle and upper slopes of Haleakala Volcano, in E Maui, and higher elevations of Molokai. Currently confined to area from Waikamoi Preserve E to Manawainui Valley, in Maui; extinct on Molokai, where last recorded in 1907. Distribution restricted by presence of disease-carrying mosquitoes (Culicidae) at lower elevations. Entirety of range lies within East Maui Watershed Partnership area, fenced at c. 1070 m to control feral ungulates, including feral pigs and axis deer (*Axis axis*).
Bibliography. Anon. (2009i), Berger (1981), Berlin & VanGelder (1999), Berlin, Simon, Pratt, Kowalsky & Hatfield (2001), Bryan (1908), Butchart & Stattersfield (2004), Carothers (2001), Carpenter (1976), Conant (1981), Hirschfeld (2007, 2008), Jarvi *et al.* (2001), Loope & Madeiros (1995), Perkins (1903), Pratt, H.D. (1994, 2005, 2009a), Pratt, H.D. *et al.* (1987), Pratt, T.K., Simon *et al.* (2001), van Riper *et al.* (1986), Scott *et al.* (1986), Simon *et al.* (1998, 2001), Stattersfield & Capper (2000), VanGelder & Smith (2001).

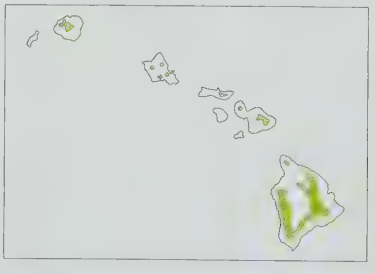
Genus *DREPANIS* Temminck, 1820

23. Iiwi

Drepanis coccinea

French: Iiwi rouge **German**: Iiwikleidervogel **Spanish**: Iiwi
Other common names: Iiwi popolo, Iiwi polena (both for immature)

Taxonomy. *Certhia coccinea* G. Forster, 1781, Kona District, Hawaii.
Long regarded as sole member of genus *Vestiaria*, but this was subsumed into present genus (other members of which now extinct) on grounds that the only defining characters at species level are colour differences. Birds from Molokai described as race *suavis*, but appear inseparable from those in rest of species' range. Monotypic.
Distribution. Main Hawaiian Is: Kauai, Oahu, Molokai, Maui and Hawaii.



Descriptive notes. 15 cm; male 19·9 g, female 16·7 g. A medium-sized honeycreeper with heavy sickle-shaped bill. Head and body, including scapulars, brilliant scarlet-vermilion, with grey tinges in undertail-coverts, sometimes paler and more orange on thighs, narrow orange eyering; wing and tail glossy black, greater coverts edged scarlet, innermost tertial white, next partly white or grey; iris yellow-brown to brown; bill and legs scarlet-orange, slightly paler than body plumage. Sexes alike. Juvenile has body feathers greenish-yellow to mustard-yellow, tipped black (especially dorsally), cheek, throat and scapulars variably tinged scarlet, wing and tail dark grey with tawny to white feather edgings, tertials with pale grey in place of adult's white; as feathers wear, dark tips become reduced and scattered and base colour fades to tawny-yellow; moulting birds may be quite blotchy, with irregular patches of adult plumage; bill at first dark brown, changing gradually to adult colour (change not necessarily co-ordinated with moult). Voice. Calls include a human-like upslurred whistle, rather similar to call of *Palmeria dolei*, and a 2-note "ker-weee". Song a loosely organized series of seemingly random croaks, chirps,

creaks, whistles, reedy dissonances and "rusty-hinge" squeaks, often incorporating call notes and occasionally involving mimicry of local species.

Habitat. Wet to mesic ohia–koa (*Metrosideros polymorpha–Acacia koa*) forest, preferably with understorey of tree-ferns (*Cibotium*), kolea (*Myrsine lessertiana*) and naio (*Myoporum sandwicense*). Visits dry mamane (*Sophora chrysophylla*) forest, but rarely breeds there. Mainly above 1250 m, but locally down to 300 m and up to 2900 m.

Food and Feeding. Mainly nectarivorous, but also takes invertebrates. Bill fits falcate corollas of many native plants, including those in genera *Clermontia*, *Cyanea* and *Trematolobelia* (Lobeliaceae), native mints (*Stenogyne*), ohe naupaka (*Scaevola glabra*), mamane, and others. May have been pollinator of such co-evolved flowers, but in many recent observations birds pierce corollas at base, stealing nectar without pollinating, a trait perhaps learnt by feeding on introduced flowers with straight corollas such as banana poka (*Passiflora mollissima*), to which almost addicted. At least half of foraging on ohia-lehua (*Metrosideros polymorpha*) and other open-faced flowers, e.g. kokio keo keo (*Hibiscus arnottianus*) and kanawao (*Broussaisia arguta*), perhaps a recent adaptive shift leading to evolution of shorter bill. Defends feeding territories during peaks of bloom. Regularly moves into mamane–naio forest when mamane in bloom.

Breeding. Extended season, Dec–Jul (mostly Feb–Jun). Monogamous, but partners separate outside breeding season. Male courtship displays include song flights and wing-fluttering while singing; courtship feeding throughout cycle. Nest built by both sexes, female doing most of work, materials vary, often outer layer made of ohia twigs and moss, inner cup lined with fibrous bark strips and lichens, external diameter 9·5 cm, height 7·4 cm, internal diameter 5·4 cm, depth 3·5 cm, placed at mean height of 7·2 m in terminal leaf cluster in ohia canopy; territory (under 1000 m²) larger than that of most other members of family. Clutch 1–3 eggs, usually 2, white, with chocolate-brown spots, dots and splotches mostly around larger end, mean size 20·7 × 15·5 mm; incubation by female alone, fed by male off nest, period 14 days; chicks brooded by female, fed mostly by her (71% of feeding), nestling period c. 21 days, but after 12–14 days chicks will jump from nest at slightest disturbance; fledglings may follow parents and beg for up to 4 months.

Movements. Resident. Sometimes nomadic in search of nectar resources; flies between islands.

Status and Conservation. VULNERABLE. Restricted-range species: present in Central Hawaiian Islands EBA and Hawai'i EBA. Reasonably common, with estimated population of at least 350,000 individuals in early 1990s, but considered possibly at risk because of long slow decline in numbers and contraction of range; still abundant locally, with densities of 2000/km² in prime habitat such as Hakalau Forest National Wildlife Refuge, on Hawaii. Formerly present throughout all Main Hawaiian Is; now found mainly above 1250 m on Hawaii, E Maui and Kauai, with relict populations on Oahu, W Maui, and probably Molokai; extirpated on Lanai by 1929. Kauai range contracted during 1973–2000, and population decreased by 60% overall, but numbers at highest elevations remained stable. Species is known to be highly susceptible to avian malaria, carried by introduced mosquitoes (Culicidae) at lower elevations, e.g. 90% mortality from one infected mosquito bite. No resistant populations yet detected, but persistence of some individuals of this species as low as 300 m suggests possible degree of tolerance in some places. Genetic uniformity and nomadism apparently prevent establishment of genetically distinct local populations, slowing evolution of disease tolerance. Studies under way to determine exact population status and cause of recent declines. Other factors likely to promote decline are habitat degradation by introduced mammals such as cattle and pigs, and predation by introduced cats and rats (*Rattus*).

Bibliography. Anon. (2009i), Atkinson *et al.* (1995), Berger (1981), Butchart & Stattersfield (2004), Carothers (1982), Conant *et al.* (1998), Eddinger (1970), Engilis (1990), Fancy & Ralph (1998), Foster, Tweed *et al.* (2004), Foster, Woodworth *et al.* (2007), Hirai (1978), Jarvi *et al.* (2001), MacMillen & Carpenter (1980), Mitchell *et al.* (2005), Munro (1960), Olson (1989), Perkins (1903), Pratt, H.D. (2002b, 2005, 2009a), Pratt, H.D. *et al.* (1987), Ralph & Fancy (1995), Reynolds & Snetsinger (2001), Reynolds *et al.* (2003), van Riper *et al.* (1986), Scott *et al.* (1986), Smith *et al.* (1995), Stattersfield & Capper (2000), Telfer (1993), VanderWerf & Rohrer (1996), Wilson & Evans (1890–1899).

Class AVES
Order PASSERIFORMES
Suborder OSCINES
Family PEUCEDRAMIDAE (OLIVE WARBLER)



- Small passerine with notched tail, relatively long and rather thin bill slightly decurved; distinctive plumage with prominent wingbars, male brightly coloured.
- 13 cm.



- South USA and Middle America.
- Open coniferous and mixed forest.
- 1 genus, 1 species, 5 taxa.
- No species threatened; none extinct since 1600.

Systematics

This newly created family contains just one species, the Olive Warbler (*Peucedramus taeniatus*), the taxonomic history of which is highly convoluted. Historically, it has for long been considered to belong to the New World warbler family (Parulidae). In plumage, it rather resembles some members of the genus *Dendroica* of that family, and some early ornithologists subsumed the genus *Peucedramus* into *Dendroica*, this on the basis mainly of plumage similarities between the two. Although superficially similar in plumage to *Dendroica* species, the Olive Warbler does exhibit several important differences. F. M. Chapman, in 1907, and many scientists since then, pointed out such features of the Olive Warbler as a notably forked tail, a more slender, decurved and notched bill, proportionately longer wings, a different nest construction, and the fact that northern Olive Warbler males, at least, have a distinct first-summer (or first alternate) plumage, not acquiring adult-type plumage until their second spring.

Others were already questioning the placement of this species with the New World warblers, and in 1962 W. G. George suggested that it was, in fact, more closely related to the Old World warblers (Sylviidae). This view was based mainly on the arrangement of the hyoid muscles and jaw musculature, and the shape of the tongue's basihyal bone, which bore similarities to that of the Old World family. George and others noted also that the Olive Warbler's limb musculature, call note and egg colour, the fact that its young soil the nest before leaving it, and its albumen proteins were not consistent with placement in Parulidae. The last of these factors gave a hint of what was to come following the advent of genetic research, a pronounced difference in albumen proteins giving an indication of the different genetic lineage of Peucedramidae, which C. G. Sibley and J. E. Ahlquist would later start to unravel.

In 1990, Sibley and Ahlquist took the surprising step of placing the Olive Warbler in its own subfamily within their hugely expanded Fringillidae family. This decision was based on these authors' new studies, using DNA–DNA hybridization, which suggested that the Olive Warbler is the sister-taxon of all the other species in this immense family: in other words, the first ancestral branch of that family resulted in the splitting off of just one species, the Olive Warbler. This was the first instance in which genetics had played a part in the Olive Warbler debate, and the findings were regarded as tentative, pending further study.

The work of these two scientists was ground-breaking, and was at the time considered controversial by some, but there is no doubt that it paved the way for a whole new era of genetic research into avian systematics and classification. Subsequent studies have corroborated Sibley and Ahlquist's findings in so far as indicating that this species is not a parulid warbler, nor even very closely related to that family. They have not, however, provided much clarification on its taxonomic position with regard to which species are its closest relatives. The authors of such studies have variously allied it tentatively with the waxbills (Estrildidae), the sunbirds (Nectariniidae) and the accentors (Prunellidae), and some of them, such as J. G. Groth, in 1998 and 2000, and P. G. P. Ericson and U. S. Johansson, in 2003, have tentatively identified the Olive Warbler as the sister-clade of the Prunellidae.

Thus, it now appears that George was partly correct and that the Olive Warbler is not closely related to the New World warblers, although, contrary to his suspicions, it appears not to be related to the Old World warblers, either. More work is required in order to unravel the taxonomic complexities of this intriguing species, but what is becoming clear is that it is a quite ancient lineage and appears not to have any close living relatives. With the "resplitting" of the vast Fringillidae family, the Olive Warbler was assigned its own monotypic family, Peucedramidae, and more recent authors have largely followed this treatment.

Five subspecies of the Olive Warbler are currently recognized, the differences being largely clinal. The birds become progressively smaller and, in the case at least of males, brighter from north to south. The nominate race ranges from Guerrero, in south-west Mexico, east to Guatemala, but there is a gap in distribution in the region of the Isthmus of Tehuantepec. Those to the west of the isthmus, in Guerrero and western Oaxaca, are said to have rather paler upperparts than those to the east, in Chiapas and Guatemala. To reflect these purported differences, the populations normally grouped together as the nominate have sometimes instead been divided into two races, but there are complications with the resulting nomenclature. The problem arises due to some confusion over the precise locality of origin of the type specimen of *taeniatus*. This form was initially described by B. du Bus de Gisignies in 1847 as having been taken in "Mexique". In 1944 P. Brodkorb restricted the location to San Cristóbal, in Chiapas, to the east of the Isthmus of Tehuantepec. However, in 1948 J. T. Zimmer presented evidence suggesting that the type of *taeniatus* probably came from San Pedro, in Oaxaca, to the west of the isthmus, although he appears to have

overlooked or ignored Brodkorb's paper. There is still some uncertainty as to which type locality is correct, but Brodkorb's version is habitually followed. For those authors who prefer to recognize different races for the birds either side of the isthmus, names are available for either version of the type locality: if the nominate is considered to refer to the western populations, eastern birds take the name *aurantiacus*; but if *taeniatus* is to be applied to the eastern form, western birds receive the name *georgei*.

A little to the west and north, the central Mexican population of Olive Warblers, those from Jalisco eastwards to western Veracruz, were given the name *giraudi* by Zimmer in 1948. This is a new name for *olivaceus*, under which this population was described more than one hundred years earlier, but the name *olivaceus* is invalid, because it is preoccupied. This is interesting in view of the English vernacular name of the species, which is based on the scientific name of *Sylvia olivacea*, originally given to the species by J. P. Giraud in 1841. The English name "Olive Warbler" does seem rather inappropriate for a bird with males that are so richly and contrastingly coloured, although it could be said to fit the rather duller females a little better. Despite the fact that the scientific name was subsequently found to be unusable, the English name nevertheless stuck, and has been used ever since.

Morphological Aspects

The Olive Warbler is superficially similar to the New World warblers in its morphology, and the plumage pattern is reminiscent of that of the parulid genus *Dendroica*, to the extent that it was once placed in that genus. In many ways, the Olive Warbler does, indeed, bear a superficial resemblance to a *Dendroica* warbler, as it has a bright and strongly patterned head, two very prominent white wingbars and white patches in the outer tail feathers, and it is sexually dimorphic. Details of its morphology, however, clearly show that it differs in many respects. It has an emarginated tail, with a pronounced notch or fork at the tip, a thinner and more decurved bill, and a different shape to the basihyal bone of the tongue, and there are differences in jaw, limb and hyoid musculature (see Systematics). The relatively long bill appears to be an adaptation for probing in bark crevices and needle clusters of pine trees (*Pinus*), and this may be one factor enabling northern individuals to remain on their breeding grounds in the montane forests of the southern USA and northern Mexico; these areas are cold during winter, with relatively few insects available. It has proportionately longer wings than those of *Dendroica* species. It is sexually dimorphic, but, unlike any *Dendroica* warblers, the first-summer males, at least in the northern race *arizonae*, have a distinct plumage that is obviously duller and more female-like than that of the adult males, the head being olive-coloured, rather than tawny. Many first-year male *Dendroica* warblers are slightly duller than the adult males, but they nonetheless show the same basic plumage pattern and coloration. The American Redstart (*Setophaga ruticilla*) is the only New World warbler in which the immature males show obvious age dimorphism, having a distinct, female-like plumage in their first spring.

As already stated, Olive Warblers are quite similar in basic size, shape and structure to New World warblers, particularly those of the genus *Dendroica*, but they have a thinner and more decurved bill, a noticeably notched tail, and proportionately longer wings with pointed tips. They are about 13 cm in body length, and their weight ranges from 10 g to just over 12 g. The size does vary geographically, southern subspecies being smaller than the northern ones. Males are, on average, slightly larger than females, but the differences are certainly not noticeable in the field; in the subspecies *arizonae*, the wing length of males is 72–81 mm and that of females 67–75 mm.

Adult males have a tawny-orange head, throat and breast, and a contrasting black mask around the eye, stretching from the ear-coverts forward to the base of the bill. The upperparts are greyish and the wings are darker, with a small white patch at the base of the primaries and two striking white wingbars. The tail is blackish-grey, but with extensive white in the outer two feather pairs, and the lower underparts are of a dull whitish colour. In fresh autumn plumage, the upperparts have a slight olive tinge and the tawny feathers of the rear crown and nape may be tipped with grey; these tips wear off by the spring, leaving the head slightly brighter and the upperparts purer grey. Adult females have a greyish crown and upperparts, a darker greyish mask surrounded by pale yellow supercilia and neck sides, and dull white underparts with a yellow wash on the breast; the white wingbars are narrower than those found in the male, and there is slightly less white in the tail.

First-year males most closely resemble the adult female, but they are brighter, with a deeper yellow colour on the head, and the facial mask tends to be darker than that of the adult female. They have slightly less white at the base of the primaries and in the outer tail than the adult male. In spring, some first-year males of the subspecies *arizonae* may acquire a few tawny feathers on the throat, presumably the result of a limited pre-breeding moult (see below). In addition, first-year males are greyer on the upperparts in spring than in autumn, when the upperparts have a more brownish-olive tinge, but this is a result of feather wear over the course of the winter, rather than of moult.

Compared with adults of their gender, first-year females are duller, especially in the autumn, having a browner tinge on the upperparts and paler and buffier yellow surrounds to the facial mask, which is slightly paler grey; the white patch at the base of the primaries is generally smaller and often inconspicuous.

Juveniles are similar to, but duller than, first-years in autumn plumage. They are brownish-tinged dull olive above, and have the supercilium and the side of the neck dull buffy yellow; the throat and breast are similarly dull buffish-yellow, and the lower underparts buffy white. The wingbars are tinged yellowish. Juvenile females are said to be slightly duller than the males of the same age.

Geographical variation is predominantly clinal in nature, individuals becoming smaller and brighter from north to south. Olive Warblers breeding in south-west USA, race *arizonae*, are relatively large, and the males have a comparatively dull tawny head and breast. The southernmost subspecies, *micrus*, occurring from El Salvador south to Nicaragua, is the smallest and brightest race, males having a bright tawny-golden head and breast, whiter underparts and a larger white patch at the base of the primaries, and the primary edgings are white, rather than yellowish-olive; females of this race have a richer yellow colour around the rear of the ear-coverts. The intervening subspecies are intermediate in these respects, *jaliscensis* and *giraudi* tending to be more olive



Superficially resembling a New World warbler of the genus Dendroica, *the* ***Olive Warbler*** *shows a number of significant differences. Its tail is notched, its bill more slender and decurved, and its wings longer and more pointed. Following DNA studies, it has been assigned its own family. It appears to have no close living relatives, but further study is needed. There are five subspecies, with birds becoming smaller and brighter from north to south. The male of race* arizonae *is the largest and dullest.*

[*Peucedramus taeniatus arizonae*, Chiricahua Mountains, SE Arizona, USA. Photo: Jim Zipp/ardea.com]

on the upperparts, especially the posterior upperparts, than the nominate race.

In the northern part of the range, at least, the post-juvenile moult begins in July and is usually completed during August. It is a partial moult and involves the body feathers and some wing-coverts, but not the flight-feathers or the tail feathers. The post-breeding moult of the adults likewise takes place during July and August and is complete, meaning that all of the feathers are replaced. There is some evidence that a very limited pre-breeding moult may be undertaken by northern individuals, possibly only first-years, and involving only the head and throat. Some immature males of the subspecies *arizonae* acquire a few scattered tawny-coloured feathers in the plumage of the head and throat by their first spring, and this is presumed to be the result of a moult of some head and throat feathers. Such a pre-breeding moult has not yet been reported for more southerly Olive Warbler populations, but further study is required in order to establish whether it may occur too in the south of the species' range.

Habitat

Throughout the year, the Olive Warbler has a rather particular habitat. At all seasons it is closely tied to montane coniferous forests, especially those of pines (*Pinus*) or firs (*Abies*), and high-altitude pine–oak (*Pinus–Quercus*) forests, preferring quite open forest habitats, rather than those with a dense, closed canopy. In the limited part of its breeding range in the south-western USA, it appears particularly tied to open forests of ponderosa pine (*Pinus ponderosa*), but it is also frequently found in open forests of sugar pine (*Pinus lambertiana*) and Douglas fir (*Pseudotsuga menziesii*). In the Rincon Mountains of Arizona, it is reported as being more common in fir than in pine forests. In Mexico, the Olive Warbler has been found in dense thorn-forest in Colima and in pine–alder (*Pinus–Alnus*) forest in the Valley of Mexico, as well as occupying the more favoured pine and pine–oak forests. In the south of its range, in Guatemala, Honduras and northern Nicaragua, it appears to be more restricted to pine and pine–oak forests.

In the northernmost part of its range, in the southern USA, the Olive Warbler generally breeds above 2300 m and up to 3500 m, and in Mexico it is found from 1700 m to 3500 m. In these areas it is mostly an altitudinal migrant, generally descending to slightly lower elevations in the winter months (see Movements). In the south of its range, it lives at lower altitudes, between 1000 m and 2150 m, reflecting the lower elevations of the mountain ranges in these areas. The only records away from highland areas are from Colima, where this species has occasionally been seen in lowland thorn-forest and coastal palm groves, although such instances are probably exceptional.

General Habits

Little is known of the general habits of the Olive Warbler. The localized, day-to-day movements and activities of this species remain largely unknown, although its flight is apparently swift and straight, individuals often covering quite long distances in a single flight. The birds are territorial in the breeding season, and probably do not wander beyond the limits of their territory. At other times, however, they generally join up with mixed-species foraging flocks, which roam quite widely.

Aggressive encounters between males are regular during the establishment of breeding territories, especially if one of the males is a first-summer individual, in its second calendar-year of life. Such aggressive encounters typically involve one individual, the adult, chasing the other; if already mated, the territory-owner's mate may join in the chase. Other interactions between breeding males do not, however, involve the same level of aggression, and it is likely that the individuals concerned are neighbours with established territories, and that they are relatively familiar with each other. While foraging, mated partners maintain contact with each other with frequent soft call notes, and when approaching the nest they do so cautiously, alighting near the trunk of the tree and then creeping quietly along the branch to the nest.

Breeding males tend to sing from a stationary perch near the top of a tree, although they will also sing while actively foraging, especially during territory establishment. It is thought that individuals return to the same territories year after year. Olive Warblers frequently perform a wing-flicking action like that of a kinglet (*Regulus*), and this habit further sets them apart from members of the New World warbler family.

During the winter season, Olive Warblers typically join mixed foraging flocks of foliage-gleaning insectivores and other species. Often, these flocks are led by Mexican Chickadees (*Poecile sclateri*) and/or Bridled Titmice (*Baeolophus wollweberi*), and they may also contain Townsend's (*Dendroica townsendi*), Hermit (*Dendroica occidentalis*) and Crescent-chested Warblers (*Parula superciliosa*), as well as various other parulid species, kinglets, tanagers (Thraupidae) and nuthatches (Sittidae). Similarly, in the late summer, once their young have fledged, Olive Warblers frequently join mixed foraging flocks, the core species again often being Mexican Chickadees and Bridled Titmice, other attending



*The female **Olive Warbler** is less richly coloured than the male. However, there is some possibility of confusion with first-year males, which unlike any* Dendroica *warbler have a distinct plumage, intermediate between the sexes. Claimed records of singing females may be attributable to these first-summer males. Olive Warblers are monogamous, and pair members appear to remain together throughout the year. They are territorial when breeding, and females will join attacks on intruding males—which are, most frequently, first-summer birds.*

[*Peucedramus taeniatus arizonae*,
Cochise County, Arizona, USA.
Photo: Brian E. Small]



*Primarily or perhaps exclusively insectivorous, the **Olive Warbler** uses its relatively long, slender bill to glean prey from the needle clusters and bark crevices of pines. It forages mostly in the outer parts of the middle to upper canopy, sometimes sallying in pursuit of flushed insects, or occasionally descending to the ground to retrieve dropped larvae. In all seasons, Olive Warblers are found in montane coniferous forests, and they favour conifers for their foraging when in mixed forests such as pine-oak.*

[*Peucedramus taeniatus arizonae*, Chiricahua Mountains, SE Arizona, USA. Photo: Charles W. Melton]

species including Hutton's Vireo (*Vireo huttoni*) and the Painted Whitestart (*Myioborus pictus*). Generally, only two or three Olive Warblers join any one such flock, although larger flocks with up to 15 or more individuals are regularly reported. In one study in south Durango, in Mexico, Olive Warblers were encountered in 39 out of 63 summer flocks and in 41 out of 68 winter flocks, these figures representing a presence in flocks of approximately 62% and 60%, respectively; they contributed, on average, 2·3 individuals per summer flock and 1·8 individuals per winter flock. The somewhat higher figure for summer flocks was presumably a result, at least in part, of family-members still being together in parties, although it is also stated that the young of this species may remain with the parents through their first winter and that young may sometimes join foraging flocks that contain no adults. Olive Warblers sometimes associate with larger and more varied foraging flocks, which can include an assortment of vireos, tanagers, Bushtits (*Psaltriparus minimus*), juncos (*Junco*) and wrens (Troglodytidae), and they have been reported as associating quite closely with small flocks of Western Bluebirds (*Sialia mexicana*).

Little has been recorded of the maintenance behaviour and comfort activities of this species. One female preened four times while incubating her eggs, doing so without leaving the nest. Head-scratching is performed by lifting one leg over the lowered wing to reach the head, the method known as "indirect scratching".

Voice

Bird vocalizations are generally divided into two main types. Songs are used primarily in defending a territory or to advertise for a mate, whereas calls are employed in a wider variety of situations, such as when maintaining contact among members of a flock, the signalling of danger, or the signalling of aggression, either to conspecifics or to other species. As a general rule, songs are longer, more varied and more complex than calls and, although there are many exceptions to this, it holds true for the Olive Warbler. This species' calls are generally quite short in duration and simple in structure.

The song is a two-note whistle or buzzy whistle repeated several times in quick succession, and often transcribed as "peeta peeta peeta peeta" or "peedo peedo peedo peedo". A slight variant is described as "whit-er-a whit-er-a whit-er-a whit-er-a". The whistled notes are reminiscent of those made by a Great Tit (*Parus major*). The song is delivered at a rate of 3–8 notes per second; individual songs tend to last for 1–1·5 seconds, and are given at a rate of eight to ten songs per minute. With the double note referred to as a simple syllable, males use at least two types of syllable, and their songs consist either of a series of one and the same syllable, such as "peeta peeta peeta" and so on, or of two syllable types in sequence; an example of the latter could be "peeeta peeta peeta peeta" followed by "peedo, peedo, peedo".

Olive Warblers sing throughout the year, although singing frequency increases in late winter and reaches a peak in April. In the daily pattern, song frequency is at its peak in mid-morning, but in spring, when the daily pattern is being established, males sing more constantly throughout the morning and in the late afternoon. Once the territory has been established, the male generally sings while foraging within the canopy of a pine or fir tree; during the process of territory establishment, however, he tends to sing from more exposed perches in tall pine trees, or while moving through the tops of the tallest pines in the territory. There have been several claims that the females sing, but it has been suggested that these reports may involve first-summer males, which resemble females in plumage.

The most common call of this species is a rich downslurred whistled note, transcribed as "kew" or "phew". This call is similar to that of the Western Bluebird, with which Olive Warblers sometimes associate in autumn (see General Habits). Other calls include a high reedy whistle, not unlike that of the Evening Grosbeak (*Hesperiphona vespertina*), which is given as a hard, scolding "pit", and soft whispered contact notes given by pair-members when they are foraging separately.

Food and Feeding

Olive Warblers are primarily, and probably even entirely, insectivorous, although few details of their prey items and feeding habits are known. The main food appears to be insects and other arthropods, and, in the only intrusive study known to have been carried out, the stomach contents of all five individuals examined contained insects.

The species usually forages at medium to high levels in the canopy, concentrating on the outer branches and twigs, probing terminal needle clusters, and moving in a rather deliberate and methodical manner, similar to that of a Pine Warbler (*Dendroica pinus*). Its foraging behaviour has also been likened to that of a Hermit Warbler. In addition, Olive Warblers have been observed to forage at lower levels, sometimes within 1 m of the ground in small shrubs, and they occasionally descend to the ground in order to pick up prey items, although reported instances of this behaviour generally involved tortricid moth larvae that the bird had dropped while foraging in the canopy.

Nevertheless, in a study in Arizona it was found that the birds spent nearly equal amounts of time foraging at all levels up to 24 m, and on larger branches as well as terminal twigs. In Mexico, studies in Durango revealed that pine trees are preferred for foraging, oaks being utilized less often. The most common method of feeding is that of perch-gleaning from pine needles, and aerial sallies are used frequently as a means of capturing prey flushed from the foliage. Further, individuals will sometimes hover in order to glean prey from substrates that are inaccessible from a perch.

Breeding

Compared with those of the temperate New World warblers, the breeding habits of the Olive Warbler are not very well known.

From the limited information available, it appears that Olive Warblers are monogamous, the pair-members generally remaining together throughout the year. Little has been recorded of the courtship of this species, but partners have been watched while flying about 6–10 m up in pine trees, and frequently facing each other at a range of 15–45 cm. The female has been observed to join the male in chasing an intruding male out of the territory.

This species builds a cup-shaped nest 10–23 m up in a conifer tree, near the tip of a branch and often concealed in a clump of pine needles or mistletoe (Loranthaceae): as a result, it is very difficult for a human observer to discover and to monitor the nest. One intrepid observer early in the twentieth century described how, in order to find one nest, he clambered about in a tree for five hours. The nest itself is a deep and compact cup of rootlets, stalks and other fine materials, often incorporating mosses, rootlets and stalks of the shrubby plant known as the cream bush (*Holodiscus dumosus*), and with silvery fibres from the undersides of silverleaf oak (*Quercus hypoleucoides*) leaves in the inner wall. The structure is held together with spider webs and leaf ribs, and is lined with fine rootlets and plant down, one early observer stating that the female which he observed was quite particular in the rootlets which she chose for the lining of her nest.

Data from the small number of nests that have been found suggest that it is the female which builds the structure, the male often singing nearby as she does so, and it is also she which incubates the eggs, the male feeding her fairly frequently during this stage. The eggs are noticeably darker than those of New World warblers, leading one early observer to suggest that the species could be called, somewhat quaintly, the "Black-egged Warbler". The full clutch generally contains three or four eggs, laid from late May to mid-June in the northern part of the range, but during April farther south, in Durango. There is one record of egg-laying in late February, in Oaxaca. The eggs are ovate or short ovate, the mean dimensions of 28 eggs being 17·1 × 12·8 mm. The incubation period has not been recorded.

Once the eggs hatch, both parents feed the chicks. In the days prior to departure from the nest, the young defecate on the nest rim. This appears to be in contrast to the behaviour of New World warblers, in which the parents, by removing the nestlings' faecal sacs, keep the nest sanitized until the young have left. Among some New World warbler species, older nestlings may defecate over the side of the nest, and it has been suggested that this is the case also with the Olive Warbler and that the rim of the nest is sometimes soiled by accident. Nevertheless, this behaviour is frequently used as one of several factors differentiating the Olive Warbler from the New World warblers. There is apparently no information on the duration of the nestling period in the Olive Warbler. At one nest, the two young were observed to leave the nest just after sunrise.

There are no records of parasitism of Olive Warblers by Brown-headed Cowbirds (*Molothrus ater*), despite the fact that the two species overlap geographically. Olive Warblers typically nest in fairly open but extensive pine forests, areas which are generally shunned by the cowbirds, and there is therefore little, if any, overlap between the two species in habitat. There is, however, a report of a female Olive Warbler which, while caring for her recently fledged young, chased a female Brown-headed Cowbird. This may have been coincidental, or it may indicate that there is at least some recognition of the potential threat posed to Olive Warblers by cowbirds.

Movements

The Olive Warbler is mostly sedentary, but the northern subspecies, *arizonae*, is partly migratory, the northernmost breeders of this race undertaking short-distance movements into northern Mexico in winter. The majority of the Olive Warblers overwintering in the Tepic region of Nayarit, in western Mexico, are apparently of this race. Some northernmost breeders, however, evidently remain on or near the breeding grounds throughout the winter months, but with some evidence of a descent to lower elevations at this time. Migrants typically arrive back on the breeding grounds during early April.

Perhaps predictably, there are few records of vagrancy. Nevertheless, the species has been recorded straying to Texas on at least three occasions, and there are a few records from the Rio Grande area of southern New Mexico.

Relationship with Man

Much of the Olive Warbler's relationship with humans has been based on discussion of its taxonomic position and its relationships with other species, and relatively little interest has been shown in its behaviour, population or status. The history of the Olive Warbler's taxonomic treatment has already been summarized (see Systematics); otherwise, comparatively little is known about this species.

As this is primarily a Middle American species, it is one of the lesser-known North American passerines, despite its striking plumage and superficial resemblance to a *Dendroica* warbler. So far as is evident, it has had little influence on humans, either directly or indirectly, and it is not known to have been kept in captivity.

Status and Conservation

The Olive Warbler is currently not considered to be at any serious risk, although there is very little information on its population densities or possible changes in its total numbers. The highest recorded densities are 5·6 pairs per 10 ha in south-eastern Arizona, while in Mexico densities have been found to range from 0·9 to 4·3 individuals per 10 ha. In Mexico, there is apparently some evidence of decreasing densities in pine–oak woodlands in southern Durango following the selective logging of the largest pine trees in these areas. In one 37-ha plot in southern Durango, it was estimated that five or six pairs were present; these quite large territories were thought to be the result of the micro-habitat, as oak trees comprised 78% of the total number of trees, whereas pines, which Olive Warblers prefer for nesting, accounted for only 12%. The total population of the species has been estimated at some two million individuals, of which fewer than 5% occur in the USA. In Mexico and northern Central America, the species appears to be common to fairly common throughout its range.

Because the total range of the Olive Warbler in the USA is relatively small, it has been suggested that its population in this country could be vulnerable to extensive selective logging and certain catastrophic events. Of the latter, the most significant is perhaps large-scale fires. Both extensive logging and fires have been described as potential threats in New Mexico, although there is no indication that these have had any impact on the Olive Warbler's numbers, either in New Mexico or elsewhere.

With the increasing acceptance of the proposals to place the Olive Warbler in a family of its own, and with continuing research to establish its true taxonomic position (see Systematics), there may now be a greater stimulus to discover more about this little-known species. A great deal more information needs to be compiled about the Olive Warbler's ecology and demographics in order to permit the appropriate steps to be taken to assure its future conservation.



PLATE 50

inches 2
cm 5

PLATE 50

Genus *PEUCEDRAMUS* Henshaw, 1875

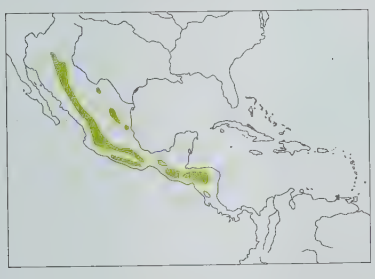
Olive Warbler

Peucedramus taeniatus

French: Fauvine des pins **German**: Trugwaldsänger **Spanish**: Ocotero

Taxonomy. *Sylvia taeniata* du Bus de Gisignies, 1847, Mexico = San Cristóbal, Chiapas.
Species formerly known as *P. olivaceus*, but that name invalid, as preoccupied. Relationships uncertain and much disputed; seems to be an ancient lineage with no close relatives, although has recently been tentatively linked with the accentors (Prunellidae). In the past, genus often placed in New World warbler family (Parulidae), in which considered close to *Dendroica*, and sometimes subsumed in latter; other taxonomists considered it closer to Old World warblers (Sylviidae), on basis mainly of certain internal morphological traits. Recent genetic studies involving DNA–DNA hybridization indicate that placement in a family of its own (considered not particularly closely related to Parulidae) is probably the most appropriate treatment, pending further studies. Geographical variation predominantly clinal, individuals becoming smaller and brighter from N to S. Isolated population in NW Coahuila (N Mexico) presumed to belong with *jaliscensis*, but racial identity uncertain; further study required. Some uncertainty regarding correct type locality (see page 660). Proposed races *georgei*, described from S Mexico (R Molina, in S Oaxaca), and *aurantiacus*, described from SC Guatemala (Chilasco, in Baja Verapaz), are included within nominate. Five subspecies currently recognized.

Subspecies and Distribution.
P. t. arizonae W. deW. Miller & Griscom, 1925 – SW USA (S Arizona and SW New Mexico) and NW Mexico (NE Sonora S to SW Chihuahua).
P. t. jaliscensis W. deW. Miller & Griscom, 1925 – S Chihuahua and C Coahuila S to Jalisco and Colima, also S Nuevo León and W Tamaulipas S to C San Luis Potosí.
P. t. giraudi J. T. Zimmer, 1948 – C Mexico from Jalisco and Michoacán E to WC Veracruz.
P. t. taeniatus (du Bus de Gisignies, 1847) – SC Mexico (Guerrero) S to Guatemala.
P. t. micrus W. deW. Miller & Griscom, 1925 – Honduras, extreme N El Salvador and N Nicaragua.



Descriptive notes. 13 cm; 10·1–12·1 g. Male nominate race has tawny-orange head, throat and breast, sharply demarcated black lores and ear-coverts, faint grey feather fringes on nape (broader and more obvious when plumage fresh); upper mantle golden-olive, rest of upperparts grey; upperwing blackish with olive feather edges, small white patch at base of primaries, broad white wingbars formed by tips of greater and median upperwing-coverts; tail dull blackish-grey with olive feather edges, extensive white in outer two feather pairs; lower underparts whitish, flanks washed pale grey; iris dark; bill and legs blackish. Female has crown, nape and upper mantle yellowish olive-green, brightest in superciliary area, greyish-black lores and ear-coverts; throat pale yellow, breast and side of neck richer yellow, colour extending upwards as half-collar around rear of ear-coverts; rest of plumage like that of male, but slightly less white in tail and at base of primaries. Juvenile has crown, nape and upperparts uniformly dull olive, otherwise resembles dull first-year female; first-year male intermediate between adult male and female, with dull blackish lores and ear-coverts, rich orange-yellow breast and neck side, yellow-olive crown, nape and upper mantle (paler and brighter than adult female), this plumage retained through first spring; first-year female generally duller than adult, with greyish lores and ear-coverts, grey-washed yellowish-olive crown and nape, yellowish supercilium, olive-grey upperparts, whitish throat, pale yellow breast and side of neck, plumage retained through first spring. Races vary mainly in brightness of plumage, generally increasingly bright towards S: *arizonae* is dullest, male head tawny-brown, female with crown to nape pale olive, breast and side of neck primrose-yellow; *jaliscensis* resembles nominate in head colour, but more olive on upperparts, particularly on rump; *giraudi* is like previous, but on average slightly larger; *micrus* is smallest and brightest race, male head bright golden-tawny, female with breast and side of neck richer yellow than nominate, both sexes with more white in wing and tail than other races. Voice. Song a loud 2-note call repeated four or five times, sometimes with slight warble at end, transcribed as "peeta peeta peeta peeta" or "peedo peedo peedo peedo", and somewhat reminiscent of song of Great Tit (*Parus major*). Usual call a short plaintive whistle "kew" or "phew"; hard "pit" note also given occasionally.

Habitat. Open pine (*Pinus*) forest, pine–oak (*Pinus–Quercus*) forest and fir (*Abies*) forest, at 1700–3500 m. Primarily in pine and mixed pine–alder (*Pinus–Alnus*) forests in Valley of Mexico, in both humid and semi-arid pine–oak forests in Oaxaca; preferably in fir (rather than pine) forest in Rincorn Mts, in S USA (Arizona).

Food and Feeding. Feeds on insects and presumably other arthropods. Forages mainly at middle to high levels; occasionally at lower levels, and sometimes visits ground in order to pick up items. Often creeps along pine branches, using its relatively long, slender bill to probe in cracks and crevices in bark, and in clumps of pine needles. Most common technique perch-gleaning; aerial sallies used frequently for capturing prey flushed from foliage; sometimes hover-gleans. During winter months, individuals and small groups often join mixed-species foraging flocks, especially those containing parulid species, such as Hermit Warbler (*Dendroica occidentalis*), Townsend's Warbler (*Dendroica townsendi*) and Crescent-chested Warbler (*Parula superciliosa*), and also Mexican Chickadees (*Poecile sclateri*) and Bridled Titmice (*Baeolophus wollweberi*).

Breeding. Season Apr–Jul, in N later, from about mid-May. Nest a compact cup of mosses, lichens and rootlets, lined with plant down and fine rootlets, placed 10–23 m up at end of conifer branch. Clutch 3–4 eggs. No information on incubation and fledging periods.

Movements. Majority essentially resident, roving with foraging flocks in winter. Some N breeders of race *arizonae* move S into N Mexico in winter, returning to breeding grounds in early Apr; others remain throughout year on N breeding grounds in Arizona and New Mexico. Also an altitudinal migrant in N, some making post-breeding descent to slightly lower elevations. Vagrant to Texas.

Status and Conservation. Not globally threatened. Common to fairly common in most of range. Estimated global population 2,000,000 individuals. Estimates of population densities in S USA (Arizona) and WC Mexico (Durango) in range 0·9–5·6 pairs/10 ha. Some evidence of local decreases in density in pine–oak forests following selective logging of largest pine trees.

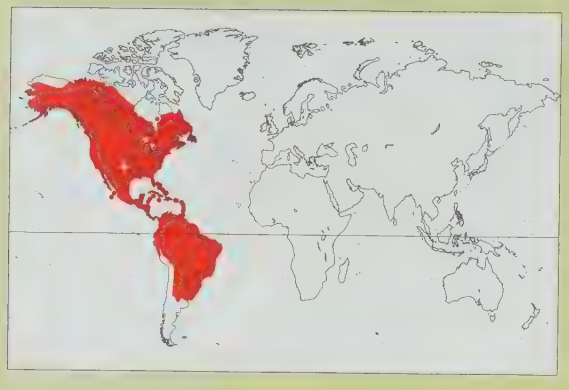
Bibliography. Anon. (2009c, 2009d), Binford (1989), Bock (1994), Brodkorb (1944), Butchart & Stattersfield (2004), Chapman (1907), Curson *et al.* (1994), Dickinson (2003), Dunn & Garrett (1997), Ericson & Johansson (2003), George (1962, 1963, 1968), Groth (1998, 2000), Hubbard (1963), Klicka *et al.* (2000), Lowery & Monroe (1968), Lowther & Nocedal (1997), Marshall (1956, 1957), Miller & Griscom (1925), Nocedal (1984, 1994a, 1994b), Parkes (1985c), Price (1895), Sibley (1996), Sibley & Ahlquist (1990), Sibley & Monroe (1990, 1993), Stotz *et al.* (1996), Webster (1958, 1962), Willard (1910), Yuri & Mindell (2002), Zimmer (1948).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PARULIDAE (NEW WORLD WARBLERS)



- Small to very small passerines, most with short and rather slender bill; tail rather short to medium-long, and often graduated; plumage of many species bright and colourful, tropical species often relatively dull.
- 11–19 cm.



- New World.
- Wide variety of habitats, mostly various types of forest and woodland; also grassland, mesquite and chaparral scrub, saltmarshes and reedbeds.
- 25 genera, 116 species, 323 taxa.
- 14 species threatened; at least one extinct since 1600.

Systematics

The 116 species of New World warbler currently recognized belong to a vast assemblage of "nine-primaried" oscine passerines which also includes the tanagers (Thraupidae), the New World blackbirds (Icteridae), the buntings and New World sparrows (Emberizidae), the cardinals (Cardinalidae), the Plush-capped Finch (*Catamblyrhynchus diadema*) and the Bananaquit (*Coereba flaveola*); these last two species, of uncertain affiliation, are for convenience currently included in Thraupidae. This huge assemblage is, in evolutionary terms, one of the most rapidly radiating groups of birds in the world and it is perhaps not surprising, therefore, that the limits of these families, and their relationships to one another, are often rather unclear and have frequently been subject to differences of opinion among taxonomists.

Over a long period the New World warblers, often referred to as the "wood-warblers", were placed in their own family, which also included the Olive Warbler (*Peucedramus taeniatus*). This was the treatment followed by G. H. Lowery and B. L. Monroe in J. L. Peters's *Check-list of Birds of the World*. Following DNA studies in the early 1980s, the above-mentioned families were merged, as subfamilies, into one huge family, Emberizidae, this treatment being adopted by the American Ornithologists' Union in the sixth edition of its *Check-list of North American Birds*. In 1990, C. G. Sibley and J. E. Ahlquist, in their landmark publication *Phylogeny and Classification of Birds*, based on studies involving DNA–DNA hybridization, created an even larger family by merging the already enormous Emberizidae with the predominantly Old World Fringillidae. Within this vast new family were three subfamilies: Fringillinae, Emberizinae and Peucedraminae. In this new treatment, the New World warblers were accorded the reduced status of a tribe, Parulini, within the subfamily Emberizinae, while the Olive Warbler was elevated to its own monospecific subfamily (Peucedraminae). In the late 1990s, this arrangement was broken down again, and the New World warblers once again gained family status, as Parulidae, with the Olive Warbler too receiving its own family, Peucedramidae. This latest treatment was adopted also by the American Ornithologists' Union in the seventh edition of its *Check-list*.

Even more confusing are the higher taxonomic limits of the New World warblers, this being due mainly to the very close relationship of this family with the tanagers. To a North American observer, the differences between New World warblers and tanagers may seem well defined, but in the tropics the situation is far less clear-cut and several warbler genera currently treated in Parulidae have recently been shown to be genetically closer to the tanagers or, in one case, the cardinals and allies. Prior to 1968, the taxonomy of the New World warblers had been fairly stable, although the affinities of the Olive Warbler had already been questioned by this time. In 1968, however, Lowery and Monroe, in their arrangement for Peters's *Check-list*, disbanded the large Coerebidae family, which had contained, among others, the Neotropical honeycreepers, and placed the conebills (*Conirostrum*) and the Bananaquit with the New World warblers and the other genera with the tanagers. Some 20 years later, in 1989, R. S. Ridgely and G. Tudor, in the first volume of their *Handbook of the Birds of South America*, removed the conebills and the Bananaquit from the New World warblers, placing the former with the tanagers and reinstating the latter in its own, now



New World warbler genera have evolved so rapidly and recently that the placement of species can be uncertain. The genus Parula *contains two undisputed species, the* ***Northern Parula*** *and the Tropical Parula* (Parula pitiayumi). *DNA studies suggest these two species are close to the genus* Dendroica, *and the Northern Parula has hybridized with the Yellow-throated Warbler* (Dendroica dominica). *The two remaining* Parula *species share some plumage traits with the first two, but DNA data place them closer to the genus* Vermivora.

[*Parula americana*, Litchfield County, Connecticut, USA. Photo: Brian E. Small]



*The **Nashville Warbler** shares a white eyering and other features with Virginia's Warbler* (Vermivora virginiae) *and the Colima Warbler* (V. crissalis). *The three are considered to form a superspecies, and it has been proposed that all really belong to the same species, though this view is not generally accepted. Like the Philadelphia Vireo* (Vireo philadelphicus), *the Nashville Warbler was named after a place where it occurs only on migration.*

[*Vermivora ruficapilla ridgwayi*, Riverside County, California, USA. Photo: Brian E. Small]

monotypic family, Coerebidae. They also placed the Pardusco (*Nephelornis oneillei*) of the Peruvian Andes with the tanagers, whereas others had thought this newly discovered species to be more closely related to the parulids. All major subsequent works have followed this treatment.

The relationships of the Olive Warbler have long been a matter of dispute (see page 660). Some earlier ornithologists accepted this species as a parulid, some even proposing merging the genus *Peucedramus* with *Dendroica* on the grounds mainly of plumage similarities. Others, however, were already questioning its placement within the New World warblers, and in 1962 W. G. George suggested that the Olive Warbler was closer to the Old World warblers (Sylviidae), a view based on several traits, including its hyoidean musculature. In 1990, Sibley and Ahlquist placed the Olive Warbler in its own subfamily within their enormously expanded Fringillidae, the DNA–DNA hybridization studies of these authors suggesting that it was the sister-taxon of all the other species in this immense family. Subsequent studies appear to corroborate these findings. With the re-splitting of the vast Fringillidae family, the Olive Warbler was assigned to its own monotypic family, and recent authors have mostly followed this treatment.

Over the years, the placement of several other genera within the family Parulidae has also been questioned. The Wrenthrush (*Zeledonia coronata*) of Central America was formerly placed in its own family, Zeledoniidae, and was thought to be more closely allied to the thrushes (Turdidae), or perhaps the wrens (Troglodytidae), than to the New World warblers. Electrophoretic and skeletal studies in the late 1960s and early 1970s suggested that it is an aberrant parulid, probably most closely related to the genus *Basileuterus*, that has secondarily adapted to a terrestrial lifestyle. A more recent study, however, described below, has once again questioned the relationships of this unusual bird.

Two monotypic genera restricted to Hispaniola, namely *Microligea* and *Xenoligea*, are now generally believed to belong with the tanagers, rather than with the New World warblers. These two species were formerly placed in the same genus, *Microligea*, but J. Bond regarded the White-winged Warbler (*Xenoligea montana*) as being more closely allied to the tanagers than to the New World warblers, and he erected the subgenus *Xenoligea* to emphasize the difference between the two. Lowery and Monroe, in their 1968 treatment of Parulidae for Peters's *Check-list*, accorded full generic rank to *Xenoligea*. At the time, the Green-tailed Warbler (*Microligea palustris*) was thought to be more certainly allied with the New World warblers, and quite closely related to the yellowthroats (*Geothlypis*). The American Ornithologists' Union, in the sixth edition of its Check-list, regarded it as possibly closer to the genus *Dendroica*, while more recent research on the genetics and morphology of *Microligea*, undertaken by M. A. McDonald, suggests that this species, too, is closer to the tanagers. More recently still, work by Webster on the skeletal characters of New World warblers has provided further evidence for regarding these two genera as tanagers. It is worth noting that these two species, formerly considered congeneric, are not segregated by range or exclusively by habitat and also that they differ from each other in such structural features as bill size and tail length.

Similarly, the placement in Parulidae of two other genera, *Icteria* and *Granatellus*, has been frequently questioned. In particular, the monotypic *Icteria*, containing the Yellow-breasted Chat (*Icteria virens*), has over the years been tentatively placed in several different families, including the New World blackbirds, the honeycreepers (formerly Coerebidae) and the vireos (Vireonidae). Sibley and Ahlquist provided genetic evidence for retaining both of these genera in the New World warblers, although Webster's study of skeletal characters suggests that *Granatellus* belongs with the tanagers. Intriguingly, this study indicated also that the highly distinctive Rosy Thrush-tanager (*Rhodinocichla rosea*) is, in fact, a parulid warbler, rather than a tanager, surely one of its more surprising results.

Recent research, described below, appears to conflict with Sibley and Ahlquist's results concerning *Icteria*, and with some of the other above-mentioned studies. In an analytical work published in 2002, I. J. Lovette and E. Bermingham, using mitochondrial and nuclear DNA, carried out a phylogenetic reconstruction of the family Parulidae. The study did not include *Peucedramus*, now generally accepted as belonging in its own family, but, of the 25 genera tested, only 19 were found to form a monophyletic group, sharing a common ancestor. The six genera falling outside the monophyletic grouping were *Icteria*, *Microligea*, *Xenoligea*, *Zeledonia*, *Granatellus* and *Teretistris*. For the first five of these this is not altogether surprising, as their placement within Parulidae had already been questioned. It was, however, the first instance in which the placement in this family of *Teretistris*, containing the Yellow-headed Warbler (*Teretistris fernandinae*) and the Oriente Warbler (*Teretistris fornsi*), both of Cuba, had been doubted. This conclusion was supported by evidence from the DNA sequence; it was discovered that all of the 19 New World warbler genera forming a monophyletic group were missing a codon (three molecules of DNA which code for an amino acid) at



The Blue-winged Warbler (Vermivora cyanoptera) *regularly hybridizes with the Golden-winged Warbler* (V. chrysoptera). *This produces two hybrid types, the commoner of which is known as "**Brewster's Warbler**". Birds with yellowish underparts are mostly first generation hybrids; those with white underparts, like the bird shown here, are thought to be back-crosses between Brewster's and Golden-winged Warblers. Very occasionally, a back-cross results in a hybrid with only the recessive characters of the parent species, known as "Lawrence's Warbler". The males have the bodies of Blue-winged Warblers with the black ear-coverts and throat of the Golden-winged.*

[*Vermivora cyanoptera* x *Vermivora chrysoptera*, Ohio, USA.
Photo: Brian E. Small]

exactly the same place in the DNA sequence. This codon was not missing in the other six genera, and it is apparently present in all other passerine genera. It is perhaps unfortunate that *Rhodinocichla*, the Rosy Thrush-tanager, was not included in this study, bearing in mind the findings of the earlier one, described above, although some workers consider that *Rhodinocichla* is close to *Granatellus*, both genera falling within the tanager family. On this last subject, recent molecular-genetic analyses have suggested that *Granatellus* is closer to the cardinals (Cardinalidae) than it is to either Parulidae or Thraupidae. Research work on the New World warbler relationships continues, and it is unlikely that the last word has been written on the subject.

The fact that New World warblers are evolving so rapidly has resulted in several genera being very closely related, and the placement of certain species in one or another genus often being uncertain. For example, the genus *Parula* contains from two to four species, depending on the preferred treatment of the particular author. The inclusion of two of the species, the Northern Parula (*Parula americana*) and the Tropical Parula (*Parula pitiayumi*), is not disputed. Most recent authors have included also the Flame-throated Warbler (*Parula gutturalis*) and the Crescent-chested Warbler (*Parula superciliosa*) in this genus, but formerly these two species were generally placed in *Vermivora*. The overall plumage pattern of both is closest to that of *Parula*, but the rather long, pointed, unicoloured bill resembles that of a *Vermivora* warbler. Some authors have suggested that the intermediate appearance of these two species warrants the merging of the two genera, and it has also been proposed that *Dendroica* should be incorporated in such a merger. More recently, other taxonomists have pointed out that the genus *Vermivora* as currently constituted is not a monophyletic assemblage, but that it contains two clades, one consisting of the Blue-winged Warbler (*Vermivora cyanoptera*) and the Golden-winged Warbler (*Vermivora chrysoptera*) and also, probably, the presumed extinct Bachman's Warbler (*Vermivora bachmanii*), and the other containing the Tennessee (*Vermivora peregrina*), Orange-crowned (*Vermivora celata*), Nashville (*Vermivora ruficapilla*), Virginia's (*Vermivora virginiae*), Colima (*Vermivora crissalis*) and Lucy's Warblers (*Vermivora luciae*). A third clade, the sister of the latter group, contains the Flame-throated and Crescent-chested Warblers, indicating that these two species are closer to those six *Vermivora* species than they are to other *Parula*. In 2008, G. Sangster suggested that these three clades warranted generic separation, with *Vermivora* reserved for the Golden-winged and Blue-winged Warblers, a new genus, *Leiothlypis*, created for the Tennessee, Orange-crowned, Nashville, Virginia's, Colima and Lucy's Warblers, and *Oreothlypis* resurrected for the Flame-throated and Crescent-chested Warblers.

Within the genus *Basileuterus*, the Riverbank Warbler (*Basileuterus rivularis*) and Buff-rumped Warbler (*Basileuterus fulvicauda*) are often removed to a separate genus, *Phaeothlypis*, on account of their terrestrial nature, their distinctive tail-pumping and tail-swinging behaviour and their lowland range. On the other hand, three other *Basileuterus* species, namely the Flavescent (*Basileuterus flaveolus*), White-striped (*Basileuterus leucophrys*) and White-browed Warblers (*Basileuterus*



Once considered an island population of Adelaide's Warbler (Dendroica adelaidae), *the **St Lucia Warbler** has been shown to have as high a level of genetic differentiation as is found between some continental American species. It is more brightly coloured than Adelaide's Warbler. The Barbuda Warbler* (D. subita), *also recently split, is duller than Adelaide's Warbler, which is now considered to consist only of the populations on Puerto Rico and Vieques. These three species form a superspecies with the much more widely distributed Yellow-throated* (D. dominica) *and Grace's Warblers* (D. graciae).

[*Dendroica delicata*, St Lucia, Windward Islands.
Photo: David Fisher]





As a general rule (with significant exceptions), temperate-breeding New World warblers are sexually dimorphic, males having brighter and bolder plumage coloration than females during the breeding season. The overall plumage pattern is often similar, and in some species the sexes can only be separated when seen together. But in a number of Dendroica *warblers, there are stronger differences. The breeding male* ***Bay-breasted Warbler*** *(above), for example, has a black forecrown and face, a chestnut cap, a large creamy-yellow patch on the side of his neck, and chestnut extending from his throat and upper breast along his flanks. The female (below) is generally much duller, with only a hint or sprinkling of the male's chestnut colouring. Outside breeding, while wintering in Central America and north-west South America, both sexes could be mistaken for a completely different species, with olive green head and upperparts. The male, however, retains some chestnut in the winter, and the female is still noticeably duller.*

[*Dendroica castanea*, Galveston County, Texas, USA. Photos: Brian E. Small]







*The **Yellow Warbler**, with perhaps the widest distribution of any parulid species, has 43 subspecies. These are normally divided into three groups, one temperate-breeding and migratory, the other two tropical and sedentary. The "*aestiva *group" (top) consists of nine North American races which breed in a variety of damp, early-successional habitats, and also overgrown pastures, hedgerows and suburban parks. These races are slightly smaller than those of the other two groups, with more pointed wings, and a bright yellow head and underparts. They winter in Central and South America in a variety of wooded and scrubby habitats, including mangroves, where they may overlap with the other two groups. The males of most of the "*petechia *group" (not shown) of the Caribbean have sharply defined orange-rufous to rufous-chestnut caps. Those of the "*erithachorides *group" (middle and bottom) of Middle America and north-west South America mostly have rufous-chestnut hoods, although in some races, like* aureola *of the Galapagos (centre), only the crown is chestnut. The calls of the* aestiva *group also differ from those of the other two groups. Not surprisingly, some taxonomists have split the Yellow Warbler into two or even three species; the* aestiva *group retaining the current vernacular name, and the* erithachorides *and* petechia *groups respectively renamed "Mangrove Warbler" and "Golden Warbler". However, head patterns typical of Golden Warblers are found in some Mangrove races (as here, centre), and vice-versa.*

[Top: *Dendroica petechia*, Galveston County, Texas, USA. Photo: Brian E. Small.

Centre: *Dendroica petechia aureola*, Galapagos, Ecuador. Photo: Andrew W. Jones.

Bottom: *Dendroica petechia*, Mexico. Photo: Wil Leurs/AGAMI]

When originally described, the ***Black-and-white Warbler*** *was placed in the treecreeper family, Certhiidae. In its adaptations for tree-creeping, such as its shortened tarsus, large foot with long hind claw, and short tail, it shows remarkable similarities to a nuthatch (Sittidae). Like a nuthatch, it can creep down tree trunks, as well as up them. Despite these special characteristics, many taxonomists believe it belongs in the genus* Dendroica, *rather than its own monotypic genus, as at present. The Black-and-white Warbler has been known to hybridize with the Cerulean Warbler* (D. cerulea) *and the Blackburnian Warbler* (D. fusca).

[*Mniotilta varia*, Point Lookout State Park, Maryland, USA. Photo: George M. Jett]

leucoblepharus), also share these attributes to some extent, and they appear to bridge the gap between the Buff-rumped and Riverbank Warblers and the typical *Basileuterus* warblers. Most ornithologists who do not place the Buff-rumped and Riverbank Warblers in a separate genus prefer, instead, to use *Phaeothlypis* as a subgenus incorporating all five of the terrestrial, tail-pumping *Basileuterus* species. While on the subject of *Phaeothlypis*, it has recently been suggested that the Whistling Warbler (*Catharopeza bishopi*), restricted to St Vincent, in the Lesser Antilles, may be most closely related to this group on the basis of similarities in voice, behaviour and morphology. Previous workers had thought it to be closest to *Dendroica*, and some had considered merging it with that genus, suggesting that it may form a superspecies with the three Caribbean endemic *Dendroica* species, namely the Arrow-headed Warbler (*Dendroica pharetra*), the Plumbeous Warbler (*Dendroica plumbea*) and the Elfin Woods Warbler (*Dendroica angelae*).

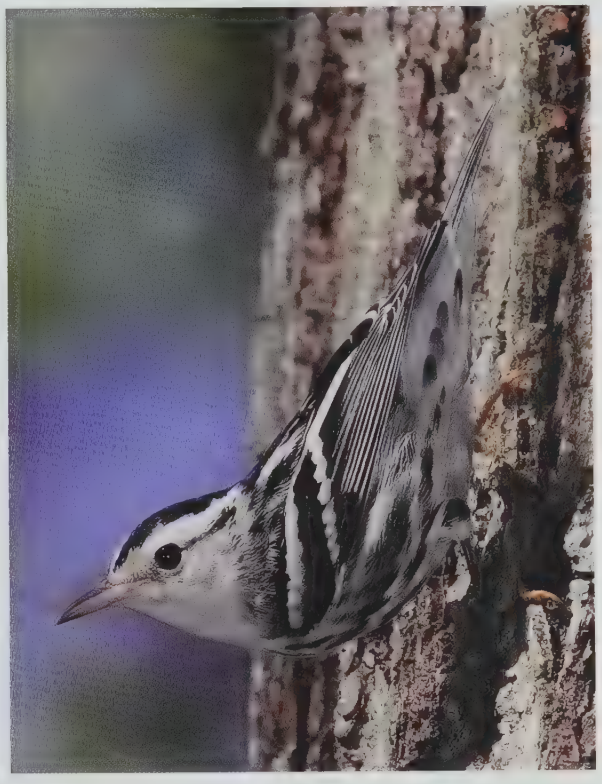
There may be a link also between *Oporornis* and *Geothlypis*. One species in the former genus, the Kentucky Warbler (*Oporornis formosus*), seems not to be particularly closely related to the other three, but it is very similar in plumage and, apparently, genetically to the Olive-crowned Yellowthroat (*Geothlypis semiflava*). In one study it was suggested that these two species might even be sister-taxa, meaning that they share a direct common ancestor. This possibility requires further study but, if found to be accurate, it would suggest that the species allocation in these two genera needs some revision or that, perhaps, the genera should be merged. Recent studies using protein electrophoresis support the idea of a very close relationship between these two genera, whereas a study of skeletal characters did not find an especially close relationship between them. Current opinion, however, tends towards the idea that *Geothlypis* and *Oporornis* form a monophyletic assemblage. Within the genus *Geothlypis* as presently defined, one species, the Grey-crowned Yellowthroat (*Geothlypis poliocephala*), is noticeably different from the others in terms of its morphology, vocalizations and habitat, and is often placed in a monotypic genus, *Chamaethlypis*.

The Black-and-white Warbler (*Mniotilta varia*) is generally placed in the monotypic genus *Mniotilta*, but many taxonomists have suggested that this should be merged with *Dendroica*, to which, despite its morphological adaptations for tree-climbing, it is clearly very closely related. Several recent studies have also indicated that the American Redstart (*Setophaga ruticilla*) is genetically very close to *Dendroica* and that it, too, should be subsumed within that genus. Further, the findings of one recent study were that the Hooded Warbler (*Wilsonia citrina*) is more closely related to the *Dendroica* species than it is to the other two *Wilsonia* species.

Although *Seiurus* currently contains three species, one of these, the Ovenbird (*Seiurus aurocapilla*), differs from its two congeners, the Northern Waterthrush (*Seiurus noveboracensis*) and the Louisiana Waterthrush (*Seiurus motacilla*), in many respects. These include genetics, vocalizations, the shape of the nest, and the juvenile plumage and the length of time over which this plumage is retained. Because of these differences, some ornithologists have suggested that the Ovenbird be placed in its own monotypic genus. Sangster, while agreeing with this proposal, pointed out that Ovenbird is the type species of *Seiurus*, and that this genus should therefore become monotypic, and he created a new genus, *Parkesia*, for the two waterthrush species.

In the past, the monotypic genus *Limnothlypis*, containing Swainson's Warbler (*Limnothlypis swainsonii*), has sometimes been merged with *Helmitheros*, containing the Worm-eating Warbler (*Helmitheros vermivorum*), a treatment based primarily on structural similarities between the two. This treatment, however, has not been followed by more recent taxonomists, and Swainson's Warbler may, in fact, be genetically close to the Blue-winged and Golden-winged Warblers, both in the genus *Vermivora*.

Again as a result of the rapid evolution within the Parulidae, there are several unresolved questions concerning species limits within the family. Very recently, since the current taxonomy was finalized, there have been several suggested splits involving parulids, although only one has so far gained wide acceptance.



In the Caribbean, Adelaide's Warbler (*Dendroica adelaidae*) was previously thought to consist of populations on Puerto Rico and nearby Vieques, as well as on Barbuda and St Lucia. Following molecular-genetic investigation, the populations on these islands have been shown to exhibit a level of genetic differentiation similar to that found among some continental American species. Most authorities now recognize the warblers on Barbuda as a separate species, the Barbuda Warbler (*Dendroica subita*), and those on St Lucia as a third species, the St Lucia Warbler (*Dendroica delicata*). Two tropical *Basileuterus* species, the Two-banded Warbler (*Basileuterus bivittatus*) and the Golden-bellied Warbler (*Basileuterus chrysogaster*), consist each of two widely separated populations, and some ornithologists have recently afforded full species rank to all of these populations, a treatment based largely on differences in vocalizations. Under this treatment, the Two-banded Warbler is limited to the southern Andes, and its northern subspecies *roraimae*, occurring on the tepuis of south Venezuela and adjacent parts of Brazil and Guyana, is elevated to species level as the "Roraiman Warbler"; and the northern race *chlorophrys* of the Golden-bellied Warbler, found in the Colombian and Ecuadorian Andes, is likewise given full species rank and is sometimes referred to as the "Choco Warbler", while the nominate race, restricted to southern Peru, is given the name "Cuzco Warbler".

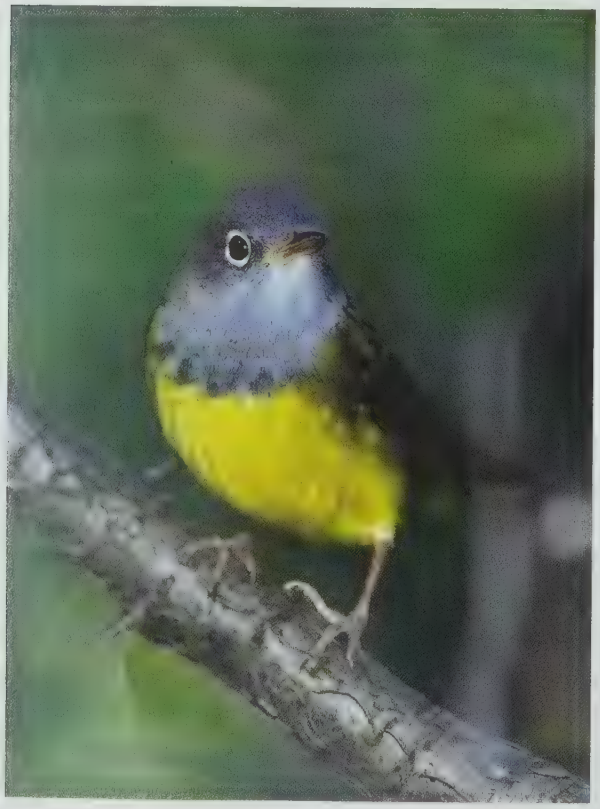
The widely distributed Yellow Warbler (*Dendroica petechia*) consists of as many as 43 subspecies. These are normally divided into three groups, the "*aestiva* group" of North America, wintering in Central and South America, the "*petechia* group" of the Caribbean, and the "*erithachorides* group" of Middle America and north-west South America. The North American populations are distinct from the other two in being migratory and in being quite catholic in their habitat choice. The other two are, in contrast, sedentary and largely restricted to mangroves, although the "*petechia* group" does utilize low scrub and humid forest on some Caribbean islands. The latter occurs in the Caribbean and locally on the Venezuelan coast, and the "*erithachorides* group" is found along the coasts of Mexico, Central America and northern South America, and in the Galapagos Islands. These two groups are often collectively regarded as representing a distinct species, separate from the northern "Yellow" group, on account of their sedentary nature and their restricted coastal habitat preferences. Moreover, the "*erithachorides* group" and the "*petechia* group", have sometimes been split from each other as, respectively, the



As a result of its secretive behaviour in its dense cane-brake habitat, ***Swainson's Warbler*** *is often described as one of North America's least known warblers. It has an unusually long, stout and deep-based bill. The pale yellowish wash visible on the white underparts of this bird is a feature of fresh autumn plumage, and gradually disappears as feathers become worn. Adult birds are noticeably whiter underneath by late spring and summer. Unlike most New World warblers breeding in temperate areas, Swainson's Warbler is not sexually dimorphic.*

[*Limnothlypis swainsonii*, Washington County, Texas, USA. Photo: Brian E. Small]

"Mangrove Warbler" and the "Golden Warbler". The races of the "Mangrove" subspecies on the coast of north-west Venezuela, however, approach the adjoining subspecies of the "Golden Warbler" in head pattern. Furthermore, in both these groups there are anomalies in head pattern, the males of one or more subspecies showing a head pattern similar to that found in the other group. Throughout much of their respective ranges, the "Golden Warbler" has a chestnut cap and the "Mangrove Warbler" has a rufous hood, but on the Caribbean island of Martinique the local race of the former has a rufous hood, thus resembling a typical "Mangrove Warbler", while the races of the latter on the Pacific coast of South America and in the Galapagos Islands have a head pattern similar to that of typical "Golden Warblers". These anomalies do not occur near any potential zone of contact and are generally believed to be the result of independent evolution of a "Mangrove" head pattern within the "Golden" complex and *vice versa*. On the other hand, a recent DNA study has found that the chestnut-headed "Golden Warblers" of Martinique are genetically more similar to "Mangrove Warblers" than they are to the "Golden Warblers" which surround them geographically, a situation which has led several recent authors to place the Martinique birds within the "Mangrove" group. The isolated Galapagos populations are genetically distinct from both Latin American and North American populations, with a mean DNA-sequence divergence of 3·7% from the former and 6·7% from the latter. The northern races of the "Golden Warbler", from the Bahamas and the Florida Keys south to Jamaica and Cuba, tend towards typical Yellow Warblers of North America in their head pattern, but they still differ from them in their sedentary behaviour and generally more specialized habitat.



At 15 cm, the ***Connecticut Warbler*** *is the largest of the four* Oporornis *warblers. One individual which had been putting on fat prior to migration weighed in at 26·8 g, making it one of the heaviest New World warblers recorded, second only to the much larger Yellow-breasted Chat* (Icteria virens). *The Connecticut Warbler also differs from its congeners in its mode of terrestrial locomotion: it walks rather than hops, and has appropriately long, strong legs.*

[*Oporornis agilis*, Chicago, Illinois, USA. Photo: Rob Curtis/ The Early Birder]

The Yellow-rumped Warbler (*Dendroica coronata*) was formerly considered to constitute two species, the nominate race and *hooveri* being known as the "Myrtle Warbler" and the remaining three subspecies treated together as "Audubon's Warbler". Some ornithologists still regard these two groups as valid species, a view based on the fact that the hybridization zone between them is fairly narrow, which indicates that hybrids may be genetically less fit and therefore selected against. The two Middle American races, *nigrifrons* and *goldmani*, are sedentary, and their ranges are isolated from the breeding ranges of the more northern races. Recent analyses have suggested that these two sedentary taxa separated from the migratory northern subspecies in the early Pleistocene, and that they have diverged from the migratory races and from each other to the extent that they probably now represent separate species; they have been named as the Black-faced and Goldman's Warblers respectively.

Four species of yellowthroat are very closely related to one another, forming a superspecies and formerly regarded by some ornithologists as being conspecific. These are the Common (*Geothlypis trichas*), Belding's (*Geothlypis beldingi*), Altamira



Apart from its black facial mask, the ***Olive-crowned Yellowthroat*** *has little in its appearance to relate it to the rest of its genus,* Geothlypis. *It has been found to be closer genetically to the Kentucky Warbler* (Oporornis formosus), *which similarly seems not closely related to the other three members of its genus. The two are similar in plumage, and may form a link between the two genera; indeed, some taxonomists already merge* Oporornis *into* Geothlypis. *The Olive-crowned Yellowthroat is sedentary, with two geographically disjunct populations which may actually be better treated as full species than as subspecies.*

[*Geothlypis semiflava semiflava*, Ecuador. Photo: Glenn Bartley]

(*Geothlypis flavovelata*) and Bahama Yellowthroats (*Geothlypis rostrata*). Studies have shown that all four are very similar genetically, although the Altimira Yellowthroat seems genetically to be slightly more distinct than the other three. Conversely, the various forms of the Masked Yellowthroat (*Geothlypis aequinoctialis*) have been regarded as three or four different species, with *chiriquensis*, *aequinoctialis*, *velata*, and the pair *auricularis* and *peruviana* all being genetically distinct and having widely discrete ranges; they differ from each other also in size and in head pattern. Some researchers also suggest the splitting of *peruviana* from *auricularis* on account of vocal differences between the two, but it has been pointed out that the song of the Common Yellowthroat varies across its range and that vocal differences among yellowthroats should, therefore, be used with some caution when seeking evidence for the splitting of species. Of the remaining species in the genus *Geothlypis*, the Grey-crowned Yellowthroat differs from the others in several morphological traits, most obviously the strong bill with a curved culmen and the relatively long graduated tail. In addition, it has a distinct song and at least one distinct call, and because of this it is often placed in its own genus, *Chamaethlypis*. Such treatment has been disputed, however, on the basis that the Masked and Olive-crowned Yellowthroats approach the Grey-crowned Yellowthroat in these characters.

Species limits are rather complicated also in the genus *Myioborus*, containing the tropical whitestarts. The Painted Whitestart (*Myioborus pictus*) is the basal taxon in the genus and the sister-taxon of the eleven other species. The Slate-throated Whitestart (*Myioborus miniatus*) overlaps in range with most of the other species in the genus, but it occurs at lower elevations than, and is thought to be the sister-taxon of, the other "highland" species of southern Central America and South America.

The Golden-fronted (*Myioborus ornatus*) and Spectacled Whitestarts (*Myioborus melanocephalus*) form a superspecies, which may include the White-fronted Whitestart (*Myioborus albifrons*), too. The Golden-fronted Whitestart is essentially confined to the Colombian Andes, occurring in two races, while the Spectacled Whitestart occurs in five races, occupying the Andes from extreme south-western Colombia south to central Bolivia. Birds described as a "variant" of the northern race *ruficoronatus* of the Spectacled Whitestart are found in north-western Ecuador and south-western Colombia. They have a head pattern intermediate between that of *ruficoronatus* and that of the subspecies *chrysops* of the Golden-fronted Whitestart, though varying in the amount of yellow in the crown, and the tail pattern is very close to that of the latter species. The northern two races of the Spectacled Whitestart, *ruficoronatus* and *griseonuchus*, were formerly considered to represent a separate species, and some ornithologists still advocate this view. The rufous-crowned *griseonuchus* and the adjoining, black-crowned *malaris*, however, share a black head which extends onto the submoustachial area, and *griseonuchus* also has less rufous in the crown than the more northerly *ruficoronatus*. This provides a link between the two forms and suggests gene flow between all adjoining races. The two subspecies of the Golden-fronted Whitestart, the nominate race and *chrysops*, have discrete geographical ranges with no known area of contact, which means that the nominate, eastern race is isolated from the more westerly complex containing *chrysops* and the Spectacled Whitestart. Golden-fronted and Spectacled Whitestarts are not known to occur sympatrically. They do, however, occur in very close proximity to each other in south-western Colombia and north-western Ecuador, and it is in this region that the several apparently intermediate specimens described above have been taken and where several intermediate individuals have been seen in recent years. These suggest some degree of intergradation between the two species or, possibly, an undescribed subspecies of one or the other species. This could be viewed as evidence for combining the two into a single species, further support for which comes from a recent study of the molecular phylogenetics of the genus by J. L. Pérez-Emán, which indicates that the race *ruficoronatus* of the Spectacled Whitestart is, in fact, closer to the Golden-fronted Whitestart than it is to the other races of the Spectacled Whitestart.

The White-fronted Whitestart is confined to the Andes of western Venezuela. It forms a monophyletic clade with the Spectacled and Golden-fronted Whitestarts, and may be part of the same superspecies. Although its distributional range almost adjoins that of the subspecies *chrysops* of the Golden-fronted Whitestart, the two are separated by the Táchira Valley and are not known to come into contact with each other.

The other monophyletic clade in *Myioborus* involves the Tepui Whitestart (*Myioborus castaneocapilla*), the White-faced

Whitestart (*Myioborus albifacies*) and the Guaiquinima Whitestart (*Myioborus cardonai*), and probably also the Yellow-faced Whitestart (*Myioborus pariae*). It has been suggested that the Guaiquinima and White-faced Whitestarts might be better treated as a single species, as they are effectively identical in plumage apart from the white face of the latter. Pérez-Emán's study, however, suggested that the Guaiquinima Whitestart is in reality closer to the Tepui Whitestart (race *maguirei*) than it is to the White-faced Whitestart, and that all three are best maintained as separate species.

The Tepui Whitestart and the Brown-capped Whitestart (*Myioborus brunniceps*) are very similar in plumage and were until recently considered conspecific. Their geographical ranges are, however, widely separated, the Brown-capped occurring in the southern Andes and the Tepui Whitestart in the tepuis of Venezuela and adjacent parts of Brazil and Guyana, and they also have quite different songs. The study by Pérez-Emán found that the two are not particularly close within the genus, and that the near similarity in plumage may be due to retention of ancestral plumage traits, rather than reflecting a close relationship. The Brown-capped Whitestart and the Yellow-crowned (*Myioborus flavivertex*) and Collared Whitestarts (*Myioborus torquatus*) appear not to fit into either of the major "highland" clades within the genus, and their relationships within the "highland" *Myioborus* group are still unclear.

In the large genus *Basileuterus*, the Rufous-capped Warbler (*Basileuterus rufifrons*) occurs in two groups, the northern "white-bellied" and the southern "yellow-bellied". The southern group of three races is sometimes considered to constitute a separate species, the "Chestnut-capped Warbler", but there is widespread interbreeding between the two groups in Guatemala, El Salvador and Honduras. In addition, the northern subspecies *salvini* approaches the southern *delattrii* in underpart colour and other characters, and thus appears to form a link between the two groups.

Another member of this genus, the Golden-crowned Warbler (*Basileuterus culicivorus*), consists of 13 subspecies. These fall into three main groups, which are quite distinct in plumage and have rather different songs, and are sometimes regarded as three separate species forming a superspecies. They are the "*culicivorus* group" of Middle America, sometimes known as the "Stripe-crowned Warbler", the "*cabanisi* group" of northern Colombia and north-western Venezuela, often referred to as "Cabanis's Warbler", and the "*auricapillus* group" of north-eastern and southern Venezuela and central-eastern South America, the Golden-crowned Warbler (*sensu stricto*). The Three-banded Warbler (*Basileuterus trifasciatus*) of south-west Ecuador and north-west Peru used to be regarded as conspecific with the Golden-crowned Warbler and could be part of this same superspecies; all recent taxonomists have awarded it full species status. Similarly, the White-bellied Warbler (*Basileuterus hypoleucus*) of south Brazil and north-east Paraguay is sometimes included in this superspecies.

Hitherto, very few fossils of this family have been identified with certainty. Fossilized bones from at least three individual Common Yellowthroats are known from Florida, in deposits from the Rancholabrean period of the Pleistocene, and fossil bones of the Prothonotary Warbler (*Protonotaria citrea*) have been identified in Abaco Island Cave, in the Bahamas, from the Holocene. A single specimen, thought to be of a Black-and-white Warbler, has been identified from the same period in Texas, there is a record of a fossil of a waterthrush from a cave in Virginia, and a specimen, possibly of a Yellow-breasted Chat, from Tertiary deposits in Florida. Consequently, since a fossil record is virtually lacking, an assessment of the evolutionary history of the Parulidae has to be based on genetics, biogeography and educated guesswork. The most likely area of origin for the family is the North American tropics, as this is where the highest diversity of New World warblers occurs, in terms both of number of genera and number of species, at least in the non-breeding season. Today, the North American tropics are restricted to Middle America, from southern Mexico south to Panama, but nine million years ago, during the Miocene, the continent of North America was separated from South America and its landmass extended south to what is now Nicaragua. Tropical conditions were far more widespread during that epoch, for long periods of time extending north to what is now the extreme south of Canada.

It has been suggested that the evolution of the New World warblers began during the Miocene in this large tropical zone. This would account for the concentration of the sedentary genera in the present-day tropics of North America, and also for the migratory patterns of the North American breeding species, the bulk



*The **Green-tailed Warbler** and the White-winged Warbler* (Xenoligea montana) *are both confined to the island of Hispaniola, and each is the sole representative of its genus. Both are olive-green above and off-white below, with a greyish head. Until recently, the Green-tailed Warbler was thought to be close to the yellowthroats* (Geothlypis), *or the genus* Dendroica. *Research on genetics, morphology and skeletal characteristics now suggests that, along with the White-winged Warbler, it really belongs with the tanagers (Thraupidae) rather than the New World warblers.*

[*Microligea palustris palustris*,
Sierra de Bahoruco
National Park,
near Puerto Escondido,
Dominican Republic.
Photo: Doug Wechsler/
VIREO]



Like Hispaniola, Cuba has two endemic species that are traditionally placed in Parulidae, but that are increasingly being considered alien to it. The ***Yellow-headed Warbler*** *and the Oriente Warbler* (Teretistris fornsi) *form a closely related species pair. In the Oriente Warbler, the same basic colours of the Yellow-headed Warbler are differently distributed, its crown, nape and upperparts being grey, and its face, throat and underparts yellow. Both are found in all types of forest, from the lowlands to the mountains. The Yellow-headed occupies the west of Cuba, while the Oriente Warbler replaces it in the east.*

[*Teretistris fernandinae*, Bermejas, Cienaga de Zapata, Cuba. Photo: Eladio Fernández]

of which winter in Mexico and Central America, with the numbers of individuals and species decreasing through southern Central America and into South America. *Basileuterus* and *Myioborus* are primarily South American in distribution, and this suggests that these two genera reached South America at an early stage in the family's evolutionary history, almost certainly before the Panama gap closed, an event which took place about three million years ago. Most speciation within these genera occurred in South America while it was geographically isolated, with some species of each genus spreading north after the subsequent closing of the Panama gap; this would account for the limited number of species of these two genera present in Middle America today.

The evolution of most of the genera in the family Parulidae is thought to have taken place in the Pliocene, the *Myioborus* group splitting from its sister New World warbler clade in the late Miocene or early Pliocene. In tropical North America, this would have occurred when warblers spread north during warm interglacials and retreated back south, into what is now Middle America, during the colder glacial periods. At the end of each glacial period, species would reinvade the northern areas, different populations reaching different areas, perhaps separated by newly formed geological features. Each population would thus evolve in isolation, gradually producing the different genera which are evident today. It seems likely that the migratory tendencies of most of the North American breeding species also evolved at this time, different populations moving north as the ice retreated at the end of each glacial period and breeding in isolation, but being forced south again by the colder winters. The first invasion of the Caribbean islands, producing the five endemic genera of this region, may have happened at about the same time.

This evolution was probably quite rapid, and the genera are still closely related, as evidenced by the fact that vestigial characters of one genus are often found in others. As an example, the white tail spots typical of the genus *Dendroica* are present too on some of the *Vermivora* and, very occasionally, in *Seiurus*. The relative frequency of intergeneric hybrids may also be evidence of the close relationship among the North American genera. This phenomenon is discussed in greater detail later (see Breeding).

Speciation within the parulid genera occurred in later glaciations, the event producing the superspecies, such as that containing the Golden-cheeked (*Dendroica chrysoparia*), Black-throated Green (*Dendroica virens*), Townsend's (*Dendroica townsendi*) and Hermit Warblers (*Dendroica occidentalis*) in North America, taking place during the most recent glaciations. For example, it is thought that the Louisiana Waterthrush may have evolved from Northern Waterthrush stock during an interglacial period of the Pleistocene when populations of the latter were isolated in the southern Appalachians. As already noted, it is believed that ancestral New World warblers of the *Myioborus* and *Basileuterus* stock reached South America before the closing of the Panama gap occurred about three million years ago. This period corresponded with both a cooling of the climate and major geological activity, which formed many of the South American mountain ranges. As a consequence, ancestral members of these genera could have quickly become isolated from one another, thereby giving rise to a period of rapid speciation to produce the variety of species living in South America today.

Considerable confusion has been caused by Linnaeus's binomial "*Certhia pinus*". Regrettably, he established this name on the basis of two illustrations that depict different species, namely the Blue-winged Warbler and the Pine Warbler (*Dendroica pinus*). A single act of naming a single taxon can not be extended to apply the same name to two different taxa, and the First Reviser of this case, A. Wilson, selected the Pine Warbler as the correct recipient of this name. Treating both forms in the genus *Sylvia*, he coined the name "*Sylvia solitaria*" for the Blue-winged. However, this specific name was already preoccupied, and very recently the new species name *cyanoptera* was introduced for the Blue-winged Warbler. In the meantime, the scientific naming of the Pine Warbler has commonly been attributed to Wilson, but it seems clear that he was not attempting to introduce a new name, but rather applying the already existing Linnaean name to this species within his arrangement of the genus *Sylvia*.

Morphological Aspects

New World warblers are mostly small to very small passerines. With one exception, they range in length from 11 cm to 15 cm and in weight from 5 g to about 17·5 g, although Blackpoll War-



*A minority of female **Hooded Warblers** can resemble the male (shown here) in coloration, though they are always duller. When wintering, the sexes show different habitat preferences, males usually being found in closed-canopy forest, while females are commoner in more open vegetation, including secondary-growth forest. Interestingly, a survey in the Yucatán Peninsula, Mexico, found that females with the most male-like plumage tended to locate their territories in the kind of habitat favoured by males.*

[*Wilsonia citrina*, High Island, Texas, USA. Photo: Charles W. Melton]

blers (*Dendroica striata*) putting on fat prior to their long-haul flight over the western Atlantic have weighed in at 20·9 g and Connecticut Warblers (*Oporornis agilis*) in the same condition at up to 26·8 g. The single exception to this general picture is that of the Yellow-breasted Chat, which is considerably larger than others in the family, being 19 cm long and weighing from 20 g to nearly 34 g. As a general rule, the parulids have the shape typical of a small insectivorous passerine, with a fairly slender bill and with a tail varying from rather short to medium-long and often graduated. Many of those possessing a relatively long tail, such as the *Granatellus* chats, the Whistling Warbler and northern races of the Rufous-capped Warbler, often hold the tail cocked upwards. All members of the family have nine primaries, belonging, as they do, to the very large New World group of "nine-primaried" oscine passerines (see Systematics). They are, in many ways, the New World equivalent of the Old World sylviid warblers and are mostly quite similar to them in overall shape, although the two families are not closely related. Some New World warblers have diverged from this basic shape and bear a closer superficial resemblance to other avian families, such as the thrushes, the Old World flycatchers (Muscicapidae) and even the nuthatches (Sittidae). There is now some genetic evidence to suggest that some New World warblers with unusual morphological features may be better placed in the family Thraupidae (see Systematics).



The majority of parulid species have a fairly short, slender bill adapted for gleaning insects and other small invertebrates from leaves and other vegetation. Nevertheless, there are subtle variations on this basic standard. The bills of the Blue-winged and Golden-winged Warblers are rather longer and more pointed than those of most others in the genus *Vermivora*, and this is thought to be an adaptation to these species' specialized foraging behaviour of probing in clumps of dead leaves for the insects within them, often hanging upside-down in tit or chickadee (Paridae) fashion to do so. Among the other *Vermivora*, the Tennessee Warbler often hangs upside-down in order to glean from the underside of leaves, and its bill shape approaches that of the Blue and Golden-winged Warblers. Others in this genus feed mainly by perch-gleaning, and also by flycatching and hover-gleaning. The Flame-throated Warbler has a similarly shaped bill to those of the Blue-winged and Golden-winged Warblers, and it employs a similar method of foraging, whereas others in the genus *Parula* feed more by gleaning invertebrates from leaves and twigs.

Within Parulidae, the American Redstart is the most habitual exponent of aerial flycatching, and it shows convergence with the muscicapid flycatchers and tyrant-flycatchers (Tyrannidae) in several morphological characteristics. Indeed, it was placed in the Old World flycatcher family when it was first described. Its flattened bill with elongated rictal bristles, its rather weak legs and its relatively large wing-and-tail surface area are all specific adaptations to flycatching, and it shows considerable divergence

*The spectacular colouring of the **Red Warbler** and its close congener, the Pink-headed Warbler* (Ergaticus versicolor)*, is otherwise unparallelled among the Parulidae. The two have sometimes been considered to belong to the same species, although there is no increase in similarity between them where they approach one another's ranges. The Red-faced Warbler* (Cardellina rubrifrons)*, which has a mostly red head and is also found in Mexico, has sometimes been proposed as a third member of the genus* Ergaticus. *Intriguingly, the Red Warbler has been found to have toxic alkaloids in its feathers, and the bright coloration may serve as a warning to predators.*

[*Ergaticus ruber*, Oaxaca, Mexico. Photo: Manuel Grosselet]



Species limits are particularly complicated in the tropical whitestarts. A recent study of molecular phylogenetics indicates that the race ruficoronatus *of the* ***Spectacled Whitestart*** *may be closer to the Golden-fronted Whitestart* (Myioborus ornatus) *than it is to the other four Spectacled Whitestart subspecies. This and the other rufous-capped race of the Spectacled Warbler,* griseonuchus, *were formerly considered to form a separate species, but* griseonuchus, *with the extended pattern of black on its face, is now seen as the link with the black-capped races to the south.*

[*Myioborus melanocephalus ruficoronatus*, Ecuador. Photo: Glenn Bartley]

from the *Dendroica* warblers, its closest relatives, in these respects. Its convergence with tyrannid flycatchers is such that, on the breeding grounds, it competes with the Least Flycatcher (*Empidonax minimus*) for the same species of flying insect (see Food and Feeding).

Similarly, the predominantly tropical whitestarts of the genus *Myioborus* forage largely by flycatching, although not so persistently as the American Redstart, and they show, albeit not to the same extent, some of the same flycatching adaptations, such as a flattened bill and weak legs. They also droop their wings and spread the tail to flush their invertebrate prey. The tails of whitestarts have conspicuous white outer feathers, a fact which probably assists in this process, but only one species, the Painted Whitestart, has striking pale wing patches, the wings of its congeners being unmarked. This similarity in morphology and foraging behaviour led to the Painted Whitestart originally being placed in the genus *Setophaga*, along with the American Redstart, but it is now included in *Myioborus*. These two genera are not closely related, and the similarities between them are due to ecological convergence. This also explains why the species in *Myioborus* are still frequently referred to as "redstarts", even though they have white, not red, in the tail; the "start" part of the name is derived from *steort*, an old Anglo-Saxon word for tail.

Another species that has diverged quite considerably from its closest relatives, again *Dendroica*, is the Black-and-white Warbler. This species, which forages by creeping along, up and down the trunks and larger limbs of trees in the manner of a nuthatch, shows remarkable morphological convergence with nuthatches in terms of its strong legs with shortened tarsus, large feet and relatively long hind claw, and its relatively short tail. Its bill, although quite long and strong, is also rather slender, with a slightly decurved culmen; in this respect it perhaps bears a closer morphological resemblance to the treecreepers (Certhiidae), another tree-climbing, bark-probing family, than it does to the nuthatches. When originally described, this species was placed in the treecreeper family. Although the Black-and-white Warbler is unique in the extent of its adaptations, the Yellow-throated Warbler (*Dendroica dominica*) also feeds largely by creeping along, but not up and down, the larger limbs of trees and shows some similar adaptations to those of the Black-and-white Warbler, such as a long, slender bill. Its legs and general proportions, however, are more typical of the *Dendroica* genus, to which it belongs.

Within the same genus, subtle differences in bill shape may allow two species to live side by side by exploiting different feeding niches. The nominate race of the Yellow-throated Warbler generally breeds in deciduous forest, but some populations breed in loblolly pines (*Pinus taeda*), where they co-exist with Pine Warblers. These pine-inhabiting Yellow-throated Warblers have the bill about 10% longer than that of populations of the same species breeding in deciduous forests, and also notably longer and more slender than the bill of the sympatric Pine Warbler. Careful observation has shown that these Yellow-throated Warblers appear to co-exist with Pine Warblers by specializing in probing old, opened pine cones for insects concealed within them in cold weather, switching to flycatching and gleaning in warmer weather, when insects are flying. The Pine Warblers forage mainly by gleaning, whatever the weather conditions. It has been postulated that Yellow-throated Warblers are quite recent invaders of these pine forests, where Pine Warblers are both more numerous and dominant in aggressive encounters with them, and the increased bill length is a result of rapid evolutionary change in this new habitat. This enhanced bill length allows the Yellow-throated Warblers to co-exist with the dominant Pine Warblers by exploiting a different niche, thereby helping them to avoid aggressive encounters. It has been shown that the bills of Pine Warblers are too short and broad to penetrate opened pine cones, with the result that this species is unable to utilize this food source. In the Florida Panhandle, the race *stoddardi* of the Yellow-throated Warbler also inhabits pine forests and co-exists with the Pine Warbler; it is perhaps noteworthy, therefore, that the main distinguishing characteristic of this subspecies is its long, slender bill.

The genus *Seiurus* is characterized by long, strong legs, a walking gait, and brown or olive upperparts contrasting with boldly dark-streaked pale underparts. In such respects, these ground-dwelling birds bear a superficial resemblance to small thrushes more than to other New World warblers. The common name of "waterthrush" that is given to two of the three *Seiurus* species, the Northern and Louisiana Waterthrushes, is testimony to this. The Connecticut Warbler is another terrestrial, walking New World warbler with similarly long, strong legs. Its three congeners, however, all hop, rather than walk, although it is notable that the

legs of the predominantly terrestrial Kentucky Warbler are on average longer than those of the Mourning (*Oporornis philadelphia*) and MacGillivray's Warblers (*Oporornis tolmiei*), which spend more time in low vegetation than on the ground itself.

Five of the 24 species in *Basileuterus* are largely or entirely terrestrial. These form the subgenus *Phaeothlypis* (see Systematics), but none of the species regularly walks, although a walking gait has been recorded for two of them, the White-striped and Buff-rumped Warblers, and their legs are not significantly longer than those of other, similar-sized species in this genus that occur mainly low in the understorey. The aberrant Wrenthrush of Central America is very short-winged and short-tailed, and is only a very weak flier. It somewhat resembles a *Grallaricula* antpitta of tropical America and is totally unlike any other New World warbler, its general appearance and almost flightless behaviour being adaptations to its dense bamboo-thicket habitat.

Basic plumage patterns vary widely among the genera, but less so within them. A general rule could be that temperate-breeding New World warblers, or at least the males thereof, are bright birds with bold and distinctive colour schemes, whereas the tropical species are relatively dull. There are, however, several notable exceptions to this generalization.

Vermivora species are characterized mostly by their plain olive, grey or brownish upperparts and pale underparts, lacking any wingbars or tail spots. Many have an inconspicuous rufous or orange crown patch. Blue-winged and Golden-winged Warblers, however, are striking exceptions, both having bright and distinctive head and wing patterns and exhibiting the strongest sexual dimorphism in the genus. The two typical *Parula* species, the Northern and Tropical Parulas, have a striking pattern of blue-grey upperparts with a greenish mantle, white wingbars and orange-yellow underparts, becoming white on the lower belly. The two species linking these with *Vermivora* and currently treated within the genus *Parula*, the Flame-throated and Crescent-chested Warblers, share some, but not all, of these traits; the Crescent-chested resembles a typical *Parula* but with a white supercilium and no wingbars, whereas the Flame-throated is plain above and has a fiery orange throat and a black, rather than greenish, mantle patch.

The genus *Dendroica* is perhaps best typified by the presence of white wingbars and tail spots, and a bright male breeding plumage, held throughout the year by many species, with bright patches of yellow or orange, combined with black and/or white, on the head and breast. Again, there are exceptions to the general picture, the most obvious example being provided by the Yellow Warbler, which is basically yellow and comparatively plain, although males in breeding plumage are very bright. Some members of this genus have relatively inconspicuous wingbars, while on others these bars combine to form a white patch in the wing, but the only species lacking them altogether is the Black-throated Blue Warbler (*Dendroica caerulescens*), which has, instead, a white patch at the base of the primaries.

Four monotypic genera, *Catharopeza*, *Mniotilta*, *Setophaga* and *Protonotaria*, all have very distinct and boldly patterned plumages and have been considered to be closely related to *Dendroica*. The genus *Seiurus* consists of three largely terrestrial species with plain brownish upperparts and whitish underparts, the latter spotted or streaked darker. The *Oporornis* and *Geothlypis* species have plain olive-green upperparts, yellow or yellowish underparts, and pinkish legs. Male *Geothlypis* have a distinctive black facial mask, albeit much reduced on the Grey-crowned Yellowthroat, and this feature is shared to some extent with the Kentucky Warbler in *Oporornis*, the other species of which have a greyish or brownish hood.

The three *Wilsonia* warblers have plain green or grey upperparts, yellow underparts and a black-and-yellow head pattern, one of them, the Hooded Warbler, having conspicuous white in the outer tail. In a genus of its own, the Red-faced Warbler (*Cardellina rubrifrons*) is considered to be closely related to *Wilsonia* but is strikingly different in plumage, being grey above and whitish below, with a single whitish wingbar and a striking red-and-black head pattern. The two *Ergaticus* species are mostly red or dark pinkish, a unique coloration among the Parulidae. In Middle America, the Neotropical Fan-tailed Warbler (*Euthlypis lachrymosa*), also in a monotypic genus, has grey upperparts, a yellow crown patch and yellow underparts, and a long, white-tipped tail. It is similar in general pattern to the Yellow-breasted Chat, though notably smaller.



*The tail feathers of the **Neotropical Fan-tailed Warbler** are sharply graduated, the central pair being longest. The tail is carried half-open, and pumped up and down or from side to side, these movements being made more conspicuous by the white tips to the feathers. Although many New World warblers wag their tails, this behaviour is most typical of ground-dwelling species such as this one. Some* Basileuterus *species, such as the Buff-rumped Warbler* (B. fulvicauda), *also forage on the ground and wag their tails. The Neotropical Fan-tailed Warbler is considered closest to this genus, and is sometimes subsumed into it.*

[*Euthlypis lachrymosa*, Peso Island, San Blas, Mexico.
Photo: Jim Zipp/ ardea.com]

Basileuterus warblers are typically plain olive above, lacking wingbars and tail markings, and have varying tones of yellowish below, and often sport a striking head pattern involving orange or yellowish crownstripes. The *Phaeothlypis* subgenus (see Systematics) generally lacks yellow in the underparts, and one species, the Buff-rumped Warbler, has a striking bicoloured tail pattern. In the monotypic genus *Zeledonia*, the Wrenthrush is probably the most aberrant New World warbler in its morphology, but it does share some plumage characters, including olive upperparts and an orange crownstripe, with *Basileuterus* and is often considered closest to that genus. *Icteria*, the Yellow-breasted Chat, is almost equally aberrant, but in plumage it does resemble both *Geothlypis* and *Euthlypis*, having a yellow breast and white belly like those of the former and grey upperparts and a long tail similar to the latter's, although its tail lacks the white tip shown by *Euthlypis*.

The *Granatellus* chats are very striking in their plumage and, unusually for tropical New World warblers, are both brightly coloured and sexually dimorphic. Males display a gaudy combination of black, red, grey and white, and females are grey above and have a buffy supercilium and underparts.

The endemic Caribbean genera vary widely in plumage. On Cuba, the two *Teretistris* species have plumages essentially in different patterns of grey and yellow, with whitish lower underparts; the Oriente Warbler is grey above and yellow below, while the Yellow-headed Warbler has grey upperparts and a yellow hood. The two Hispaniolan monotypic genera are both olive-green above and off-white below, with a greyish head; *Xenoligea* has extensive white in the wing and a white-tipped tail, features which *Microligea* lacks. On St Lucia, Semper's Warbler (*Leucopeza semperi*) is, or perhaps, as it may well be extinct, was, very plain and uniform in appearance, being largely dull brownish, with a greyer head and paler underparts.

As a general rule, temperate-breeding New World warblers are sexually dimorphic in breeding plumage, whereas the sexes of tropical ones are similar in plumage throughout the year. Exceptions among the temperate-breeding species are the members of *Seiurus*, which contains the waterthrushes and the Ovenbird, and Swainson's and the Worm-eating Warblers, in which the sexes are similar. In a few other cases, such as the Colima Warbler and the Palm Warbler (*Dendroica palmarum*), the sexes are so similar as to be essentially indistinguishable; females are on average marginally duller than males, but this is not noticeable in the field and individuals cannot be sexed with any degree of certainty. Dimorphism in the other species is manifest largely in the fact that, to a greater or lesser degree, males have brighter plumage than females, the overall pattern of the two sexes being similar. In some species, such as the Orange-crowned, Virginia's, Yellow-throated and Grace's Warblers (*Dendroica graciae*) and the Yellow-breasted Chat, the differences are very slight, but are evident when mated partners are observed together. With Orange-crowned and Virginia's Warblers, the main difference is in the extent of the rufous crown patch, which is not normally noticeable in the field, although the general plumage of the female is also slightly duller. With the Yellow-breasted Chat, the principal difference between the sexes is in the colour of the inside of the mouth, which is black in males and pinkish in females. Sexual dimorphism is most pronounced among certain *Dendroica* species, examples being the Black-throated Blue, Blackpoll, Bay-breasted (*Dendroica castanea*), Cerulean (*Dendroica cerulea*) and Blackburnian Warblers (*Dendroica fusca*), and also in the Black-and-white and Prothonotary Warblers and the American Redstart. The pattern, as well as the brightness, of the plumage of the Black-throated Blue and Blackpoll Warblers and the American Redstart is noticeably different between the sexes. This is also the case with most of the *Geothlypis* yellowthroats, the females of which lack the distinctive black mask of the male. The sole exception is the Grey-crowned Yellowthroat, in which the female is a slightly duller version of the male; this species is sometimes placed in its own monotypic genus, *Chamaeothlypis* (see Systematics).

Most of the *Dendroica* species exhibiting sexual dimorphism also show seasonal dimorphism, moulting into a duller non-breeding plumage after the breeding season and before migrating. In the case of females, this change in appearance is usually very slight, although females of the Blackpoll, Bay-breasted and Chestnut-sided Warblers (*Dendroica pensylvanica*) show strong seasonal dimorphism. Males of many of the species experience a far



The eight subspecies of the ***Russet-crowned Warbler*** *form two groups, differing in underpart coloration. Two belong to the "white-bellied" group", with underparts uniformly greyish-white. The remainder, including the race* elatus, *are the "yellow-bellied group". It has been suggested that these groups may constitute two separate species. A similar situation exists with the Rufous-capped Warbler* (Basileuterus rufifrons), *the races once again being divided into white- and yellow-bellied. Again, the yellow-bellied races have been proposed as a separate species, but the two groups interbreed freely in Central America.*

[*Basileuterus coronatus elatus*, Bellavista Cloud Forest Reserve, Ecuador. Photo: Theodoulos Poullis]



Formerly thought to be related most closely either to the thrushes (Turdidae) or wrens (Troglodytidae), the ***Wrenthrush*** *is the sole species in its genus, and was at one stage awarded its own family, Zeledoniidae. Following skeletal and other studies in the 1960s and 1970s, it was transferred to Parulidae, where it was believed closest to the genus* Basileuterus*, with which it shares some plumage characters. More recent research, however, indicates that it probably does not belong with the New World warblers after all. It has adapted to a terrestrial existence, and become almost flightless, with short wings in addition to its short tail.*

[*Zeledonia coronata*, Chiriqui, Panama. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

stronger seasonal change in plumage, moulting into a much more female-like non-breeding dress. Some *Dendroica* species, for example the Black-throated Blue, Yellow-throated and Grace's Warblers and the "Black-throated Green Warbler complex" (see Systematics), are not truly seasonally dimorphic but, rather, the non-breeding plumage is marginally duller owing to pale feather tips on the darker feathers; these tips wear off during the course of the winter, or the feathers are replaced in a limited pre-breeding moult. Most other temperate-breeding New World warblers do not display significant seasonal differences in plumage, although many also have pale feather tips in fresh non-breeding plumage, and male Tennessee Warblers, in particular, are noticeably duller in non-breeding plumage.

In the case of most sexually dimorphic species, first-summer males may be marginally duller than the adults. Only one parulid, the American Redstart, has a distinctive immature male, the first-summer male having a female-like plumage that is totally different from that of the adult male.

Tropical species showing sexual dimorphism include the yellowthroats and the *Granatellus* chats. In the yellowthroats, the sexes are similar in body plumage, but females lack the distinctive black mask and pale frontal band of the males. The *Granatellus* chats exhibit some of the most highly developed sexual dimorphism in the family: the gaudy black, grey and red of the male plumage is lacking in the females, which are grey above and buffy below. Almost all of the Caribbean endemics are monomorphic in plumage, the only exceptions to this being the Vitelline (*Dendroica vitellina*) and Olive-capped Warblers (*Dendroica pityophila*) and the "Adelaide's Warbler complex" (see Systematics), all of which exhibit very slight dimorphism, with the males on average slightly brighter than the females.

All New World warblers have at least one complete moult each year, usually taking place immediately after breeding. This moult involves all of the feathers, although the wing and tail feathers are replaced sequentially, with only one or two missing at a time, so that flight is not unduly affected. Nevertheless, most species are more vulnerable to predation during this period and are typically quite unobtrusive while moulting.

The moult of temperate-breeding parulid warblers has been studied in some detail. Adults have a complete moult immediately following breeding, this being termed the post-breeding (or pre-basic) moult. The wing feathers are moulted symmetrically, so that the same feathers are missing from each wing at any one time; the primaries are moulted in sequence from the innermost to the outermost, and the secondaries from the outermost to the innermost. The tertials are typically moulted as a unit before the secondaries, and the tail feathers are replaced from the innermost to the outermost, but not always symmetrically. First-year individuals generally have a partial moult that starts soon after they have left the nest. This is known as the post-juvenile (or first pre-basic) moult, and it involves the replacement of the body feathers, the lesser and median wing-coverts and some or all of the greater coverts, but usually not any of the flight-feathers and tail feathers, nor the primary coverts and alula. The number of greater coverts replaced varies considerably, species breeding in more southerly areas generally replacing more greater coverts than more northerly breeding species and populations, and juveniles from early broods likewise replacing more than those from later broods. With practice, first-year birds can be identified in the hand, and even in the field, by the contrast between the freshly moulted, new greater coverts and the heavily worn, old ones. There is some evidence from moult studies of Yellow Warblers in central Ontario and Vermont that migrant warblers breeding at lower latitudes have a slightly more protracted moult than those breeding at higher latitudes, due to the earlier arrival in spring and the longer breeding season of those breeding farther south.

Most temperate-breeding warblers also have a pre-breeding (or pre-alternate) moult, which occurs before the breeding season, often while the birds are migrating. For many members of the family, however, this moult is absent or is restricted to a few throat feathers, possibly only on first-spring birds. For most species which do undergo this moult, it is quite restricted and involves mainly the head and throat feathers. Generally speaking, those temperate-breeding parulids with a plumage which remains much the same in appearance throughout the year do not undergo a pre-breeding moult, whereas those in which the males, at least, assume a brighter breeding plumage do and, for most of these species, the brighter breeding plumage involves mainly the head and throat feathers. Among some *Dendroica* species, such as the Blackburnian Warbler, the Magnolia Warbler (*Dendroica magnolia*) and the Yellow Warbler, this pre-breeding moult appears to be more extensive and may include some or all of the

tertials. Many species lacking the pre-breeding moult appear marginally duller during the winter months, as illustrated by, for example, the Yellow-throated, Grace's, Pine and Prothonotary Warblers, and in these cases the slightly brighter breeding plumage is produced by feather wear, the duller feather tips wearing off, rather than by a moult of the feathers. There are some odd exceptions to this generalized rule concerning the pre-breeding moult. For example, two members of the genus *Wilsonia*, namely the Hooded Warbler and Wilson's Warbler (*Wilsonia pusilla*), have a plumage that is essentially the same all year; Wilson's Warbler, however, has a limited pre-breeding moult of the head feathers which its congener seems to lack. More study may be required in order to explain such apparent anomalies.

Much less is known about the moult strategies and timings of tropical New World warblers. Adults of these species have a complete moult following breeding, as do their northern counterparts and, indeed, most birds in general. Juveniles begin their post-juvenile moult soon after fledging, but for most of the species the timing and extent of this are not known. Tropical and Caribbean parulids do not have a brighter breeding plumage and exhibit little change in appearance through the year. It seems likely, therefore, that most of these species lack a pre-breeding moult, though such a moult has been recorded for the northern races *pulchra* and *nigrilora* of the Tropical Parula. Most of the information given in the following few paragraphs is based on one or a few individuals, and more study is needed on the moult strategies of all tropical and Caribbean members of the family.

Painted Whitestarts have a quite protracted post-juvenile moult, and this may be true of many tropical species, which are not under pressure to moult quickly as they do not need to migrate. Northern subspecies, at least, of the Slate-throated Whitestart have a partial post-juvenile moult, but the extent of such a moult, if it occurs at all, in southern races is not known. Collared Whitestarts probably undergo a partial post-juvenile moult, which includes some, but not all, of the greater wing-coverts. Young Tepui Whitestarts retain the juvenile wing feathers, and often some greater coverts, for a period after fledging, suggesting that they, too, have a partial post-juvenile moult. In Ecuador, juvenile Spectacled Whitestarts have been seen in mid-February in quite advanced body moult while still begging food from their parents. This could indicate either that the post-juvenile moult of this species starts very quickly after fledging or that the young beg for food for some time after leaving the nest.

Recent molecular-genetic analyses suggest that the genus Granatellus, *which includes the* ***Red-breasted Chat****, is closer to the cardinals (Cardinalidae) than to the Parulidae. These chats have long tails, which they often hold cocked. They are strongly sexually dimorphic, the gaudy colours of the male, shown here, contrasting with the much more modest female. The race* francescae *of the Red-breasted Chat is endemic to Mexico's Tres Marias Islands, and lacks the black breastband. It has been considered a distinct species, but, by analogy, many other endemic forms of these islands also lack at least one plumage feature of their mainland counterparts and are considered merely subspecies.*

[*Granatellus venustus venustus*, Guerrero, Mexico. Photo: Manuel Grosselet]



In the case of the Common Yellowthroat, the post-juvenile moult is generally partial, or sometimes incomplete and with only some flight-feathers replaced, but it may be complete in southern populations. Similarly, the Grey-crowned Yellowthroat apparently has a partial post-juvenile moult. Belding's Yellowthroat may have a limited pre-breeding moult, but it is not known whether the post-juvenile moult of this north-west Mexican species is partial or complete.

The Tropical Parula's northern races *pulchra* and *nigrilora* have a partial post-juvenile moult and a partial pre-breeding one,

New World warblers are less active during the middle part of the day, when they rest and preen. Species that forage on the ground and in undergrowth, like the ***Flavescent Warbler****, have to be particularly vigilant for ticks and other ectoparasites, which are more abundant at ground level. A study of the Flavescent Warbler in a fragment of forest in south-eastern Brazil found that the birds defend the same territories throughout the year, for several years in succession. The territories are relatively small, averaging less than 2 ha.*

[*Basileuterus flaveolus flaveolus*, Arajara Park, Crato, Ceará, Brazil. Photos: Andy & Gill Swash/ WorldWildlifeImages.com]







Preening and other self-maintenance activities occupy 2–7% of daylight hours when parulids like this ***Palm Warbler*** *are on their breeding grounds. Up to 40% of a male warbler's time is spent singing to maintain the territory while the female is incubating. The Palm Warbler is one of a number of species that will also hold a temporary territory around a good food source on its wintering grounds. In one study in the Bahamas, Palm Warblers defended nectar-rich century plant* (Agave braceana) *blossoms, chasing away other warblers and hummingbirds. In most cases, the energy cost was high relative to the benefit—a nearby Cape May Warbler* (Dendroica tigrina) *spent 90% of its time either looking out for intruders, or chasing them.*

[*Dendroica palmarum*, Chicago, Illinois, USA. Photo: Rob Curtis/VIREO]

but the moult of the other races has not been studied. A congener, the Flame-throated Warbler, has a partial post-juvenile moult, with some juvenile greater coverts retained. Likewise, the Neotropical Fan-tailed Warbler of Central America, the sole member of its genus, undergoes a partial post-juvenile moult.

A first-year Black-cheeked Warbler (*Basileuterus melanogenys*) in February had retained juvenile outer greater coverts, suggesting that this species, too, has a partial post-juvenile moult. Its breeding season is during April–June. In contrast, a juvenile Red Warbler (*Ergaticus ruber*) in June had replaced most of the body feathers and also the same secondary in each wing, indicating that this species has a complete post-juvenile moult. A first-year Grey-throated Chat (*Granatellus sallaei*) in late April had moulted most of the body feathers as well as the tertials and outer secondaries, suggesting that the post-juvenile moult of this species, too, and perhaps those of the other *Granatellus* species is complete. On the other hand, a juvenile Rose-breasted Chat (*Granatellus pelzelni*) in early May had replaced most of its body feathers but no remiges or rectrices, although this individual may not have finished what would turn out to be a complete moult.

Some of the Caribbean *Dendroica* species, particularly the Arrow-headed Warbler, appear to have a different moult strategy from that of the other *Dendroica* species in their first year, and this possibility certainly merits further study. Plumbeous Warblers seem to have a moult strategy similar to that of temperate-breeding *Dendroica*, with a partial post-juvenile moult in the first year and later, in June–August of the following year, a complete post-breeding moult. First-year individuals of the Elfin Woods Warbler undergo a partial post-juvenile moult in July–October and then a complete moult in early summer, having held the first-year plumage for 6–10 months. Thus, first-years may begin their first complete moult while still breeding, although the breeding season of this species is from April to June and it is more likely that all birds have finished breeding by the time they commence their moult. First-year Arrow-headed Warblers apparently have a rapid post-juvenile moult soon after leaving the nest, which produces a first-winter plumage that is worn for about six months; individuals hatched in March–June moult into adult-type plumage in October–December. It is not known whether this moult is partial or complete, nor whether birds hatched during a secondary breeding season in November moult into an adult-type plumage in the following spring or retain the first-year plumage until the following October.

Habitat

As their alternative name of "wood-warblers" suggests, most species occupy woodland and forested habitats of some form. This is, however, by no means always the case, and parulids of one kind or another occupy a wide range of non-wooded habitats, ranging from mesquite (*Prosopis*) and chaparral scrub to saltmarsh and reedbeds. The *Geothlypis* yellowthroats, in particular, generally shun woodland areas, spending most of their lives instead in wetland or grassland and low scrub. Some species, such as the Black-polled Yellowthroat (*Geothlypis speciosa*) and the Altamira Yellowthroat, are closely tied to a particular type of wetland habitat, with consequent limitations on their range and abundance. The former is restricted to highland wetland habitat containing cat-tails (*Typha*) and hard-stemmed bulrushes (*Schoenoplectus acutus*), known also as "tule", in freshwater marshes in the volcanic belt of central Mexico, while the Altamira Yellowthroat is confined to lowland freshwater marshes containing extensive reedbeds in eastern Mexico. Both of these species are currently considered globally threatened owing to loss and degradation of their habitat (see Status and Conservation). Similarly, the Hooded Yellowthroat (*Geothlypis nelsoni*) is something of a habitat specialist, typically occurring in the dry, scrubby *pedregal* habitat in the volcanic belt of highland central Mexico. Other yellowthroat species are more catholic in their choice of habitat and are, consequently, more widespread. The most widely distributed tropical yellowthroat is the Masked Yellowthroat, which occurs in a wide variety of damp scrubby and grassy habitats, including grasslands, marshes, dense scrubby undergrowth in forest edges and clearings, seasonally flooded savanna and, sometimes, sugar-cane fields. The Common Yellowthroat is equally widespread in temperate North America, where it is found in a similarly wide range of wetland and grassy habitats.

In Central America, the Wrenthrush is an aberrant New World warbler largely restricted to bamboo thickets in montane forest





Many parulids have been recorded bathing in water. The birds dip the head or breast into shallow water, and flick the wings to shower droplets over the back, like this ***Wilson's Warbler****. In hot weather, they may fully immerse the body, splashing vigorously, like this* ***Yellow-rumped Warbler****. Where there is no standing water, some warblers may indulge in "dew-bathing". A letter to* The Auk *records a mixed group of birds dew-bathing in British Columbia during the very dry summer of 1961. The birds included seven Orange-crowned Warblers* (Vermivora celata)*, a Black-throated Grey Warbler* (Dendroica nigrescens) *and a Wilson's Warbler, as well as 15 Black-capped Chickadees* (Poecile atricapillus) *and one Song Sparrow* (Melospiza melodia)*. The birds fluttered against the leaves of a vine maple* (Acer circinatum) *3 m high, allowing their feathers to soak up the moisture. They emerged bedraggled, ruffling their feathers just as they would after bathing in a pool. Some birds take bathing a little further. Prothonotary Warblers* (Protonotaria citrea) *breed in wooded swamps, and young birds close to fledging can swim short distances by flapping their wings.*

[Above: *Wilsonia pusilla*, British Columbia, Canada. Photo: Glenn Bartley.

Below: *Dendroica coronata coronata*, SW Ohio, USA. Photo: Dave Maslowski/ Maslowski Productions]

and *páramo* vegetation near the tree-line. Skulking within the dense vegetation here, it has all but lost the ability to fly.

Several parulid genera are closely tied to woodland and forest habitats at all seasons. These include *Dendroica*, which means "tree-dwelling", *Myioborus*, *Seiurus*, *Oporornis*, *Wilsonia*, the majority of the *Vermivora* and *Basileuterus* species, and the eight single-species genera containing the Whistling, Black-and-white, Prothonotary, Worm-eating, Swainson's, Red-faced and Neotropical Fan-tailed Warblers and the American Redstart. Within the genus *Vermivora*, one exception to this general rule is provided by Lucy's Warbler, which breeds in mesquite and other semi-arid scrub, often along watercourses, and spends the winter months in low scrub and weedy fields. The Orange-crowned Warbler breeds in scrubby areas and brushy thickets, as well as in woodland and forest, and the Blue-winged and Golden-winged Warblers occupy successional habitats that are reverting from scrub or abandoned fields to woodland. Within this successional habitat, the Golden-winged Warbler appears to be something of a habitat specialist, occurring in the earlier stages of this succession, while the closely related Blue-winged Warbler is more of a habitat generalist, colonizing a wider range of these successional stages and often replacing its relative when areas become too scrubbed over for that species. It is generally accepted that forest-swelling species in North America fare better in continuous than in fragmented forest, with nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) considered a primary reason for the lower breeding success recorded in fragmented stands, which offer the open habitat which the cowbirds favour (see Breeding).

The *Dendroica* warblers inhabit a wide range of forests, from the extensive coniferous forests of northern North America, occupied in the summer breeding period, through to tropical and montane rainforests in the winter. In the boreal spruce (*Picea*) forest, several members of this genus co-exist during the breeding season, and R. H. MacArthur, in a detailed study, found that they feed in different spatial micro-habitats within the forest in order to do so. This kind of narrow niche-partitioning as a foraging strategy is generally more pronounced in tropical forest, but in the boreal forests of North America it allows several closely related *Dendroica* species to co-exist in what appears to be a rather uniform habitat; this is discussed in greater detail later (see Food and Feeding). Most of the warblers in this genus inhabit the canopy parts of the forest, some species, such as Townsend's, Hermit, Cape May (*Dendroica tigrina*) and Blackburnian Warblers, keeping mainly to the treetops. The Cape May Warbler, however, will frequently descend to lower levels in the winter in order to defend flowering shrubs, the nectar from which forms an important food source at this season. Other species, such as the Yellow-rumped Warbler, range more widely and spend much time in foraging at lower levels, including on the ground. Among the *Dendroica*, the Yellow Warbler and the Black-throated Grey Warbler (*Dendroica nigrescens*) seem to be the least dependent on forest, the former favouring scrub and early-successional habitats, especially wet willow (*Salix*) thickets, waterside willow scrub and abandoned pastures, and Black-throated Grey Warblers preferring open, semi-arid woodlands, especially of conifers and live oaks (*Quercus*), with a brushy understorey.

Some parulids are very specialized in their habitat selection. A prime example is that of Kirtland's Warbler (*Dendroica kirtlandii*), which for breeding requires dense stands of young jack pine (*Pinus banksiana*) 2–7 m in height and ideally of 80 ha or more in extent, with a ground cover of blueberry (*Vaccinium*), grasses, sedges and ferns in which to place the nest. When the pines grow taller than 7 m, the warblers move out, as the thick ground cover is shaded out. It breeds almost solely in Michigan, in the north USA, migrating to the Bahamas. In the modern world, habitat management has become an essential tool in ensuring the survival of this species (see Status and Conservation). Another example is provided by the Golden-cheeked Warbler. This species, which breeds only in a small part of Texas, requires forest with a mature canopy dominated by oaks to provide optimal foraging habitat, and with Ashe juniper (*Juniperus ashei*) stands admixed, as it is totally reliant on strips of mature Ashe juniper bark for building its nest. It migrates to non-breeding grounds in south Mexico and northern Central America, where it spends the



*Studies indicate that there is a plumage-based hierarchy in the **Yellow Warbler**. Birds with extensive chestnut streaking on their breasts are dominant over individuals with less streaking, and defend breeding territories of higher quality. This bird may be having a little more trouble establishing who is top warbler! As well as being a reliable badge of social status that can help settle disputes between males without physical aggression, the amount of streaking may help females identify better-quality males. Birds with more streaking have higher annual survival rates.*

[*Dendroica petechia aestiva*,
Point Pelee National Park, Ontario, Canada.
Photo: Rob Curtis/ The Early Birder]



Like all Myioborus *species, the* ***Slate-throated Whitestart*** *has contrasting black-and-white tail feathers, the amount of white varying geographically within, as well as between, subspecies. Tail fanning is used during aggressive and territorial encounters, and may have other social-signalling functions. The birds sometimes fan their tails in a distraction display when disturbed at the nest. One study showed that the birds use it for "flush-pursuit" foraging, to startle prey into flight. Birds which had their white feather tips experimentally darkened were less successful at foraging.*

[*Myioborus miniatus hellmayri*, Los Tarrales, Guatemala. Photo: Samuel Hansson]

winter in pine–oak woodland. This warbler's habitat on both the breeding and the non-breeding grounds is being destroyed, and it is listed as globally threatened (see Status and Conservation).

Whitestarts are specialists of the canopy, occurring in montane forests in Middle and South America. The Slate-throated Whitestart is the most widespread of the twelve species, overlapping in range with most of its congeners but segregated altitudinally, at least in the Andes, the Santa Marta Mountains and the mountains of Costa Rica. Typically, it occurs in submontane and lower montane forests, from 500 m to about 2500 m; it ascends locally to about 3000 m, but is generally replaced, with limited overlap, at higher altitudes by the other species with which it is sympatric in these mountain ranges. Golden-fronted and Spectacled Whitestarts, in particular, often live in the elfin forests at the tree-line, and the other Andean species do so to a lesser degree. Few of the other members of the genus occur sympatrically, but where the Brown-capped Whitestart overlaps with the Spectacled Whitestart, in Bolivia, it tends to inhabit dry deciduous forest and alder (*Alnus*) woodlands, the Spectacled Whitestart occupying the more humid forests. Farther south, in Argentina, where the latter species is absent, the Brown-capped Whitestart occurs in the humid forests, as well. In northern Mexico, the Slate-throated Whitestart overlaps in range with the Painted Whitestart, which ranges north to the south-western USA, and in the overlap zone it is the Slate-throated which occurs in the more humid forests, the Painted Whitestart favouring the drier pine–oak forests.

The species making up the largely tropical *Basileuterus* genus are very much understorey specialists. The majority of them are seldom seen away from dense undergrowth and are restricted to forests with a dense, relatively undisturbed understorey layer. Golden-bellied and Golden-crowned Warblers regularly forage up into the lower canopy, but even they tend to favour the boundary between the understorey and the lower canopy. The Rufous-capped and Santa Marta Warblers (*Basileuterus basilicus*) are the two *Basileuterus* species least reliant on dense forest undergrowth, although both are dependent on low, dense scrub cover. The Rufous-capped Warbler occurs in dense scrub, brushy ravines, young second growth and open coffee plantations, usually avoiding the forest interior. Santa Marta Warblers are found in dense scrub and bamboo thickets in high-altitude stunted forest and shrubby forest edge, likewise tending to avoid the forest interior.

Five species of *Basileuterus* are very much forest-floor specialists, and two of these, in particular, are also closely tied to water. The Buff-rumped and Riverbank Warblers are terrestrial species closely associated with streams, rivers, swamps and marshes, where they feed at the water's edge and on fallen logs. The Buff-rumped Warbler tends to favour running water and linear watercourses in the Andean foothills and the western Amazon Basin, whereas the Riverbank Warbler is more often found by standing water in swamps in the eastern Amazon Basin; there is some overlap in habitat choice, although not, so far as is known, in range. These two species are very different from most other members of the genus in their habitat choice and terrestrial behaviour, and they are often placed in a separate genus (see Systematics). The White-browed and White-striped Warblers are two southern South American *Basileuterus* that approach the Buff-rumped–Riverbank Warbler pair in their habitat choice, being strongly associated with water (this being especially true of the White-striped, which favours rivers and tributaries within riparian forest), and in spending most of their time near the ground, although neither is strictly terrestrial. The Flavescent Warbler also favours low undergrowth and often feeds on the ground, but, unlike the previous four species, it is not particularly associated with water.

The terrestrial, waterside habitat of Buff-rumped and Riverbank Warblers, as well as the subtle differences in habitat choice between these two species, is mirrored in many ways by the two North American waterthrush species. The Northern and Louisiana Waterthrushes are very much specialists of waterside habitats, the former preferring standing water such as swamps, boggy pools and slow-moving rivers, and the Louisiana Waterthrush being associated more with small, fast-flowing streams. Both species are, like their South American counterparts, very much tied to such habitats within the forest, where they feed largely on terrestrial and aquatic invertebrates at or near the water's edge and also in shallow water. These habitat preferences are maintained on the tropical and subtropical non-breeding grounds, Northern Waterthrushes often being found in mangrove swamps at this time of the year. Another temperate-breeding species closely associated with water is the Prothonotary



Males of Vermivora *and some other temperate-breeding genera have two kinds of song. One is used to advertise for females, and rapidly becomes less frequent after birds have found mates. The other, sung mainly at dawn and dusk, is directed at other males, and is used to maintain and defend the territory.* ***Virginia's Warbler*** *and the Orange-crowned Warbler* (V. celata) *have been found to respond to one another's territorial songs. The larger, more aggressive and dominant Orange-crowned Warbler arrives earlier on the breeding grounds. Virginia's Warbler backs away from interactions with the Orange-crowned, and has been found to retreat from speakers playing Orange-crowned Warbler songs.*

[*Vermivora virginiae*, Inyo County, California, USA. Photo: Brian E. Small]

Warbler, which breeds in flooded or swampy forests, generally building its nest over standing water. It is usually found again in wet and swampy forest and woodland, and in other wet habitats such as mangroves, both on migration and on the wintering grounds.

The habitat choices of the more typical *Basileuterus* warblers are, in some respects, mirrored by the North American genus *Oporornis*. All four of these species are very much denizens of dense understorey, typically within the forest, both on their breeding grounds and in their non-breeding quarters. The Mourning Warbler and, to a lesser extent, MacGillivray's Warbler are less tied to forest and woodland than their two congeners and are frequently found in scrub, thickets and young second growth, in both the breeding and the wintering areas, although a reliance on dense undergrowth is maintained. The Connecticut Warbler is not wholly terrestrial but tends to feed and nest lower down in the undergrowth than the other three species in the genus, and it is much more often encountered on the forest floor.

Swainson's Warbler, in the monotypic genus *Limnothlypis*, occurs in two very different habitats within its breeding range. The larger population breeds in lowland swampy forests, usually with a dense understorey of cane, dwarf palmetto (*Sabal*) or pepperbush (*Clethra*). This population has been regarded as something of a canebrake specialist, though not to the same extent as was the extinct Bachman's Warbler, but it occurs also in lowland forests lacking cane, so long as a dense understorey of palmetto or pepperbush is present. The smaller population breeds in the Appalachian Mountains, at up to about 1000 m, occupying rhododendron–mountain laurel (*Rhododendron–Kalmia*) thickets in hardwood forest. One characteristic of both habitat types is that there is a moderately dense understorey and abundant leaf litter, but relatively little ground vegetation. This habitat preference is typical of a largely terrestrial forest species which forages principally on the ground and in leaf litter. The more widespread Ovenbird, of the genus *Seiurus*, has a similar habitat requirement and utilizes a similar foraging technique; it specializes in searching areas of ground within the forest where there is little ground vegetation and where a great amount of leaf litter has been able to accumulate. These two species often occur together on the wintering grounds, where they exploit a similar habitat, and Swainson's Warblers have been seen to follow Ovenbirds through the leaf litter, feeding on invertebrates disturbed, but not captured, by the latter.

Many forest-dwelling New World warbler species will make do quite happily with second growth and disturbed forest and woodland, and some species, such as the Chestnut-sided, Golden-winged and MacGillivray's Warblers, even specialize in logged or otherwise disturbed areas where there is a flush of brushy second growth. These species were originally specialists of forest clearings and edges and are among the relatively few warbler species which have benefited from large-scale clearance of forests. Conversely, there are many species which are reliant on intact primary and old-growth forests and which have been adversely affected by such clearance work. Cerulean and Kentucky Warblers, and also Ovenbirds, are dependent on intact primary forest on both the breeding grounds and the wintering grounds. The Cerulean Warbler, in particular, has declined sharply in many areas over recent decades: loss of this primary-forest habitat is thought to be one of the main causes of its decline; another contributing factor is the increased brood parasitism by Brown-headed Cowbirds that often occurs when a species' forested habitat becomes fragmented, thereby allowing access to the cowbirds, which are birds of more open habitats (see Breeding, Status and Conservation).

Except perhaps for lost vagrants, especially those over the sea which frequently settle on ships, parulid warblers are generally not found in completely man-made habitats. Nevertheless, Yellow-throated Warblers have been seen to forage on the sides of buildings in Mexico, presumably searching for spiders (Araneae) and other invertebrates, and migrant warblers will use just about



*The unmated male **Prairie Warbler** sings one type of song almost exclusively, a series of rapid buzzy notes, accelerating and rising in pitch towards the end. Once he has a partner, he sings a quieter and less buzzy territorial song at dawn, and at times throughout the day. There is little variation in the mate-attracting song throughout the Prairie Warbler's range, but there are distinct local differences in the territorial songs. Experiments with captive-reared birds suggest that another member of the genus, the Chestnut-sided Warbler* (Dendroica pensylvanica), *learns its mate-attracting song from its father, and its territorial songs from other males. There is an account of a Prairie Warbler which sang the songs of the Black-throated Green Warbler* (D. virens) *in addition to those of its own species, using both types of song in the appropriate context. Its renderings of the Black-throated Green Warbler songs were indistinguishable sonagraphically from the real thing. It was suggested that the bird was part of a brood which for some reason was fed by a male Black-throated Green Warbler as well as the male Prairie Warbler, and learned songs from both of its "fathers". Females were probably baffled by the mixture of songs, because there was no evidence that this bird succeeded in pairing.*

[*Dendroica discolor*, Muskingum County, Ohio, USA. Photo: Brian E. Small]



Warblers in the genus Oporornis, *like the* ***Kentucky Warbler****, have a single song type. The Kentucky Warbler's song is relatively simple, consisting of five to eight loud, whistled "churree" notes. But while the elements of the song retain their shape and sequence, male Kentucky Warblers are able to raise and lower the frequencies and change the "energy levels" within the song. Songs in a single population of this species have been shown to be almost as variable as songs throughout the breeding range, indicating that Kentucky Warblers do not have local song dialects.*

[*Oporornis formosus*, Grimes County, Texas, USA. Photo: Brian E. Small]

any habitat that may contain suitable food if circumstances demand, although most will preferentially use habitats more typical of their breeding or wintering areas.

General Habits

All New World warblers are diurnal in their feeding and breeding and most other activities. The North American species, however, are migratory, moving southwards after breeding, and these are nocturnal migrants. When not migrating, parulids' activities are carried out largely during daylight hours, the birds roosting during the night.

Very little has been recorded of the roosting habits of the family. The majority of the species probably adopt a roosting posture with the head turned backwards and the bill tucked under the scapular feathers. The Golden-cheeked and Kirtland's Warblers, the American Redstart, and the Northern and Louisiana Waterthrushes have been observed to sleep in this posture, which is the typical roosting posture for passerines and many other avian species. Northern Parulas have been recorded as roosting communally with other warbler species on the wintering grounds, primarily in isolated stands of large trees adjacent to, but usually not within, the home ranges used during the day. A breeding male Blackburnian Warbler was seen to take frequent daytime "naps" between bouts of foraging for its nestlings.

During the incubation and brooding stages, female Kirtland's Warblers roost on the nest, sleeping in the typical posture. In a study of captive Kirtland's Warblers, recently fledged young chose roosting perches close to one another until they were about nine months old, after which they roosted separately. This might correspond with the species' behaviour in the wild, which would involve roosting communally on the wintering grounds but separately on the breeding grounds, although this has not yet been confirmed by studies of this species in the field. Incubating Kirtland's, Golden-cheeked and Prairie Warblers (*Dendroica discolor*) have been observed to doze during the day with the head held forward; in the case of the Golden-cheeked Warbler, the head was resting on the rim of the nest, while some of the Prairie Warblers dozed with the head turned over the shoulder in a manner more typical of a roosting individual. Prairie Warblers have been frequently seen to forage vigorously at dusk, immediately prior to flying up to leaf clusters in the tops of small trees, where they roost. Wintering Prairie Warblers in Puerto Rico are reported as roosting communally, often with other species, although they are generally solitary during the day. Prothonotary Warblers, too, roost communally in the non-breeding season, and with this species the behaviour may have evolved as a result of a scarcity of cavity roosting sites; in Costa Rica and Panama, groups of these warblers have been observed moving together to roosting trees, although the exact roost-site within the trees could not be seen. American Redstarts, as well as roosting in the typical passerine posture, have been observed to rest during the day with the feathers fluffed and the bill pointing upwards. Similarly, Louisiana Waterthrushes sometimes take a nap during the day, when they have been observed in a squatting position with the neck drawn into the body and the eyes closed. At night, they have been recorded as roosting on exposed roots under overhanging creek banks.

When not breeding, many New World warbler species form flocks with conspecifics or other species, or both. After the breeding season and when on migration, many of the *Dendroica* species, in particular, join the foraging flocks led by chickadees (*Poecile*) and titmice (*Baeolophus*). Yellow-rumped Warblers wintering in temperate North America often form large flocks; at the northern edge of their non-breeding range these flocks are usually monospecific, perhaps a result of this species' reliance on bayberries (*Myrica*) at these latitudes, but farther south they are more often found in the mixed-species foraging flocks led by chickadees and titmice. The act of joining a flock, whether it



*Each male **Common Yellowthroat** has its own unchanging version of the "witchity-witchity-witchity-witch" song, which is usually quite different from those of its neighbours. Within the dense undergrowth of its typical habitat—often* Typha *beds, as here, or scrub—vocal cues are more important than visual cues. Male territory-holders would rarely be able to see their neighbours, and also spend much of their time out of sight of their mates. Having individual songs enables male Common Yellowthroats to identify one another. They have been found to respond far more aggressively to recordings of the songs of unfamiliar males than to the songs of their neighbours. By reacting only to potential intruders, the birds save time and energy. However, if the song of one male is played from the centre of a neighbour's territory, rather than from the border, the neighbour responds very aggressively. Females appear to recognize their mates from their songs. Common Yellowthroats also sing in flight, using a more variable and warbling version of their songs, but ending with the more familiar phrases of the perch song. Males continue to perform their flight songs at the same rate after pairing, and it has been suggested that, among other functions, they may serve to alert the sitting female to the presence of a predator, while diverting attention towards the singing male.*

[*Geothlypis trichas typhicola*, Galveston County, Texas, USA. Photo: Brian E. Small]



As well as singing its song from perches, the ***Canada Warbler*** *has a similar, but slightly longer, flight song. There is a recent report of a female-plumaged Canada Warbler singing, which follows up older descriptions of singing female-plumaged individuals of the other two members of the genus, Wilson's* (Wilsonia pusilla) *and Hooded Warblers* (W. citrina). *All three breed in habitats where there is a dense, undisturbed understorey, and are difficult to observe. While there are very few documented examples of the females of temperate-breeding species singing, females of many tropical New World warblers sing frequently, often duetting with their mates.*

[*Wilsonia canadensis*, Ontario, Canada. Photo: Glenn Bartley]

consists solely of conspecifics or of several species, is likely to increase an individual bird's chances of finding food and, in addition, to reduce the likelihood of predation by the effect of "safety in numbers". Orange-crowned Warblers wintering in the same area are generally solitary, but single individuals will frequently join these mixed flocks, perhaps doing so only temporarily as the flock passes through the warbler's winter feeding territory. Other territorial species holding winter territories in tropical regions may also join up with mixed flocks which pass through their territory or home range.

Flocking behaviour by temperate-breeding parulids on the wintering grounds can vary according to local circumstances, such as the available food supply. For example, Tennessee Warblers frequently form monospecific flocks when foraging for insects, but they are solitary when feeding on nectar; as they are specialist nectar-eaters in the wintering area, they will aggressively defend from conspecifics a flowering tree containing the nectar source (see also Food and Feeding). This difference in behaviour relates to the availability and defensibility of the food source. A localized nectar source is relatively easily defended and is also highly visible to other birds, and it is, therefore, worth the effort to defend it. Insect prey, however, is both more dispersed and more elusive; consequently, there is no point in defending such a food source, and flocking may be beneficial as other flock-members may help to indicate fruitful foraging areas. Cape May Warblers, likewise, are specialized nectarivores in winter and will also defend flowering trees, particularly agave (*Agave*), against conspecifics and other species.

Aggressive encounters between conspecific New World warblers most often occur between males on breeding territories and are usually won by the territory-holder. As already noted, parulids often behave aggressively when defending a temporary non-breeding territory containing an easily defensible food source such as a flowering or fruiting tree. Such aggression may be directed against other warblers and other bird species, as well as against conspecifics, but it generally lasts only as long as the food source which is being defended. Some species, such as the American Redstart and the Northern Waterthrush, will aggressively defend their winter foraging territories against conspecifics, and the waterthrush will also defend temporary foraging areas around pools when on migration (see below). Pine Warblers not uncommonly form flocks in winter in temperate North America, often in the same areas as those where Yellow-rumped Warblers are present. Unlike the latter species, however, the Pine Warbler is frequently aggressive towards conspecific flock-members, although the reasons for this are unclear. Aggressive behaviour towards conspecifics when foraging has been recorded also for other parulids, such as the Black-and-white Warbler

In Mexico, sizeable mixed-species foraging flocks containing large numbers of Townsend's and Hermit Warblers, together with up to 14 other species, including Orange-crowned, Crescent-chested and Yellow-rumped Warblers, occur in the highland pine–oak forests. Here, though, Townsend's and Yellow-rumped Warblers have been observed to behave in the same manner as Tennessee Warblers, aggressively defending trees infested with honeydew-producing scale insects (Coccoidea) against both conspecifics and Hermit Warblers, which appear to be submissive towards them. In the south-east USA, however, Yellow-rumped Warblers in Florida are submissive towards Palm Warblers defending nectar sources on flowering trees.

Many other temperate New World warblers are solitary and territorial on the wintering grounds, seldom, if ever, joining mixed flocks. These include the *Seiurus* and *Oporornis* species, the Hooded Warbler and the American Redstart. It may be difficult to determine winter territoriality, especially with relatively unobtrusive species. For example, there is little direct evidence of winter territoriality among Swainson's Warblers, but ringed individuals have returned to the same localities in three or four successive winters. This suggests that Swainson's Warblers also maintain winter territories, and this behaviour may be the norm for temperate-breeding parulid warblers that are solitary in the winter season.

Although New World warblers, often including those which are solitary on the wintering grounds, generally migrate in flocks, some of the species defend temporary territories while on migration. This normally happens where there is a localized food source that is readily defensible. As an example, Northern Waterthrushes aggressively defend small pools during the spring migration in Texas. Such feeding areas can constitute highly valuable food sources after the long trans-Gulf flight, and this marked territoriality may prevent some individuals from finding access



Pairs of ***Buff-rumped Warblers*** *remain on their territories all year. In common with many other tropical parulids, they have not been studied in detail, and whether they continue to sing throughout the year is not recorded. However, the congeneric Rufous-capped* (Basileuterus rufifrons) *and Black-crested Warblers* (B. nigrocristatus) *have both been recorded singing at all times of the year. The male Buff-rumped Warbler's song consists of a short warble followed by eight or nine ringing "chew" notes, to which the female occasionally replies with a similar short warble.*

[*Basileuterus fulvicauda fulvicauda*, Pousada do Rio Roosevelt, Amazonia, Brazil. Photo: Edson Endrigo]





Gleaning, which involves picking prey from bark or leaves with the bill, is the single most widely used foraging technique among the Parulidae. The New World warblers can be broadly divided into terrestrial, brush and arboreal foragers. The ***Palm Warbler*** *gleans insects from low shrubs, but also forages on the ground; in Canada, in early spring, it has even been seen taking insects from the frozen surfaces of lakes. The* ***Blackpoll Warbler*** *forages mainly by gleaning at middle to high levels in trees. However, Blackpoll Warblers have also been recorded feeding on the ground in the Bahamas. Truly terrestrial foragers include the Ovenbird* (Seiurus aurocapilla)*, which gleans from the surface of leaf litter, and Swainson's Warbler* (Limnothlypis swainsonii)*, which turns over leaves and picks its prey from beneath them. Most New World warblers use a variety of foraging techniques, and the Palm and Blackpoll Warblers will both swoop up from their perches in pursuit of flying insects.*

[Above: *Dendroica palmarum hypochrysea*, Brooklyn, New York, USA. Photo: Tom Stephenson.

Below: *Dendroica striata*, Chicago, Illinois, USA. Photo: Rob Curtis/ The Early Birder]



*Foraging mainly high up in trees in summer, the **Tennessee Warbler** often hangs upside-down to glean insects from the undersides of leaves. Tennessee Warblers specialize in moth larvae during the summer, and are able to take vigorous advantage of spruce budworm* (Choristoneura fumiferana) *outbreaks by increasing their clutch sizes. In one study in boreal forest in Ontario, territory density—the number of territories per plot—increased nine-fold over the four years of an outbreak, and the species went from eleventh commonest to the commonest bird in the forest.*

[*Vermivora peregrina*, Port Aransas, Nueces County, Texas, USA. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

to suitable foraging areas after the sea crossing. These individuals would move on quickly, whereas those that were able to defend a pool would stay for several days, putting on fat reserves which would presumably increase their chances of reaching the breeding grounds more quickly and subsequently obtaining a high-quality territory there.

For only a few members of this family has the daily routine been studied in reasonable detail. The most in-depth investigation of any temperate species is undoubtedly V. Nolan's long-term study of breeding Prairie Warblers in Indiana. This covered almost every aspect of the birds' behaviour during the breeding season. Nolan found that the males sing from just before dawn and continue throughout much of the day, at least early in the breeding season, with a distinct peak at dawn and a lesser one at dusk. Intensity of singing diminishes as the season progresses, although there may be a slight resurgence in late summer. Female Prairie Warblers sit for an average of 78% of the time during the incubation period, with the highest attentiveness just after dawn and at dusk; after dawn, attentiveness declined steadily until mid-morning, then rose during the middle of the day, and declined to a low of about 65% in late afternoon, before rising again towards dusk (see Breeding).

This pattern seems typical of temperate-breeding New World warblers, at least, most species commencing singing just before dawn, when it is still too dark for efficient foraging. A detailed study of Black-throated Green Warblers on the breeding grounds found a similar general pattern. Males of this species spent most of the dawn and dusk periods in singing from a perch; singing predominated also early in the morning, but time spent in foraging increased as the morning progressed. There were periods of inactivity, interspersed with preening, in the middle of the day. Once the eggs had hatched, foraging was the dominant activity over the day as a whole. During the incubation period, females spent more than 80% of their time incubating the eggs, with pulses of feeding activity early in the day and then every few hours through the rest of the day; after the hatch, the female devoted progressively less time to brooding and more time to foraging as the chicks grew, eventually spending virtually all daylight hours in foraging and in feeding the young. A similar study of Blackburnian Warblers during the breeding season revealed that both sexes had a daily time budget very similar to that of the Black-throated Green Warbler, the female brooding for 77% of the time when the eggs first hatched, but eventually switching to full-time foraging and chick-feeding.

Male Swainson's Warblers sing from about a half-hour before dawn until it is light enough to forage, and then switch to foraging interspersed with singing from the ground. The females of this species spend about 78% of their time incubating until the eggs hatch; they then give about 53% of their time to brooding



*Rarely found far from water, the **Northern Waterthrush** will use submerged logs to help it reach prey in water too deep for it to wade in. It gleans floating arthropods, sometimes fluttering out to snatch them from the surface, and reaches under water to pick up molluscs, small crustaceans, mayfly (Ephemeroptera) larvae and other small invertebrates. It will pull dead leaves from the water, or from leaf litter, and scrutinize them for prey. Like other parulids, it also gleans foliage and twigs, sometimes hovering, or sallying after flies.*

[*Seiurus noveboracensis noveboracensis*, Central Park, New York, USA. Photo: Peter Post]

the young for the first three days, thereafter increasing the amount of time spent in foraging, at the expense of brooding.

In a study of Black-throated Blue Warblers on their breeding grounds, it was found that, prior to the hatching of the eggs, the males devoted 17–40% of the daylight hours to singing from perches, 30–32% to foraging, 19–22% to foraging combined with singing, 3–7% to preening and other self-maintenance, 0·4–0·9% to aggressive interactions and 1–9% to "resting", while the females spent 75·1% of the daylight hours in incubating and 21·5% in foraging. After the young hatched out, both sexes foraged for 70–75% of the daylight hours, as seems typical and, indeed, probably necessary in order to raise a brood successfully. In another study of this species, it was estimated that, on the wintering grounds, both sexes spent most of their time in foraging. Studies of Yellow-rumped Warblers on the breeding grounds reveal that, during the nestling period, the males spend most of the time just before dawn in singing and that this is followed by a period of singing interspersed with foraging. An earlier study found that female Yellow-rumped Warblers devoted 25% of their time to brooding their young when these first hatched, and that the percentage decreased as the nestlings grew. In the non-breeding quarters, this species may defend sources of aphid (Aphidoidea) honeydew, and a study in Chiapas, in south Mexico, found that individuals defending such a food source spent 85% of their time within the temporary territory, of which they devoted 76% to foraging and feeding and 20% to the active defence of the territory.

Maintenance activities for most New World warblers involve head-scratching and bathing, as well as preening. Head-scratching can be performed in one of two ways: either indirectly, whereby a leg is raised over the lowered wing, or directly, when the leg is lifted directly to the head while the wing is held closed against the body. Most *Vermivora* species, as well as Swainson's and Canada Warblers (*Wilsonia canadensis*) and the Yellow-breasted Chat, employ the direct method of head-scratching, whereas most *Dendroica* species, along with Wilson's and Red-faced Warblers, scratch indirectly. Some species may use either method. For example, Yellow-rumped Warblers usually scratch indirectly, in the manner typical of *Dendroica* species, but they have been observed to use the direct method, too, and Common Yellowthroats, which generally scratch the head indirectly, occasionally use the direct method. The Black-and-white Warbler apparently regularly uses both direct and indirect head-scratching methods. The Northern Waterthrush is reported as head-scratching indirectly when young, but directly when it reaches adulthood. It has been suggested that direct scratching may be preferred by ground-feeding warblers, as it is less likely to result in the wings becoming soiled. The ground-dwelling Louisiana Waterthrush, however, regularly scratches indirectly, although it does also employ both methods.

Bathing is performed by many avian species, and has been recorded for a good number of parulids. Typically, the individual dips its head and/or breast in shallow water and flicks its wings so as to spread water over the back. The activity is generally combined with or followed by preening. Painted Whitestarts regularly bathe in streams, and it is likely that some other members of the family do likewise. In places where there is no standing water available, some warblers may indulge in "dew-bathing", in which they fluff up the feathers and wriggle along the tops of dew-laden or mist-moistened shrubs in order to wet the plumage. Such behaviour has been reported for many parulid species, including the Orange-crowned, Black-throated Grey, Prairie, Hooded and Wilson's Warblers and the American Redstart. Sunbathing has been documented for the Golden-cheeked Warbler, Louisiana Waterthrush and Common Yellowthroat, and is no doubt part of the maintenance behaviour of other parulids, too. Typically, the sunning individual crouches on the ground or on a low branch, with the spread wings and tail facing towards the sun. Sunning behaviour has been reported also for the Prothonotary Warbler.

The behaviour known as "anting", whereby a bird allows ants (Formicidae) to swarm over its body, possibly using the formic acid produced by the insects as an "anti-parasite" chemical, appears to be rare among warblers. It has been reported for captive Kirtland's Warblers, and there is also a record of a Three-striped Warbler (*Basileuterus tristriatus*) apparently indulging in this behaviour, but using a caterpillar for the purpose.

Although many New World warbler species wag the tail, this behaviour is more typical of ground-dwelling species such as the Northern and Louisiana Waterthrushes, the Buff-rumped and Riverbank Warblers, and the Palm Warbler. Buff-rumped and Riverbank Warblers swivel the tail from side to side, as well as



*The **Rufous-capped Warbler** forages slowly and deliberately, pausing to scan around, and paying particular attention to the undersides of leaves above it, before moving on. It feeds by gleaning at the middle and lower levels of scrub and open woodland. Studies of a population in a coffee plantation found that foraging height changed seasonally. During the wet season, the birds were found equally in the canopy and understorey, but in the dry season they were found more often at lower levels. This coincides with the arrival of winter migrants from the north, which feed on larger arthropods in the canopy, and thus reduce their availability.*

[*Basileuterus rufifrons mesochrysus*, Valle de Antón, Panama. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

pumping it up and down, in a very characteristic manner. This action is a feature also of the other three members of the subgenus *Phaeothlypis*, namely the White-browed, White-striped and Flavescent Warblers, although with these there is little or no sideways movement involved. The Louisiana Waterthrush wags or pumps its tail more emphatically than the Northern Waterthrush, the action involving the whole rear end of the bird. Prairie and Kirtland's Warblers frequently twitch the tail up and down, and from side to side; in this respect they are similar to the Palm Warbler, although their actions lack the regular up-and-down tail-wagging that is so typical of the Palm Warbler. Some other species, such as the Kentucky Warbler, may flick the tail as a sign of agitation. Hooded Warblers frequently flick the tail, and in this case the action also involves partial fanning of the tail to reveal the white in the outer feathers.

Most of the whitestarts characteristically flick their wings and fan the tail, revealing the white outer feathers, especially when foraging. Such conspicuous behaviour is thought to startle invertebrate prey into flight, whereupon the whitestart pursues it in a short aerial sally. The American Redstart performs similar behaviour, characteristically drooping its wings and fanning its tail to show off the bright markings, and it is thought that this action is used also as a foraging technique designed to flush insects from foliage, the redstart then pursuing these in the air.

Voice

New World warblers are highly vocal birds at all times of the year. During the breeding season, males of all species sing to maintain a territory and to advertise for a mate. Tropical species which defend territories throughout the year may sing through all months. During the non-breeding season, parulids use a variety of contact calls when on migration and when in mixed-species foraging flocks. During the spring migration in eastern North America, in particular, great waves of New World warblers emit "chip" calls as they make their way north across the countryside, and often through cities as well. The songs and calls of the temperate-breeding members of the family have been studied in detail, whereas much less is known about the vocalizations of tropical species.

Males of many temperate-breeding parulids, especially among the genera *Vermivora*, *Parula*, *Dendroica*, *Mniotilta* and *Setophaga*, sing two different song types on their territory, the two types being used in different social contexts. These are often referred to as "Accented Ending" and "Unaccented Ending" songs, an allusion to the more emphatic ending of many of the former song type. Accented Ending songs, however, do not always have this emphasis at the end, and the type of song given seems to depend on the context in which it is being used, as discussed later in this section. Several ornithologists have, therefore, opted to call the Accented Ending song "Type 1 song" and the Unaccented Ending song "Type 2 song", and these terms are considered better and less cumbersome.

Type 1 songs appear to be used mainly for intersexual signalling, in relation to advertising for a mate, and the male usually gives this song type while moving, often while foraging, closer to the centre of the territory. They are seldom sung at dawn and dusk, and the frequency with which they are given tends to decrease rapidly once the males are mated. Male Prairie Warblers, however, will revert to Type 1 songs if they lose their mate, presumably in an attempt to attract a replacement. In one study, experimental removal of the female Chestnut-sided Warbler from the mate's territory likewise resulted in the males reverting to Type 1 songs.

Type 2 songs appear to be used mainly for intrasexual signalling in relation to territorial defence. They are, therefore, directed primarily at rival males. They are usually delivered from stationary, often prominent perches near the edge of the territory, especially where there is an adjoining territory of a conspecific male. Particular perches are often utilized throughout the breeding season. Type 2 songs are given especially often at dawn and dusk, the first and last songs of the day almost always being of this type, at least until the pair-bond is established. In the case of Black-throated Green Warblers, individuals in dense populations, where the stimulus of singing rival males was much more pronounced, sang Type 2 songs more frequently than those individuals in more sparsely distributed populations. The same is probably true of other species, the proximity of rival males determining the frequency with which this song type is given.

This differentiation of song types is especially pronounced in the genus *Dendroica*, where it is apparently well developed in



*This **Yellow Warbler** was observed picking opportunistically at the sleeping sea lion, apparently eating insects or bits of skin. The Galapagos race* aureola *is part of the "*erithachorides *group" of subspecies, which are sometimes collectively known as "Mangrove Warblers", after the habitat where most of them are found. However,* aureola *is frequently seen feeding on rocky beaches, and elsewhere. The races of this group may also be found in dry scrub and montane forest. Members of the "*erithachorides *group" do not perform flycatching sallies as often as those of the northern, migratory "*aestiva *group", but glean at all levels, even on the ground.*

[*Dendroica petechia aureola*, Champion Islet, Floreana, Galapagos. Photo: Tim Laman/ naturepl.com]



Just as the Palm Warbler (Dendroica palmarum) *is rarely seen in palms, and the Prairie Warbler* (D. discolor) *is not found on prairies, the* ***Worm-eating Warbler*** *does not eat earthworms. It does sometimes forage on the ground, turning over dead leaves, but it feeds primarily by gleaning in the undergrowth for insects and their larvae, as well as spiders. Outside the breeding season it specializes in probing clusters of dead leaves, often hanging acrobatically. "Worm" is an archaic word for caterpillar, as in "budworm". The specific name* vermivorum *(like the name of the closely-related genus* Vermivora*) also means "worm-eating".*

[*Helmitheros vermivorum*, Shawnee State Park, S Ohio, USA. Photo: Dave Maslowski/ Maslowski Productions]

many of the species. Outside this genus, it is well established for the Northern Parula and the American Redstart. Some *Dendroica* species, however, appear to sing only one song type, albeit with variations, the Yellow-throated and Pine Warblers being examples of this, while the western subspecies of the Palm Warbler sings Type 1 and Type 2 songs, whereas the eastern or yellow race of this species appears to use just a single song type. Black-throated Blue Warbler songs have not yet been studied in detail, but they appear to consist of three types: the primary song, which is the most common and is given repeatedly from the centre of the territory, and two other song types, which are given from the territory boundaries and seem to be directed primarily at conspecifics. Thus, the primary song may correspond to the Type 1 song of other *Dendroica* species, and the other two seem to correspond to Type 2 songs.

Yellow Warblers of the northern "*aestiva* group" (see Systematics) sing two song types, but they also give intermediate songs, and over much of the range it is unclear whether they correspond to Type 1 or to Type 2 songs, the song type varying independently of the circumstances in which it is being used. In the north-eastern part of their range in the USA, however, some Yellow Warbler populations do sing two song types which appear to correspond to Type 1 and Type 2, respectively. Yellow Warbler populations of the "*petechia* group" and the "*erithacoides* group", at least in the northern parts of their ranges, appear to sing a single song type which corresponds more closely to the Type 2 song of the "*aestiva* group", although at least one researcher has reported occasional songs which may be closer to Type 1 songs.

There is not universal agreement that Type 1 and Type 2 songs have such segregated roles in the breeding behaviour of the New World warblers. One researcher has proposed that male parulids which sing the two song types use Type 1 in the absence of stimuli to sing Type 2 songs. There are, however, some problems with this hypothesis. For example, the first male warbler in a population to sing at dawn should give a Type 1 song, because there are no other singing males to stimulate a Type 2 song. In fact, the opposite is almost always the case, the males presumably being eager to advertise to rivals that they are still occupying their territory, although it is worth noting that the researcher did include low light levels among the strong external stimuli for a Type 2 song. It has also been suggested that the two song types might have a similar social function, and that the different types reflect the motivation of the singing bird. In studies of Black-throated Grey Warblers, it was concluded that the Type 1 song is often given in territorial defence, and other studies suggest that Type 1 songs may be uttered during territorial conflicts when the female of the pair is nearby. Clearly, song variation in *Dendroica* warblers merits further study.

The number of different Type 2 songs varies widely among species, and the number of Type 1 songs also shows some, though generally considerably less, variation from one species to another. At one extreme, the Black-throated Green and Blackburnian Warblers have just one song of each type, although there is subtle individual variation in the Type 2 song. Similarly, Hermit and Townsend's Warblers have just one song of each type, but both of these species give different vocalizations, which may represent a third song type, during disputes between males at the territory boundary. Several species have two or more of one or both song types, and, at the other extreme, up to 16 different Type 2 songs have been described for individual Yellow Warblers and up to five Type 1 and ten Type 2 songs for individual Chestnut-sided Warblers.

In contrast to the aforegoing details, the majority of warblers outside the genus *Dendroica*, and excluding the few others mentioned above, appear to sing just one primary song. Even so, there is often considerable variation, both among populations and among individuals.

Vocalizations of the parulids breeding in tropical regions have not been studied in anything like the same detail as have those of their temperate-breeding counterparts. At least two species of *Basileuterus* warbler have been recorded as singing at all times of the year; these are the Black-crested Warbler (*Basileuterus nigrocristatus*) in Colombia and the Rufous-capped Warbler in Costa Rica. Bearing in mind that nearly all tropical warblers are highly sedentary, with most species apparently defending a territory throughout the year, this is not surprising. Indeed, it may be normal for those species which remain on their territory all year.

Again unlike the temperate-breeding species, many females of tropical parulids sing frequently, often duetting with their mates.



Closely related species can have very different diets. While the Nashville Warbler (Vermivora ruficapilla) *is almost exclusively insectivorous, the* ***Tennessee Warbler*** *exploits the most seasonally abundant food, mostly insects in the summer, and a high proportion of fruit and nectar on the wintering grounds. But climate change may already be having an effect on the availability of the insect food which migratory warblers depend upon. The northern range of the spruce budworm* (Choristoneura fumiferana) *is likely to expand with increasing temperatures, and the distributions of warblers that feed on it may shift significantly farther north. The average latitude of occurrence of both the Cape May* (Dendroica tigrina) *and the Bay-breasted Warblers* (D. castanea) *has already moved north, and some models project that both of these species, and the Tennessee Warbler, may disappear south of 50° N.*

[*Vermivora peregrina*, Manitoba, Canada. Photo: Christian Artuso]

Regular duetting in which both sexes sing the main song has been recorded for the Painted Whitestart, Argentine populations, at least, of the Two-banded Warbler, the Russet-crowned Warbler (*Basileuterus coronatus*) and the Wrenthrush. There are also records of females giving a different song or call in response to the main song given by their mate. Female Spectacled Whitestarts, for instance, frequently emit a "tk-tk-tk-tk" sound in response to the typical song of the male. Masked Yellowthroats of the subspecies *velata* frequently duet, both sexes delivering a series of harsh grating notes that is quite different from the normal song of the male. In addition, a pair of Citrine Warblers (*Basileuterus luteoviridis*) has been recorded as duetting in Venezuela, one individual giving a rapid chatter and the other a series of squeaks and high notes. Again, both of these songs, if that is what they are, are quite different from the normal song of the male. Very few documented examples of singing by female temperate-breeding warblers are known. Females of the Yellow and Black-throated Blue Warblers and the Ovenbird do sing occasionally, and there is one record of a female Northern Parula singing. Similarly, female Chestnut-sided Warblers may give a series of complex vocalizations similar to a song.

Most of the tropical parulids appear to sing just one primary song, the variation reported for most species referring to geographical differences. Two distinct types of song have been reported for the Neotropical Fan-tailed Warbler, although the context in which the two songs are given and even whether it is the male that gives both song types are not known.

Most New World warblers sing from perches or while moving through vegetation. The species which most commonly sings while using a specialized display-flight is the Yellow-breasted Chat. This large species also has a loud and varied song, involving a variety of whistles, harsh scolds, cackles and chatters, which is totally unlike that of any other member of the Parulidae and is, perhaps, further evidence that it may not belong in the present family. The song flight itself is highly conspicuous and lasts for several seconds: the male launches himself into the air with slow, deep, exaggerated wingbeats, pumping the tail, the legs dangling and the head held above the level of the body; either he ascends almost vertically and then descends, or he travels in a similar display between two bushes. Several *Vermivora* species sometimes sing in flight, but, with the exception of the Nashville Warbler, they seem not to have a specialized display-flight for this purpose. The three *Seiurus* species have two song types, one of which is given in a special display-flight. This aerial song is given most often just before dusk, but it can be emitted occasionally at any time of day. It is regularly uttered by the Ovenbird and the Northern Waterthrush, but apparently less often by the Louisiana Waterthrush. Its function is not known. Otherwise, the act of singing while in flight has been recorded for Swainson's Warbler, the Mourning Warbler, MacGillivray's Warbler, the Common Yellowthroat, the Canada Warbler and the Red-faced Warbler.

Among all of the species that have been studied, it has been found that singing is most intense early in the morning, in the breeding season often starting just before dawn in temperate regions. Early in the breeding season singing may continue intermittently throughout the day, but it is generally the case that singing largely ceases around midday, with often another bout of song towards dusk. Singing is often inhibited by inclement weather, such as heavy rain and strong wind, and also by intense midday heat.

Many studies of the development of song in temperate-region New World warblers have been made, these suggesting that song appears to be largely learnt. Although there is likely to be an innate singing ability, as indicated by reports of American Redstarts and some other species singing a "formless song" soon after leaving the nest, young males appear to rely on exposure to adult male songs in order to develop their own repertoire fully. In those species which sing two song types, the Type 1 song may be learnt from the male parent, which often sings as he brings food to the fledglings, and the Type 2 song may be learnt by listening to the songs of neighbouring males. Studies of captive-reared Chestnut-sided Warblers revealed that chicks kept in isolation did not develop any species-specific song. Those to which recordings of adult Type 1 and Type 2 songs were played learned the former but not the latter, while those which heard recordings of both song types and were reared with two singing adult males learned both song types. This indicates that male chicks learn the Type 1 song from their father while in the nest and learn the Type 2 song from other males, this probably being fine-tuned in their first summer after hatching as they establish their own territory for the first time. This hypothesis may well hold generally for species which sing both song types, but it does need to be tested under field conditions.

Some evidence, from both the laboratory and the field, suggests that New World warblers do not possess an innate predisposition to learn only the species-specific song. In one study centred on the Chestnut-sided Warbler, in which the songs of the Common Yellowthroat and the Yellow Warbler were played to a hand-reared chick, the chick learned the song of the yellowthroat but not those of the Yellow Warbler. It was noted that the songs of Chestnut-sided and Yellow Warblers are very similar to each other, whereas those of the Chestnut-sided Warbler and the Common Yellowthroat are not, and it was suggested that the Chestnut-sided Warbler chick may have been able to discriminate innately between Yellow Warbler songs and those of its own species. In another study, a captive-reared Common Yellowthroat that was exposed to songs of its own species and songs of the Yellow Warbler developed an abnormal song; this consisted of a single note, rather than the 3–6 notes typical of wild individuals, that was delivered in typical yellowthroat fashion. Evidence from studies of the Northern Waterthrush's song indicate that factors such as song length, the number and repetition of phrases, and the phrase rate and frequency are innate, whereas the "morphological" characters





Most Myioborus *whitestarts are habitual flycatchers, and, like the American Redstart* (Setophaga ruticilla), *use their contrasting plumage to startle prey into flight. Different members of the genus use this technique to a greater or lesser extent. The Brown-capped Whitestart* (M. brunniceps), *for example, forages mainly by gleaning. The* ***Collared Whitestart****, however, frequently postures with drooping wings, flicking and spreading its tail to reveal the white edges. In one study, this method accounted for almost half its foraging activity, while 71% of its prey was made up of actively flying insects. Among its advantages, this technique forces well-camouflaged prey, which can otherwise only be found by patient gleaning, to reveal itself. "Flush-pursuit" foraging also exploits the anti-predator response of flying insects. Over millions of years they have evolved to escape in the opposite direction to the movement of the stimulus that disturbs them, which is normally the foraging bird's head. When the bird pivots its head to the left, the insect flies away to bird's right. But because the strongest stimulus comes from the pivoting of the whitestart's tail, the insect flies instead towards the direction in which the bird's head is facing, bringing it within the field of the bird's stereoscopic vision.*

[*Myioborus torquatus*, Costa Rica. Photos: Theodoulos Poullis]

of phrases must be learnt, and this study suggests that the same may be true of the Common Yellowthroat.

In the wild, a Chestnut-sided Warbler has been recorded as singing the song of the local Indigo Buntings (*Passerina cyanea*), and a juvenile Yellow-rumped Warbler was heard to mimic the song of local Nashville Warblers on islands in Isla Royale National Park, in Michigan, where the two species breed in close proximity to each other. A wild Common Yellowthroat in Massachusetts has been heard to deliver a very good imitation of a Chestnut-sided Warbler song, as well as its own.

Some New World warbler species appear to form what have been termed "song-pattern neighbourhoods", a phenomenon which arises when each male incorporates into his repertoire the patterns of neighbours' songs. These neighbourhoods have been reported for the Orange-crowned and Lucy's Warblers, and they indicate that for these species, at least, song-learning continues into adulthood. The song-pattern neighbourhoods reported for Orange-crowned Warblers consist of groups of two to six males singing similar songs that differ from those given in other, nearby song-pattern neighbourhoods. These can remain stable for up to ten years.

Among other parulid vocalizations, the most common and widely known calls of the temperate-breeding warblers are variations on the "chip" syllable. These are given as a contact call while the individual is perched, and serve a variety of functions, including the maintaining of contact between mated partners on the breeding grounds, and between conspecifics in foraging flocks during migration and on the winter grounds. The detailed quality of the call varies from species to species, but is quite constant within a species or subspecies, and the differences between species are often distinctive and quite easy to learn, although difficult to describe. Some of the most distinctive variations of the "chip" call include the rich metallic "chink" notes of the two waterthrushes, separable from each other with practice, the nasal "chimp" of Wilson's Warbler, the dry, nasal "tzek" of the Magnolia Warbler, and the relatively low-pitched "chup" of the Kentucky Warbler.

Migratory New World warblers generally have a flight call in addition to the "chip" calls. These are primarily contact calls, and the warblers sometimes emit them during short flights, as well as while actively migrating. Typically, parulid flight calls are a clear, high-pitched "see", "zip" or "zeet" note, those of some species having a buzzy quality. Unlike the "chip" notes, they are generally very difficult to identify to the species level. Although termed "flight calls", they are occasionally given by perched individuals, and "chip" calls are sometimes given by flying birds, especially on take-off or soon thereafter. They are used primarily as contact calls while the birds are on passage, but several species give such calls also on both the breeding grounds and the wintering grounds, indicating that these vocalizations are not used exclusively on migration.

Sedentary New World warblers in the Caribbean and the tropics likewise have a variety of common contact calls, and these are generally not based on the "chip" note that is so characteristic of the migratory species. In Cuba, the Yellow-headed and Oriente Warblers have a high-pitched staccato chattering, delivered rapidly; this has earned the Yellow-headed Warbler the common Spanish name of *chillina*, or "screecher". They have a variety of other buzzing and grating calls, and the Oriente Warbler also gives a sharp "tchip", reminiscent of the common call of temperate-breeding species. The *Myioborus* whitestarts generally have variations on a high-pitched "tsip", and variants of this type of call also characterize the common utterances of many of the *Basileuterus* species. In the latter genus, the Golden-browed (*Basileuterus belli*) and Russet-crowned Warblers emit a high-pitched, drawn-out "bzhreeeep" or "bzweeech"; the Rufous-capped Warbler has a hard "tcheck"; and the Santa Marta Warbler has been heard to give a short, weak trill. A slightly trilling "tridlip" forms another common call of the Russet-crowned Warbler. Members of the *Phaeothlypis* subgenus of *Basileuterus* tend to have louder, sharper calls, rather similar in quality to those of the temperate waterthrushes.

Young parulid warblers have a food-begging call while in the nest, and this is often used also when begging for food after fledging. These calls have not generally been studied in detail, but they are apparently quite variable. The begging call of nestling Virginia's Warblers is in the frequency range of 2500–8000 Hz, and Northern Parula nestlings and fledglings apparently have two different types of begging call, one of them being used specifically when the parents are approaching. The



*The **Magnolia Warbler** takes large numbers of caterpillars in spring and summer, mostly by gleaning, although it also hovers to pick prey from foliage. It feeds heavily on spruce budworm* (Choristoneura fumiferana) *larvae during outbreaks, but unlike its congeners, the Bay-breasted* (Dendroica castanea) *and the Cape May Warblers* (D. tigrina), *it seems unable to increase its clutch size to take advantage of this superabundant food supply.*

[*Dendroica magnolia*, Ontario, Canada. Photo: Glenn Bartley]

equivalent call of many *Dendroica* species, such as the "Black-throated Green complex" and the Blackburnian Warbler, among others, is quite similar to the "chip" note of the adults, but is often repeated in quick succession. For example, begging Golden-cheeked Warblers emit a rapid staccato "chip". The begging call of the Yellow-rumped Warbler is described as being harsh and distinctive, and fledgling Pine Warblers give a high, thin "seeet" or a rapid, harsh and buzzing "tick-tick-tidididididi". Among some of the other genera, fledgling Northern Waterthrushes give a high-pitched, buzzy "zeez", which is similar to a call used by the adults during courtship, and young Painted Whitestarts have a squeaky call that is delivered continuously when the parents arrive with food.

Various other calls may be given by warblers in specific situations, such as when alarmed, during courtship, and when under stress. For example, male Yellow Warblers have been reported as giving a hissing call in territorial defence, both sexes of Swainson's Warbler have been heard to utter a faint "twee-twee-twee" call during courtship, and both sexes of the waterthrush species give a high-pitched buzzy "zeet" or "zizz" in flight; male Black-throated Blue Warblers deliver a fast guttural trill in aggressive encounters with other males, and female Black-throated Blue Warblers give a high-pitched twittering call as part of a distraction display to divert attention from the nest. Some parulids have specific calls used as a warning to the young when a predator is detected near the nest. Mourning and MacGillivray's Warblers, for instance, utter a high-pitched "tsip" when they see predators near the nest; this call, the source of which is difficult to locate, temporarily stops the food-begging calls of the young. Yellow-breasted Chats have a variety of mewing, grating and chacking calls, many of which are incorporated into the species' unmistakable song, but they are apparently rather quiet when not singing.

Non-vocal sounds produced by members of this family are few. They are largely restricted to bill-snapping, which has been noted for several of the species. This is executed most often in aggression, such as during fights between males. Many parulids, when being handled for the purposes of ringing, for example, will snap the mandibles together in an attempt to bite the human handler.

Food and Feeding

Parulid warblers are primarily insectivorous, although they do occasionally take food items of many other kinds, and some species feed quite extensively on such foods as berries and nectar, especially in the non-breeding season. Some of the species also ingest grit on occasion, and this may be an aid to digestion in those few species, such as the Pine Warbler, which consume quantities of seeds. Insects and other arthropods, however, do undoubtedly form a large part of the diet of most warblers, particularly during the breeding season. As a family, they forage very widely, from the ground to the treetops and from the trunks to the terminal twigs of trees and bushes. Most species, nevertheless, have their own favoured foraging areas and techniques within their habitat, be it forest or more open areas.

Diets often differ among closely related species. For example, within the genus *Vermivora*, the Nashville and Lucy's Warblers appear to be entirely or almost entirely insectivorous, leafhoppers (Homoptera) forming a major part of the diet of the latter species, and Nashville Warblers feeding extensively on spruce budworms (*Choristoneura fumiferana*) during the periodic outbreaks of these insects in the boreal forests. In contrast, Tennessee Warblers, while almost exclusively insectivorous during the breeding season and, like the Nashville Warbler, concentrating heavily on spruce budworms during outbreaks, also feed extensively on fruit and nectar during the winter. Their diet can vary according to the season in their winter quarters. In Panama, during the wet season, examination of Tennessee Warbler stomachs revealed that nectar and flower parts made up 27% by volume of the total stomach contents; during the dry season 71·2% of the contents consisted of fruit. Tennessee Warblers are specialist nectar-feeders, in season, and will defend quite vigorously temporary territories around trees such as *Erythrina poeppigiana* and vines such as *Combretum fructicosum* while these are in flower. At such times the warblers' faces often become stained with orange or pink from the pollen, and these stains may become a "status symbol", making it easier for stained individuals to gain access to new flower sources than it is for unstained or less stained individuals to do so. Orange-crowned Warblers, too, are almost exclusively insectivorous during the breeding season,



Linnaeus described the Northern Parula (Parula americana) *as a tit (Paridae), and the family name Parulidae is derived from his error. As this* ***Crescent-chested Warbler*** *shows, the* Parula *species can be extremely tit-like in their behaviour, hanging upside down to investigate dead leaves and leaf clusters, particularly at the ends of branches. Also like tits,* Parula *species are found in mixed flocks of small birds in winter, often forming the nucleus of the flock.*

[*Parula superciliosa palliata*, Mexico City, Mexico. Photo: Manuel Grosselet]





The two Seiurus *waterthrush species have broadly different habitat preferences, the* ***Northern Waterthrush*** *preferring standing or slow-moving water, including swamps, while the* ***Louisiana Waterthrush*** *is associated with running water, particularly gravel-bottomed streams in upland deciduous forest. However, there is often considerable convergence in areas where their ranges overlap. Though highly aggressive towards their own species, they have been found to be tolerant of one another, even on one occasion nesting in the same upturned root. Similar in appearance, both birds constantly bob their tails. Although the slightly larger Louisana Waterthrush can take larger prey, including small fish and frogs, there is once again a considerable overlap in the invertebrates they eat. A study in Connecticut, USA, found that after the leaves came out in spring, the Northern Waterthrush broadened its foraging habits to include gleaning the foliage, while the Louisiana Waterthrush confined itself to aquatic sites and the ground. Nevertheless, the study concluded that the birds overlap in their foraging methods and prey to a greater extent than is usual with closely related species.*

[Above: *Seiurus noveboracensis*, Dos Venados Ranch, Starr County, Texas, USA. Photo: Andy & Gill Swash/ WorldWildlifeImages.com.

Below: *Seiurus motacilla*, Brooklyn, New York, USA. Photo: Tom Stephenson]



Many New World warblers, particularly temperate-breeding migratory species, broaden their diets outside the breeding season, when they tend to be exclusively insectivorous. From late summer onwards, the ***Yellow-breasted Chat*** *feeds extensively on the small fruits of a variety of indigenous plants. Pigments from the berries of the exotic morrow's honeysuckle* (Lonicera morrowii), *imported from Japan, have been put forward as the cause of an increase in records of Yellow-breasted Chats with varying amounts of orange in their plumage. Most New World warblers use only their bills when foraging. The Yellow-breasted Chat is the only species to have been recorded holding down food with its feet.*

[*Icteria virens virens*, Connecticut, USA. Photo: Jim Zipp/ardea.com]

but they will frequently eat berries and fruits during the winter months, when they are also attracted to feeders containing suet, peanut butter and even doughnuts. Along with other members of this family, this parulid will visit sapsucker (*Sphyrapicus*) wells in order to drink the sap collected within; for Orange-crowned Warblers studied in Colorado, in the west-central USA, the species involved was the Red-naped Sapsucker (*Sphyrapicus nuchalis*), which had drilled wells in willow trees.

Other warbler species that regularly feed on nectar during the winter include the Cape May, Bay-breasted, Black-throated Blue, Palm, Prairie and Yellow-throated Warblers. With the exception of the Bay-breasted Warbler, these species winter extensively in the Caribbean, and in the Bahamas they regularly visit flowers of the century plant (*Agave braceana*) to take the nectar. The Cape May Warbler appears to be especially dependent on nectar in winter, and it has a semi-tubular tongue, unique among the warblers, for this purpose. Like the Tennessee Warbler, it will defend flowering trees against conspecifics and other warbler species. Similarly, Palm Warblers have been recorded as defending flowering century trees in the Bahamas.

As noted, Tennessee Warblers specialize in feeding on spruce budworms during the outbreaks of these insects that occur periodically in the boreal forests. Nashville Warblers also do so, although to a lesser extent, and Bay-breasted Warblers will take advantage of this periodic abundance of food, but one species, the Cape May Warbler, specializes in this way more than any others. All of these species will lay a larger clutch in "budworm years", but the Cape May Warbler exhibits the most extreme variation in this respect, laying the standard clutch of four or five eggs in "normal" years, but typically six or seven or, sometimes, up to nine eggs in "spruce budworm years", when the young are fed almost exclusively on these moth larvae. The Cape May Warbler may, therefore, have one of the most specialized diets of all the *Dendroica* species, being particularly tied to spruce budworms in the breeding season and with a unique adaptation for nectar-feeding on the winter grounds.

The Yellow-rumped Warbler is another species which is primarily insectivorous during the breeding season, but which has a different diet during the winter. In the latter season it consumes a wide variety of berries, often specializing in eating those of bayberry and waxmyrtle (*Myrica*). The colloquial name of "Myrtle Warbler", used for the northern and eastern races of this species, comes from its fondness for waxmyrtle berries. This species has special adaptations for digesting the waxes and lipids contained in these berries, including the retrograde reflux of the intestinal contents to the gizzard, slow passage of the lipids through the gastro-intestinal tract, and elevated bile-salt concentration in the gallbladder and intestine. The wax in bayberries contains important nutrients, such as glycerides of myristic, palmitic, oleic and steric acids, as well as traces of protein and carbohydrate, and it may be possible for Yellow-rumped Warblers to survive for short periods solely on these berries. As with the Orange-crowned Warbler, this ability to exploit alternative food sources, including feeders, allows the species to winter farther north than most other warbler species; it is able to survive in places where it would be quite impossible to rely on a purely insectivorous diet. It has been shown that the Yellow-rumped Warbler is significantly less averse to novel food items than other *Dendroica* species which winter farther south, and this opportunism is undoubtedly an important factor in enabling it to survive in colder climes. Pine Warblers are known to eat seeds, especially those of pine, in the winter months, and they, too, are able to overwinter farther north than most parulid species.

Many other *Dendroica* species, along with the Prothonotary Warbler, will take some seeds, fruits and berries in winter, and Bay-breasted Warblers apparently feed quite extensively on fruits in their non-breeding quarters. Mourning Warblers have been seen to eat the white corpuscles that form in the leaf bases of young *Cecropia* trees. The tropical genera, in particular the *Myioborus* whitestarts, seem to be much more strictly insectivorous. Among the *Basileuterus*, the Golden-crowned, Rufous-capped and Black-cheeked Warblers have been reported as occasionally eating berries.

Most New World warblers use only the bill when foraging and feeding. The Yellow-breasted Chat, however, has been recorded as using its feet to hold down food before eating it. Apparently, this behaviour has not been recorded for any other member of the family.



Nectar can play a brief but important part in the diet of migrating and wintering New World warblers, and several have been recorded defending flowering shrubs aggressively against their own and other species. The Cape May Warbler (Dendroica tigrina) *seems to be particularly dependent on nectar, and has evolved a semi-tubular tongue, which is unique in this family. The* ***Orange-crowned Warbler*** *pierces the bases of flowers such as aloes with its bill to get at the nectar. It has been recorded visiting hummingbird feeders containing sugar-water, and also taking sap from "wells" drilled in trees by sapsuckers* (Sphyrapicus).

[*Vermivora celata*, Chicago, Illinois, USA. Photo: Rob Curtis/ The Early Birder]

The two waterthrush species are unusual among the Parulidae in that they forage largely around wet substrates, and they are also among the few warbler species known to take vertebrate prey. The Northern Waterthrush feeds around the shallow margins of pools, puddles and bogs and takes mainly invertebrate prey, including aquatic beetles (Coleoptera), molluscs and crustaceans. In South Carolina, however, migrant Northern Waterthrushes have been recorded as taking fish such as small minnows (Leuciscinae), and the stomach of one individual examined in the breeding season was found to contain a small salamander (Caudata). Louisiana Waterthrushes are slightly larger birds and generally take slightly larger prey items, as well as showing a strong preference for foraging in flowing water, such as streams, at all seasons. They, too, feed mostly on invertebrate prey, but they have been reported to prey on small fish and, in Cuba and Puerto Rico in winter, they also take small frogs. The Riverbank Warbler and the Buff-rumped Warbler, a tropical species pair, feed in a manner similar to that of the waterthrushes.

Only three other New World warblers are known to take vertebrate prey. Both the Whistling Warbler and Swainson's Warbler have been documented as eating small lizards, and the Ovenbird, in the same genus as the two waterthrushes, has been recorded as eating, but only very rarely, small lizards and frogs. It is possible that the larger members of the family may take small vertebrates more often than is suggested by this paucity of records, but vertebrate prey are certainly not a typical food item for most warblers.

Foraging techniques utilized by the Parulidae vary quite widely, some species being generalists and employing a variety of techniques, and others specializing in just a few. Among the foraging methods widely used are gleaning, probing, hanging, flycatching and sallying, and variations thereof. On a vertical scale, the New World warblers can be broadly divided into terrestrial, brush and arboreal foragers, gleaning and probing occurring at all levels and the other techniques being used in the brush and arboreal zones.

Gleaning is the single most widely used foraging technique among the Parulidae, and it is probable that most, or even all, members of the family use it to a greater or lesser degree. Gleaning typically involves the picking of invertebrate prey from a substrate with the bill, typical substrates being the ground, leaves, bark and so on. Terrestrial gleaners, such as the Ovenbird, Swainson's Warbler and the Kentucky Warbler, frequently overturn leaves on the ground in order to glean prey either from the underside of the leaf or from the ground beneath it. The two waterthrushes also glean largely from the ground, but they specialize in foraging in wet habitats, along the edges of streams, pools and puddles. The Buff-rumped and Riverbank Warbler are tropical species which forage on similar substrates and in a similar manner, but these two will also make short flycatching sallies from the ground; in both of these foraging techniques they are notably different from the other *Basileuterus* species, and are often placed in a separate genus *Phaeothlypis* (see Systematics).

Perch-gleaning is probably the most common type of gleaning employed in the brush and arboreal zones. It involves the bird in gleaning from the surface of leaves, twigs or bark while perched in the tree or bush. Parulids inhabiting the understorey and undergrowth, such as most *Basileuterus* warblers and the yellowthroats, are probably the most habitual perch-gleaners, as the more acrobatic foraging techniques would be difficult in the dense vegetation. In hover-gleaning, sometimes referred to also as "sally-striking", the bird gleans prey from a leaf that is inaccessible from a perched position, momentarily hovering in order to do so. Most or all perch-gleaners will probably also hover-glean when the occasion demands, and Black-throated Blue Warblers appear to specialize in this technique, at least during the summer, spending more time in perch-gleaning during the winter months.

Flycatching is perhaps a more conspicuous method of obtaining food. In this, the bird flies out from a perch to catch prey in mid-air. This behaviour is most common among the arboreal foragers. The American Redstart is the most habitual practitioner

of flycatching among the New World warblers, and its relatively weak legs, broad-based bill and elongated rictal bristles at the base of the bill reflect this specialization well (see Morphological Aspects). Indeed, on the breeding grounds it even competes with the Least Flycatcher for the same species of flying insect. Studies have revealed that Least Flycatchers are dominant in these aggressive encounters, but that American Redstarts are more flexible in their foraging behaviour, utilizing hover-gleaning and perch-gleaning, as well as flycatching, so that co-existence is possible. The American Redstart has a very distinctive plumage, with conspicuous orange or yellow patches on the wings and tail, and it continually flashes these bright patches by spreading the wings and fanning the tail. These actions are designed to flush from the foliage insects, which the redstart then pursues in the air. The *Myioborus* whitestarts are habitual flycatchers, but they are not so specialized as the American Redstart in this technique. Similarly, the Hooded Warbler is something of a flycatching specialist, certainly more so than its two congeners in *Wilsonia*, and many *Dendroica* and *Vermivora* species, in particular, will also practise flycatching on occasion.

The technique of probing involves the insertion of the bill into crevices or leaf clusters in order to search for prey. As with the previous technique, it is commonest among arboreal foragers. Specialized probers generally have a relatively long and pointed bill, and other species that probe regularly show this adaptation to a lesser degree. Among the probers, the Blue-winged, Golden-winged and Flame-throated Warblers habitually insert the bill into clusters of dead leaves, often hanging acrobatically to investigate such clusters at the ends of the outer branches of trees and bushes. In this respect, hanging is generally used alongside probing as a foraging technique, although it is employed also to assist with gleaning in a similar fashion, especially by Tennessee and Whistling Warblers. The Worm-eating Warbler specializes to some extent in probing terminal clusters of dead leaves in the non-breeding season, whereas in the summer it feeds more by gleaning at lower levels, mostly in the undergrowth and occasionally on the ground.

Other species probe in bark fissures for invertebrates. The Black-and-white and Yellow-throated Warblers are particularly adept at this behaviour, and the Pine, Prothonotary, Yellow-headed and Oriente Warblers also utilize this technique on a regular basis.

Certain New World warblers employ more specialized foraging techniques. The foraging behaviour of the *Granatellus* chats has not been intensively studied, but at least one of the three species, the Grey-throated Chat, frequently follows swarms of army ants (Ecitoninae) in order to feed on the invertebrates that are flushed out by the swarm. This is a specialization used by many tropical species, especially many species of antbird (Thamnophilidae, Formicariidae), which derive their name from this very behaviour. So far as is known, the Grey-throated Chat and the Neotropical Fan-tailed Warbler are the only parulids that follow army-ant swarms as a matter of habit, although others such as the Worm-eating Warbler and the Common Yellowthroat have been observed to do so occasionally. It may be that resident obligate ant-followers in the Neotropical lowlands prevent migrant parulid warblers from the Nearctic Region from exploiting this potential food source. Interestingly, a study in the mountains of Jalisco, in southern Mexico, found that migrant Yellow-rumped Warblers frequently followed army-ant swarms to feed on the disturbed invertebrates, and that Nashville, Black-throated Grey and Townsend's Warblers also attended such swarms, but less frequently. It was suggested that there are fewer resident obligate followers of army-ant swarms in the mountains of Mexico, perhaps allowing migrant warblers to exploit this food source, whereas the migrants are less able to do so at lower altitudes owing to competition from the resident obligate ant-swarm followers.

Swainson's Warblers, like Ovenbirds, forage largely on the ground, often turning over leaf litter to search for prey underneath. In Cuba, however, they have been seen to follow foraging Ovenbirds, investigating the leaves tossed aside by the latter.

Most New World warblers are small birds and need to find food regularly in order to maintain their metabolism. The majority of the species, therefore, forage actively, the smaller ones tending to do so more actively than the larger ones. Foraging rates vary within species, in correlation with other aspects of behaviour, particularly nesting activities. Studies of several *Dendroica*



Finding water for drinking is rarely a problem in the dense, damp woodlands and streamside thickets favoured by ***MacGillivray's Warbler****. Even when it nests in drier habitats, there is usually water nearby. When on migration, it finds similar habitats for stop-overs, including the scrub around desert washes. In the 1950s the US Fish & Wildlife Service began constructing permanent water tanks for wildlife in the Sonoran Desert. While these were occasionally used by migrants, including MacGillivray's Warblers, researchers found that most stopped at larger bodies of water such as rivers, which are more visible from higher altitudes.*

[*Oporornis tolmiei tolmiei*, Joshua Tree National Park, California, USA. Photo: Joe Fuhrman/ VIREO]



*In the northern part of its range, the **Painted Whitestart** is a short-distance migrant. The bird shown here will have returned to Arizona, from its wintering grounds south of Mexico City, sometime after the middle of March. Older, more experienced birds tend to get back first. Their timing must balance the need to beat the neighbours and claim the best territories with the risk of arriving before sufficient insect food is available. The sexes are similar, but this bird can be put down as a probable female because the male does not contribute to nest-building.*

[*Myioborus pictus pictus*, Tucson, Arizona, USA. Photo: Paul Bannick]

species, including the Blackburnian, Black-throated Blue, Black-throated Green, Magnolia and Yellow-rumped Warblers, have shown that females forage at a particularly rapid rate during the incubation stage and when the nestlings are very small. As they carry out all the incubation duties and spend up to 85% of the daylight hours on the nest (see Breeding), this is not surprising. No less surprising was the observation that the foraging rate of the males increased noticeably as the nestlings started to grow and required more food.

Several species of *Dendroica* breeding in the spruce forests of northern North America occur sympatrically and exploit similar food resources. These include the Cape May, Yellow-rumped, Black-throated Green, Blackburnian and Bay-breasted Warblers. In a famous study published in 1958, MacArthur showed that these species appear to avoid direct competition for food resources by concentrating their foraging in different parts of the spruce tree, as well as, to a certain extent, employing subtly different foraging methods. The canopy of a spruce is roughly conical, and MacArthur divided the canopy into six vertical components and three horizontal ones, the latter from the trunk outwards. He then carefully observed in which section of the divided tree each of the species spent most of its foraging time. From this, he was able to demonstrate that each species concentrated its foraging efforts in a different part of the tree from those chosen by the other species. Cape May Warblers specialized in the outer branches at the top of the canopy. Blackburnian and Black-throated Green Warblers concentrated their efforts slightly lower down, but still in the top half, the former species preferring the outer branches and the Black-throated Green Warbler foraging, on average, a little farther in towards the trunk. The Bay-breasted Warbler concentrated its activity in the central part of the canopy, on both a vertical and a horizontal scale, and the Yellow-rumped Warbler spent the majority of the time in foraging in the lower third of the canopy and on the ground. MacArthur also found subtly different foraging methods among the five species, and D. H. Morse later observed that this was probably due to different characteristics of the foliage in different parts of the tree, rather than to independent attributes of the species. For example, Cape May Warblers spent more time in flitting vertically from branch to branch while foraging, as might be expected for a species that forages in the outer branches of the treetops, whereas Yellow-rumped Warblers, which forage more widely over the lower parts of the canopy, spent more equal amounts of time in flitting vertically and horizontally between branches and moving along branches.

Breeding

The breeding season of all New World warblers nesting in the temperate zone is in spring and summer, when warmer temperatures provide appropriate conditions for the abundance of insect life with which they feed their young and, to a large extent, themselves. As would be expected, the season starts early in the southern USA and northern Mexico, often as early as March for sedentary populations, whereas in the far north, in Canada and Alaska, nesting does not commence until late May or June. For the tropical species, egg-laying is not dependent on a sudden spring flush of insect life, but most areas of the tropics do have at least one pronounced rainy season, which may also produce a relative abundance of insects. It is likely that many or, perhaps, most tropical New World warblers time the breeding season to coincide with the onset of the rains, and this has in fact been documented for two endemics of the Tumbes region of south-western Ecuador and north-western Peru. Here, both the Grey-and-gold Warbler (*Basileuterus fraseri*) and the Three-banded Warbler breed during January to March or April, which is the rainy season in this area. Farther south breeding is more seasonal, with southernmost Masked Yellowthroats migrating south to central Argentina in September, at the start of the austral spring, prior to breeding.

Although few species have been studied in any detail, it is thought that most tropical parulid warblers pair for life and remain on or near the territory throughout the year. In marked contrast, temperate-breeding warblers migrate to their breeding areas each spring and establish a new territory every year, not neces-



*The nest of the **Chestnut-sided Warbler** is typical of temperate-breeding parulids: a cup of grasses, shredded bark and weed stalks, often lined with animal hair. The Chestnut-sided Warbler's nest is placed up to 1 m above the ground, in a bush or sapling. New World warblers in general are monogamous, but extra-pair mating, leading to multiple paternity of the eggs in a single clutch, may be widespread. In one study of Chestnut-sided Warblers, 47% of nestlings had extra-pair fathers, and 60% of broods contained such young. This is at the upper end of the range reported for bird populations. Most of the extra-pair fathers proved to be neighbouring territory-holders, rather than floating, unpaired males. Some males were found to have fathered many more extra-pair young than others, and this contributed significantly to their overall reproductive success, with up to seven offspring compared to the usual brood size of three to five.*

[*Dendroica pensylvanica*, Thunder Bay, Ontario, Canada. Photo: Wayne Lankinen/ DRK]

sarily with their mate of the previous year. The exact timing of arrival on the breeding grounds is probably determined by two conflicting selection pressures: the desire to arrive before neighbouring conspecifics and thus to acquire the most favourable territory, and the need to avoid arriving before there is sufficient insect food and thus facing possible starvation. Males arrive, on average, several days before the females, and early-arriving males will have established a territory by the time when the first females reach the breeding area. There appears to be a selective pressure on females, as well as on males, to arrive on the breeding grounds as early as possible: although it is the male that establishes a territory, an early-arriving female will have a better choice of territories and is more likely to mate with a genetically fitter male, the male having demonstrated this by the fact that he arrived early and secured the best available territory. In one study of Magnolia Warblers, it was found that the earliest migrants in spring might actually lose weight during migration stopovers, such is the presumed selective pressure to arrive on the breeding grounds early. Parulid warblers tend to return to the same breeding territory each year, and will often, therefore, meet up with the same mate in successive years. This is not, however, always the case, and females show less site-tenacity than males. Among both males and females, older individuals arrive earlier, on average, than first-year birds, and this may be directly related to experience, those which have already made the journey at least once being able to reach the breeding grounds sooner than naive first-years.

As a general rule, New World warblers are monogamous, the two partners remaining together throughout the breeding season. There are, of course, some exceptions, but these involve mainly the temperate-nesting migratory species. Among the sedentary tropical species, the pair-members tend to remain together throughout the year. This reduces the opportunity for polygamy, and this behaviour has not been recorded for tropical species. Many parulids, including the Rufous-capped, Golden-browed, White-browed and Buff-rumped Warblers, and probably the Riverbank Warbler and the Wrenthrush as well, remain on the breeding territory throughout the year. Many other tropical warblers tend to join mixed-species foraging flocks when not breeding.



*One of only two New World warblers species that regularly nest in holes, the **Prothonotary Warbler** builds its cup-shaped nest either in a natural cavity, or an old woodpecker (Picidae) or chickadee (Paridae) hole. The nest-site is usually a tree surrounded by water. Early in the season, males may construct a number of "dummy" nests. No other parulid is known to do this. In some vireo (Vireonidae) species, part-built nests are used to attract females, but the function in the Prothonotary Warbler is unknown. The nests actually used for breeding are built by the female without the male's help.*

[*Protonotaria citrea*, Lake Koshkonong, Wisconsin, USA. Photo: Rob Curtis/ The Early Birder]

Since the temperate-breeding migratory species pair up only in the breeding season, and not necessarily with the same mate in successive years, this does provide an opportunity for polygamy. Although rare, polygyny, with the male mated with two or more females, has been recorded for the Yellow Warbler, Black-throated Blue Warbler, Prairie Warbler, Blackpoll Warbler, American Redstart, Wilson's Warbler and Common Yellowthroat. In one species, the Painted Whitestart, polygyny has been reported as being regular; it was apparently regular also for the Black-throated Blue Warbler at one study site in New Hampshire, in the north-east USA, and it is reported as being not rare for Wilson's Warbler in the Sierra Nevada mountains of California. Polyandry, whereby a female is mated with more than one male, appears to be much less common, but it has been recorded for the Ovenbird. Reasons for polygamy are not well known, but in the case of the American Redstart it was suggested that a locally low proportion of males may have been a factor, while in the Blackpoll Warbler strong site-fidelity by females was suggested as the cause.

Male New World warblers defend their territory and advertise for mates largely through song (see Voice). Courtship displays have been described for many temperate-breeding species, and these generally exhibit little variation, even between different genera. Typically, the initial display involves a short chase in which the male pursues the female, often forcing her to the ground or to a perch. The female's response flight to this initial chase is typically low and over a short distance; this may signal the sex of the "invading" bird to the resident male, as intruding males tend to fly off high, soon leaving the territory. Mating may occur after a few such chases. Some species, including the Blue-winged and Golden-winged Warblers and the Yellow, Yellow-rumped and Prairie Warblers, also have a "moth flight", in which the male flies with rapid and exaggerated wingbeats away from the female; this is used in courtship and also in aggressive encounters with other males. In addition, several of these species have a gliding flight, in which the male glides on spread wings over a short distance. Various displays involving the spreading or fanning of the wings and tail are performed by males of many species in front of females. The male Lucy's Warbler pursues the female and spreads his wings to reveal the chestnut rump patch. Mate-guarding, in which the male closely follows the female as she forages, has been reported for some species, and probably occurs more widely. It is most frequent after copulations and before incubation begins, and it helps to guarantee the male's paternity by reducing the likelihood of the female meeting other males and indulging in extra-pair copulations during this time.

The courtship of the American Redstart has been studied in some detail by M. S. Ficken, who recognized three broad stages: pair formation; the period just before nest-building and in which the nest-site is chosen; and nest-building. Copulation occurs when the nest is nearly completed. Displays were grouped into two main categories: fluff displays, in which the male erects the feathers of the breast and back; and bow displays, in which he raises the head vertically while tipping the breast towards the ground, with the wings and tail held spread. The pair-formation stage lasts only a few hours, during which the female approaches the male to within a few metres, he then flies towards her, and she responds by circling away and returning to a nearby spot, rather than, as would a first-year male, fleeing. During the pre-building stage, the male performs a gliding display and frequently follows or chases the female, often forcing her to the ground, where copulation may be attempted, usually without success. The fluff and bow displays are performed during the nest-building stage, most often as preparation for copulation. The male also guards the female by following her closely during this stage. These displays and copulations become increasingly frequent as the nest-building stage progresses, but sexual activity ends quickly once the first egg is laid.

All members of this family build a nest of some description, placing it variously, depending on the species, from ground level



For most species studied, nest-building takes three to five days. The ***American Redstart*** *builds a neat cup-shaped nest of grass, bark strips and spider webs, lined with feathers, hair and rootlets. This bird seems to have added some wood shavings. The nest is placed 2–8 m up in a tree or bush. American Redstarts also make use of the cup-shaped nests of other species, such as the Yellow Warbler* (Dendroica petechia) *and the Red-eyed Vireo* (Vireo olivaceus). *As is usual with New World warblers, the female builds the nest alone, but the male follows her closely after mating to guard against insemination by other males. The males need to be extremely vigilant guards, since extra-pair mating seems to be common in this species—up to 40% of nestlings and in 16 out of 32 broods in one population. Males were found more likely to sire extra-pair offspring in the territories of younger than older neighbours, though new arrivals were the most likely to be cuckolded, and longer-established males the least likely. Unusually for this family, male American Redstarts take two years to achieve full adult plumage, and yearlings are generally less successful at maintaining territories and attracting mates.*

[*Setophaga ruticilla*, Upper Peninsula, Michigan, USA. Photo: Dave Maslowski/ Maslowski Productions]



Like most, if not all, other tropical parulids, ***Buff-rumped Warbler*** *pairs remain together on their territory all the year round. As a result, the tropical species tend to be more strictly monogamous than their temperate-breeding cousins, and are more likely to remain with the same mate from year to year, rather than finding a new one each spring. Instead of the neat, open cup built by most temperate-breeding species, the nests of* Basileuterus *warblers are bulky and domed, with a side entrance. Buff-rumped Warbler territories tend to be long and narrow, following the courses of streams, and the nests are built on the ground, on sloping banks; most tropical species similarly nest on or near the ground. Unusually for this family, the male Buff-rumped Warbler appears to help with nest-building. For the majority of of* Basileuterus *warblers, and for the other tropical genera, information on nesting and other breeding activity is scant to non-existent. Generally, reports of male participation in nest-building among New World warblers have been treated with caution, particularly for the temperate-breeding species that have been studied in greater detail.*

[*Basileuterus fulvicauda fulvicauda*,
Chandless State Park,
River Purús, Brazil.
Photo: Dante Buzzetti]

to high in a tree. That of temperate-breeding species is typically an open cup built with grass stems, leaves and other plant material, and lined with softer plant material such as mosses and grasses, together with feathers, hair and spider webs. All *Dendroica*, *Vermivora*, *Oporornis* and *Wilsonia* species build this type of nest, as do most other temperate-breeding species, so far as is known.

There are, of course, many exceptions to this generalization concerning the shape of the nest. Among the temperate-breeding species, the Ovenbird, unlike its two congeners, builds a nest with an arched-over roof and a side entrance, the structure resembling an old-style Dutch oven. It is for this unusual nest that the bird has acquired its common vernacular name, and the odd nest is one of the reasons why some taxonomists have suggested that the species be placed in its own monotypic genus (see Systematics). Two *Parula* species, the Northern and Tropical Parulas, build a dome-shaped nest with a side entrance that is generally hollowed out in a clump of soft vegetation such as *Tillandsia* mosses and *Usnea* lichens; indeed, the Northern Parula uses almost exclusively clumps of *Usnea* in the northern part of its range and *Tillandsia* in the southern part, and is thus largely tied to areas where these plants occur commonly. Conversely, the two other *Parula* species, the Crescent-chested and Flame-throated Warblers, as well as all of the closely related *Vermivora* species, build more standard cup-shaped nests.

Just two species of New World warbler regularly nest in cavities. Lucy's Warbler builds a cup-shaped nest in a cavity, typically in a mesquite bush or behind loose bark in a mesquite bush, but it will also use old woodpecker (Picidae) holes and Verdin (*Auriparus flaviceps*) nests. Similarly, the Prothonotary Warbler builds a cup-shaped nest typically in a hole in a tree, but it also uses nestboxes and old woodpecker and chickadee holes; apparently, it prefers old milk cartons to the more traditional wooden nestboxes. Generally, the tree in which the nest-cavity is situated is surrounded by standing water, which provides some protection against terrestrial predators. This is not always the case, however, and some nest-sites are some distance from the waterside. Recently, four nests of Black-throated Green Warblers have been found in tree cavities; three of these were in the excavations made by feeding Pileated Woodpeckers (*Dryocopus pileatus*), and the fourth was in the scar left by the larva of a sugar maple borer (*Glycobius speciosus*), a long-horned wood-boring beetle. This is the first record of a *Dendroica* species nesting in a tree cavity.

The nests of tropical species are poorly known compared with those of their northern relatives, but many of them build a dome-shaped nest with a roof and a side entrance, generally on or near the ground. Virtually all of the nests of *Basileuterus*

Apart from the Prothonotary Warbler (Protonotaria citrea)*, the only other parulid known to nest habitually in holes is the diminutive* ***Lucy's Warbler****, the smallest species in the family. The highest breeding densities are in honey mesquite* (Prosopis glandulosa) *thickets, but elsewhere in the range Lucy's Warbler uses riverside cottonwood–willow* (Populus–Salix) *woodland. In closed-canopy mesquite woodland, the nests may be as little as 30 m apart, whereas in a narrow belt of mesquite along the Colorado River near Blythe, California, nests were uniformly spaced to occupy strips about 180 m long. The nests are built in natural cavities in the trees, in woodpecker holes, or sometimes behind loose bark. Lucy's Warbler also uses the abandoned nests of the Verdin* (Auriparus flaviceps).

[*Vermivora luciae.* Photo: Wardene Weisser/ardea.com]



species so far found have consisted of a domed structure, with the posterior wall extended to form a cover over the nest, and those of the two *Ergaticus* species, namely the Red Warbler and the Pink-headed Warbler (*Ergaticus versicolor*), are of this same design. Interestingly, the Collared Whitestart is said to build a dome-shaped nest, whereas the nests of all other *Myioborus* species that have been described consist of an open cup. Recently, a nest of the White-browed Warbler has been described from Brazil; it appeared to be an open cup, rather than the usual domed structure, but this is the first non-domed *Basileuterus* nest to have been described in the literature. A study of four *Basileuterus* species in Ecuador, published by H. F. Greeney and colleagues in 2005, provided the first known details of the breeding ecology of the Three-banded Warbler and confirmed the general design of a bulky domed nest with a side entrance as being typical of this genus. These authors did note, however, that the details of the design varied quite considerably, from the relatively simple and unlined domed structure of the Black-crested Warbler to the much more intricate structure of the Three-striped Warbler, the latter being composed of seven different plant materials and having three distinct layers.

Uniquely among the Parulidae, the Wrenthrush builds a nest which is a hollow ball of tightly packed mosses, with a small entrance hole at the side. It is placed on the ground, and is generally concealed on a mossy bank.

Generally, the members of this family build only one nest per season. The Prairie Warbler, however, routinely starts several fragmentary nests before one is selected for finishing, and male Prothonotary Warblers build several dummy nests (see below).

So far as is known, nest-building is undertaken entirely by the female, at least in the case of the temperate-breeding species. There are several early accounts of males helping with nest-building, these involving the Magnolia, Black-throated Blue, Golden-cheeked, Black-throated Green and Yellow-throated Warblers, but Morse considered that these should be viewed with caution, partly because of the similarity in plumage between the sexes of some



Typical clutch size for temperate-breeding species like the ***Chestnut-sided Warbler*** *is three to five eggs, usually four. The clutches of tropical species are smaller, at two to three. Incubation times vary, too: in the Chestnut-sided Warbler it lasts 11–12 days, and for temperate-breeding species in general 11–14 days is typical; but among the few tropical species that have been studied, incubation lasts 15–17 days.*

[*Dendroica pensylvanica,* Adirondack Park, New York, USA. Photo: Dave Maslowski/Maslowski Productions]



Egg-laying usually begins within a day of nest completion, although there can be a longer delay early in the season. The eggs are laid at a rate of one per day, soon after sunrise, and in temperate-breeding species like the ***American Redstart****, incubation begins with the last egg of the clutch. As far as is known, the female alone incubates in all the temperate-breeding species, although there is one record of a male American Redstart brooding young after apparently relieving the female so that she could forage. The female generally spends the entire night, and up to 90% of daylight hours, on the nest. The male may bring food to her while she is sitting, especially during cold weather when she cannot leave the eggs. Male American Redstarts guard their mates closely while they are nest-building, but when this is complete, they begin to wander outside their own territories, in search of opportunities for extra-pair copulation. According to one study, they can spend as much as 18% of their time off-territory, mostly intruding on neighbouring territories, especially where the females are still building their nests.*

[*Setophaga ruticilla*, Michigan, USA. Photo: John Shaw/NHPA]

of the species concerned. For two temperate-breeding species, Kirtland's Warbler and the Prairie Warbler, which have been studied in detail in this respect, the males were not found to assist with the task of building. It has been established, however, that male Prothonotary Warblers frequently build incomplete "dummy" nests early in the season. The purpose of these is not clear, nor is it clear whether the females complete one of these dummy nests or start a fresh one, but such behaviour has not been recorded for any other New World warbler.

For most species studied, nest-building takes 3–5 days, the exact timing being dependent on weather conditions and the condition of the female upon arrival on the breeding grounds. Poor weather and exhausted females result in slight delays in the completion of the nest. Yellow-rumped Warblers have been reported as taking ten days to complete the construction of the nest, but this would appear to be an unusually long time. Nolan, studying Prairie Warblers in Indiana, found that replacement nests and those built later in the season were completed more quickly than first nests built earlier; this was considered to be due to the fact that earlier nests are larger and more heavily lined, perhaps because of the slightly colder weather conditions early in the season. Little study has been made on the duration of the nest-building time of tropical species, although Morse states that tropical warblers typically take a week or more to build their nests, in contrast to the 3–5 days required by their northern counterparts.

Egg-laying often commences within a day of the completion of the nest. This, however, is variable, and delays of up to nine days between nest completion and the laying of the first egg have been reported for northern species. Typically, eggs are laid at a rate of one per day, generally soon after sunrise, until the clutch is complete. Nolan, in his long-term study of Prairie Warblers, found that there was a longer delay between the completion of the nest and the laying of the first egg early in the breeding season than was the case later on in the season: in the period from 25th April to 15th May the delay was 0–8 days, with a mean of 2·5 days, whereas the corresponding figures for 16th–31st May were 0–4 days, with a mean of 1·6 days. Occasional "skipped" days in the laying sequence have been reported for many of the species that have been studied in detail, such as the Yellow, Yellow-rumped, Black-throated Green and Prairie Warblers, and for the Yellow Warbler, at least, this was found to be more likely to occur early in the season and early in the laying sequence. Conversely, with Black-throated Green Warblers, the skipped day is most likely to be between the penultimate and last eggs of the clutch.

Average clutch sizes vary considerably and constantly between temperate-breeding and tropical species, those of the former being notably larger. The typical clutch of temperate-breeding species consists of four or five eggs, the regular extremes being three and seven, whereas that of tropical species is of two eggs, with larger clutches of three or occasionally more eggs reported at higher Neotropical latitudes, where climatic conditions are more temperate. Those northern species whose breeding activities correlate with the cyclical fluctuations in spruce budworm populations lay larger clutches when the budworms are at their highest levels (see Food and Feeding). The Cape May Warbler is the parulid most closely linked to the spruce budworm as a food source, and this species lays six or seven eggs, and occasionally up to nine eggs, in "spruce budworm years", but more typically four or five in other years, when this food source is at a more normal level. Bay-breasted Warblers, too, lay larger clutches, of up to seven eggs, in "budworm years", and the same may be true of the Tennessee Warbler, for which a range of 3–8 eggs in a clutch has been recorded, with 4–5 the norm.

There are very few records of temperate-breeding species laying fewer than three eggs, but the American Redstart has been known to lay a clutch of two. In contrast, the typical clutch size of all tropical warblers is two eggs, some species occasionally laying three, and records of four-egg clutches only documented for the Pink-headed, White-browed and Golden-crowned Warblers, the last in Costa Rica, and occasionally for the Grey-crowned Yellowthroat in the northern part of its Middle American range. Generally speaking, clutches of three eggs are more common among those species nesting in more northern parts of the tropical region and the subtropics, such as the Caribbean and northern Middle America, and in southern Brazil and Uruguay.

This difference becomes especially apparent when comparing closely related species nesting in, respectively, temperate areas and tropical areas. For example, the Yellow-throated and Grace's Warblers, and the "Adelaide's Warbler complex" (see Systematics), are all closely related, forming a superspecies. The Yellow-throated Warbler breeds in south-eastern North America



A report from Brazil of an open, cup-shaped nest belonging to a ***White-browed Warbler*** *is the only instance yet known of a* Basileuterus *warbler building an un-domed nest. This bird is sitting in a more typical domed nest. A distraction display, presumably intended to lead an intruder away from a nest, has been described for this species. The bird moved in tight circles on the ground with its tail fanned, fluttering its wings as though unable to fly, and giving an unusual high-pitched call. After leading the observer in a straight line for around 10 m, repeating the circling behaviour when its pursuer paused, the bird flew up to a low branch and gave its usual harsh alarm call.*

[*Basileuterus leucoblepharus leucoblepharus*, Vila Velha State Park, Paraná, Brazil. Photo: Dante Buzzetti]



*Male **Yellow Warblers** feed their mates at the nest, though they may simultaneously be seeking extra-pair mating opportunities. One study suggests that males with more brown streaking on their breasts are most successful at this. The huge range and numerous subspecies of the Yellow Warbler enable it to demonstrate that the tendency for clutch sizes to be smaller in the tropics applies within, as well as between, species. The races in the northern "*aestiva *group" produce three to five eggs, whereas those in the mostly Caribbean "*petechia *group" lay one to three eggs. Members of the "*petechia *group" also tend to incubate their eggs for a day longer.*

[*Dendroica petechia aestiva*, Domaine Maizerets Park, Quebec, Canada. Photo: Daniel Dupont]

and lays four eggs or, rarely, three or five; Grace's Warbler breeds in south-western North America and southwards to the northern parts of Central America and lays three or four eggs, three being the norm; and the "Adelaide's Warbler group" breeds on several islands in the eastern Caribbean, laying two or three eggs. It would be interesting to know whether northern Grace's Warblers lay more eggs, on average, than the southern breeders, and also whether the isolated subspecies of the Yellow-throated Warbler breeding in the Bahamas lays fewer eggs than the mainland populations. In the genus *Geothlypis*, the Common Yellowthroat breeding in North America lays 3–5 eggs, usually four, Belding's Yellowthroat, confined to Baja California, in north-west Mexico, lays 2–4 eggs, usually three, and the Olive-crowned Yellowthroat of Central America and north-west South America typically lays a clutch of two eggs. Sometimes, a difference is evident even within a single species. As an example, the Grey-crowned Yellowthroat breeds from northern Mexico south to western Panama, laying two eggs in the south of its range but more typically three and sometimes four in the north.

The reasons for this marked difference in clutch size between temperate and tropical species are not entirely clear. Higher speciation and narrower ecological niches may reduce food availability to individual birds in the tropics by both increasing competition and reducing the foraging space available. In other words, tropical parulid warblers may increase their breeding success by laying a smaller clutch, which means that they do not have to defend such a large territory in order to find sufficient food. In an environment where ecological niches are narrow and competition for resources is high, this could be the best strategy, especially if post-fledging survival of young is higher in the tropics as the juveniles do not have to undertake long and hazardous migrations. D. Lack argued that, as the amount of daylight hours is considerably lower in the tropics than in the temperate summer, smaller clutch size there is a consequence of a limit in the number of daylight hours available to feed the young. A. F. Skutch, however, has noted that tropical warblers appear not to spend all the time available to them in feeding their young, and he argues that in the tropics, where nest-predation rates are very high, a smaller clutch would result in a reduction in the number of visits to the nest, and this would decrease the chance of the nest being preyed on and could, therefore, increase the nesting success. This is an attractive hypothesis, but some studies have demonstrated that nest-predation rates are not necessarily higher in the tropics than they are in temperate zones. As with virtually all aspects of tropical ornithology, more detailed study is required in order to determine the reason or reasons why tropical warblers lay smaller clutches than their temperate counterparts.

Intraspecific brood parasitism, often referred to as "egg dumping", is rarely recorded for the Parulidae. In one study of Yellow Warblers, however, evidence of egg-dumping was found in four nests out of more than 1500 monitored, and had possibly occurred in seven others.

Incubation by temperate-breeding species generally begins once the last egg of the clutch has been laid, but for some species, such as the Prairie Warbler, it has been reported as beginning in the evening before the laying of the final egg. Females of many species sit in the nest intermittently while the clutch is incomplete, and do not begin full-scale incubation until the full clutch is laid. So far as is known, the female alone incubates the eggs, her mate often singing nearby and sometimes feeding her while she is on the nest (see below). Females typically remain on the nest throughout the night, and during the day they spend up to 90% of their time in incubating, leaving the nest only for short bouts of foraging.

Nolan's study of Prairie Warblers in Indiana found that, during the incubation period, females spent nearly 80% of their time incubating. This percentage was maintained even in very warm weather, when it would not have been necessary to keep the eggs warm, and it was, in fact, slightly lower during cooler periods, perhaps because the females had more difficulty in maintaining their energy budget and were forced to spend more time in feeding. It is commonly presumed that the main purpose of incubation, at least for passerines, is to keep the eggs warm, but these observations suggested to Nolan that a reduction of the risk of predation may have been a more important factor, at least in the case of these Prairie Warblers. Morse reported that female parulids nesting on islands lacking their principal nest predators, the Blue Jay (*Cyanocitta cristata*) and the American red squirrel



*Nests built by the **Tropical Parula** may be of two kinds. One, like that of the Northern Parula* (Parula americana), *is dome-shaped, with a side entrance, and is hollowed out of a clump of soft vegetation. The other, like that of the Flame-throated Warbler* (P. gutturalis) *is cup-shaped, and built within the shelter of an epiphytic plant, which provides the walls and roof of a substitute dome. The fourth member of the genus, the Crescent-chested Warbler* (P. superciliosa) *also builds a cup-shaped nest, but places it on or near the ground on a steep sided bank or ditch. This Tropical Parula is perching on the rim of a nest of the second type, built within an epiphyte, in Brazil. This species has previously been recorded building cup-shaped nests in Ecuador. The clutch is usually of two eggs, but can number up to four in the north of the range, in Texas and New Mexico. Five cup-shaped nests studied in Ecuador contained either two eggs or two nestlings. There seems to be no information on the incubation period anywhere in the species' range.*

[*Parula pitiayumi pitiayumi*, Serra da Cantareira State Park, Sao Paulo, Brazil. Photo: Dante Buzzetti]



For the first few days after the nestlings have hatched, naked except for a few patches of down, the female devotes as much time to brooding them as she did to incubating the eggs. Their eyes open after three days, and their feathers develop rapidly. By five days old they can thermoregulate themselves, and so need less brooding. The ***Yellow-rumped Warbler*** *sometimes has two broods in a year. This is more common in the "Audubon's group" of races, which range from western North America to Mexico and Guatemala, than in the more northerly "Myrtle group" to which the nominate race belongs.*

[*Dendroica coronata coronata*, Ontario, Canada. Photo: George K. Peck]

(*Tamiasciurus hudsonicus*), foraged more slowly during breaks from incubation than did those of the same species nesting nearby but in the presence of the predators, even though insect availability was estimated to be the same in both locations. This provides indirect evidence that incubation may be important in reducing nest predation among warblers generally.

Males of many of the Parulidae feed the mate on the nest while she is incubating. This phenomenon seems to be especially pronounced among Yellow Warblers, but is well known also for Prairie Warblers. Interestingly, male Prairie Warblers do not always feed the female at this stage when they bring food to the nest. They have been observed to eat it themselves or to leave the nest while still carrying it, and it has been suggested that the behaviour may be geared towards feeding the young, rather than the female, the latter sometimes benefiting incidentally. Whatever the reason, this behaviour demonstrates a direct male input into the costs of rearing the young by providing the female with extra nourishment and reducing the time that she has to spend in foraging for herself, thus reducing the chances of the eggs being preyed on or becoming chilled.

Temperate-breeding and tropical New World warblers differ markedly from each other both in their incubation periods and in the nestling periods of their young. These are notably longer in the tropics than in the temperate regions, and this, along with the extra time taken for tropical parulids to construct their nests, results in a considerably more protracted breeding season for tropical species. Typical incubation and fledging periods for temperate species are 11–14 days and 8–11 days, respectively. Hooded Warbler chicks leave the nest particularly quickly, frequently before they can fly properly, presumably in order to reduce the risk of predation. Prothonotary Warbler chicks will also leave the nest prematurely if danger threatens, and they can swim before they are able to fly, a useful adaptation if the nest-cavity is surrounded by water.

The few tropical species for which data are available suggest that an incubation period of 15–17 days and a fledging period of 12–15 days are fairly typical. Morse has calculated that it takes tropical species, on average, a third as long again to raise their broods compared with their temperate counterparts. As with the question of the smaller clutch sizes of tropical species, the reasons for this are not fully resolved. Being permanent residents or very short-distance dispersers, tropical species are not under the same pressures to rear a family quickly as are the temperate species, which must complete their breeding cycle and head south before the northern, or southern, winter sets in. It is not known whether migrant Masked Yellowthroats breeding in temperate Argentina complete their breeding cycle more quickly than those breeding farther north in the tropical zone. This is, however, probably not the whole answer, as tropical species must be under other pressures to complete the breeding cycle quickly; these presum-



Males take on most of the work of feeding the young in the first few days, while the female is brooding. The male ***Common Yellowthroat*** *has been found not to discriminate between his own young, and the offspring of extra-pair matings involving other males. The masks of male Common Yellowthroats vary in size, some being almost twice as large as others. Males with larger masks have been found to be more successful both in securing partners, and in extra-pair mating. Overall, they sire more young than males with smaller masks.*

[*Geothlypis trichas*. Photo: Edgar T. Jones/ ardea.com]



In the first days after hatching, the male ***Mourning Warbler*** *brings food to the brooding female, and she distributes it to the young. The female, on the right here, has a paler hood than the male, and has no black on her breast. As the female gradually reduces the time she spends brooding, she increases the contribution she makes to feeding the young. The number of parental visits to the nest increases as the young birds grow larger. They are ready to leave the nest after nine days, but the parents will continue to feed them for up to a month.*

[*Oporornis philadelphia*, Nova Scotia, Canada. Photo: Ron Austing/VIREO]

ably include the risk of predation, the birds being safer once they have left the nest, especially as most tropical warblers nest on or near the ground. The reasons for the extended nesting period may be similar to the suggested reasons for the smaller clutch size; the shorter daylight hours available to tropical species may reduce the rate at which the young can grow and fledge, although this does not so adequately explain why the incubation period should also be longer. A reduction in the number of visits to the nest should reduce both the risk of predation and the growth rate of the nestlings, although there is presumably a trade-off here between reducing the number of nest visits, which should reduce the predation risk, and increasing the amount of time that the young spend in the nest, thus increasing their period of vulnerability at this time. So far as is known, all tropical parulids hide their nests well on or near the ground, thereby minimizing the chance of discovery by randomly searching predators. This being the case, a decrease in the number of visits to the nest would reduce the risk of predation by wait-and-watch predators, and so the strategy may well pay off.

On hatching, young warblers are atricial and naked, except for variable amounts of natal down, mainly on the head, neck and back. The eyes are closed, those of temperate-breeding species opening typically after about three days. Development of the feathering is rapid, with the main feather tracts often visible by just the second day after hatching. Initially, the female broods the nestlings to about the same extent as she incubated the eggs, but the brooding rate declines after three days and more rapidly after about five days, by which time the nestlings of temperate-breeding species are able to thermoregulate themselves. The extent to which tropical species may differ in this respect is not yet known.

Both parents feed the nestlings, the female gradually reducing the amount of time spent in brooding and increasing the amount spent in foraging, as already explained. For those temperate-breeding species which have been studied in detail, the nestling which begs with its head held highest above the rim of the nest receives the food from the parent about 90% of the time, and this is probably true of the Parulidae in general. Sometimes, the female takes food brought by the male and feeds it herself to the nestling. The number of parental visits to the nest, or the feeding rate, varies according to the number and age of the nestlings, generally being higher with a larger brood and also increasing as the young grow bigger. In a study of Yellow Warblers, the male's feeding rate when the young were two days old varied from 1·9 visits per half-hour for a brood of three nestlings to 3·1 for a brood of five; when the young were eight days old, these figures increased to 3·8 and 5·2, respectively. Initially, the male's feeding rate is higher than that of the female, but the two becomes more equal as the female switches from brooding to feeding the young. In one study of Three-banded Warblers in Ecuador, a brood of nestlings was fed with arthropods at a rate of 8–20 times per hour, the hourly mean being 15 times, and both adults typically visited the nest within a minute of each other, generally provisioning different nestlings.

Temperate-breeding parulids continue to feed their young for up to a month after the latter have left the nest, although the rate of feeding decreases with time over this period. Typically, the brood splits within a few hours of fledging, with one group cared for by the male and the other tended by the female. There appears to be little contact between these family groups and, although both generally remain near the breeding territory, female Kirtland's Warblers usually take their group farther from the territory than do the males. This behaviour has been observed to occur with several other temperate species, too.

Many, perhaps most, or even all, tropical New World warblers form family parties, whose members stay together for longer than do those of their temperate counterparts. Two tropical species that have been studied in some detail in Costa Rica are the Golden-crowned and Three-striped Warblers; the young of these two remain with the breeding pair as a family party until at least the following breeding season, and they were occasionally recorded as helping to defend the parents' breeding territory in the following year. One possible reason for this extended "family period" may be that a youngster may inherit the territory if anything untoward happens to one of its parents.

As a general rule, parulids rear only one brood per season, with replacement nests and/or clutches produced in response to early predation, brood parasitism or accidental destruction of the nest. Multiple broods have, however, been recorded for several of the species which breed in temperate regions. Indeed, studies

based on individually marked females indicate that multiple broods may be produced by temperate-breeding warblers more regularly than has traditionally been thought, even by such northerly species as the Blackpoll Warbler.

It is generally acknowledged that, for most passerines, the female typically invests the most energy in the early stages of breeding. The male's contribution to brood-feeding may, therefore, release the female from some of this energetically costly activity and, as a consequence, enable her to attempt a second brood. In a study of Black-throated Blue Warblers in the southern Appalachian Mountains, in North Carolina, K. W. Stodola and colleagues investigated whether the males and females altered their provisioning rates with regard to first and second broods. Their observations at a total of 239 nests at three study sites, over a six-year period, revealed that the females provisioned the young of first broods at a rate lower than that for second broods, whereas the males' chick-feeding rate did not differ between broods. The feeding rate of males was inversely associated with that of their partners, the males increasing their provisioning when the number of nestlings increased, while the females' provisioning rate decreased.

Brood parasitism by Brown-headed Cowbirds is a problem for many species in North America, and is increasing with the recent spread of cowbirds across the continent. There are records of parasitism by cowbirds for at least 41 of the parulid species which nest regularly in North America. Some species, mainly those of more open habitats such as the Yellow and Chestnut-sided Warblers, the Common Yellowthroat and the Yellow-breasted Chat, are very common hosts, while those breeding in dense tracts of undisturbed forest, such as Townsend's Warbler, the Hermit Warbler and the Northern Waterthrush, are parasitized only rarely. This is because cowbirds, being reliant on open country for feeding, do not penetrate far into undisturbed forest habitat.

Before the arrival of Europeans in North America, cowbirds were largely restricted to the Great Plains, where they were associated with the immense herds of American bison (*Bison bison*). When Europeans began to clear the forests for agriculture, often with ranching, the cowbirds adapted quickly to the extra niche. This brought them into contact with many forest species, including numerous parulid warblers, which had no defences against them. The change happened so quickly, in evolutionary terms, that most warbler species still have no defences against cowbirds, and this can have serious consequences for small populations. For example, when cowbirds reached the breeding grounds of Kirtland's Warbler, the problem eventually became so serious that human intervention was deemed essential in order to save the species from extinction (see Status and Conservation).

Warbler hosts can be divided into two groups. These are the "naive" hosts, those which do not respond aggressively to cowbirds during the nesting season and accept their eggs, and the "experienced" hosts, those which do respond aggressively to cowbirds and have evolved some defence mechanisms against the parasitism. As a general rule, naive hosts are species which have recently come into contact with cowbirds and have not had sufficient time to evolve defences against them. These include forest-breeding species such as the Black-and-white Warbler, the Northern Waterthrush and the Kentucky Warbler. Experienced hosts tend to be more open-country species such as the Yellow, Chestnut-sided, Black-throated Grey and Prairie Warblers, the Common Yellowthroat and the Yellow-breasted Chat. This is not, however, a hard and fast rule, and some parulids, such as the Black-throated Green and Blackburnian Warblers, will mob cowbirds near their nest but will accept the parasite's eggs and rear its young. This suggests that some evolution of defences against cowbird parasitism is occurring in these species. Further, different populations of a single species may differ in the extent of their contact with cowbirds, with the result that some populations are more "experienced" than others. In a study of American Redstarts, for example, it was found that individuals in populations which had a long history of contact with cowbirds were more likely to respond aggressively to the latter near the nest than those which had only more recently come into contact with cowbirds.

Defence mechanisms which have evolved against this brood parasitism include aggressive behaviour towards cowbirds near the nest, the deserting of a parasitized nest and rebuilding, and the burying of cowbird eggs in the parasitized nest and rebuilding on top of it. Only occasionally does the host destroy or eject



*The nestling period of the **Ovenbird** is remarkably short for a passerine. The young can leave the nest after a mere seven days, especially if disturbed. In one study, at nine out of 17 nests the young departed after six days. The time to nest departure seems to be directly related to food abundance, though in some areas Ovenbirds are subject to high levels of nest predation, and there are clear advantages in getting the young out of the nest as quickly as possible. The elaborately constructed nest in the shape of a "Dutch oven", after which this species is named, is quite different to the cup-shaped nests built by its congeners, the two waterthrushes.*

[*Seiurus aurocapilla aurocapilla*, Adirondack Park, New York, USA. Photo: Dave Maslowski/ Maslowski Productions]





Little is known about the breeding biology of the ***Golden-crowned Warbler****, but the feeding behaviour of parent Three-banded Warblers* (Basileuterus trifasciatus) *at the nest has been observed in detail in Ecuador; the Three-banded forms a superspecies with the Golden-crowned. The nest described contained two nestlings, which begged horizontally from the nest opening, emitting a thin, high-pitched call. They often anticipated the arrival of an adult by one or two seconds. The parents did not enter the nest, but perched just below the entrance. They were always seen foraging together, and 37% of feeding visits by one adult were followed within a minute by a visit from the other. When feeding in succession in this way, the adults commonly fed different nestlings. The food most often brought was a single arthropod, the size of the bill or smaller. Less frequently, the adults arrived carrying several prey items. If a nestling had difficulty in swallowing an item, the adults would remove the prey and soften it up, before returning it to the same nestling. Various studies suggest that the* ***Yellow Warbler*** *makes a dependable father, bringing heavier prey items, and feeding the young more often than the female.*

[Above: *Basileuterus culicivorus azarae*, Iguazú National Park, Argentina. Photo: José Calo.

Below: *Dendroica petechia aestiva*, Jamaica Bay, New York, USA. Photo: Johann Schumacher/ VIREO]



One suggestion to explain the slower development and extended nestling period of tropical parulids is that the parents make fewer feeding visits to the nest, to reduce the risk of attracting predators. The ***Flame-throated Warbler*** *has not been studied, but observations of the congeneric Tropical Parula* (Parula pitiayumi) *in Ecuador found that parents brought food to the two nestlings between 19 and 44 times per hour, with the highest rates in the first two hours after dawn. In the half-hour immediately before the second bird left the nest, it was fed 19 times. Further studies have suggested that nest location is a more significant factor in nest predation than the rate of parental visits.*

[*Parula gutturalis*, Costa Rica. Photo: Bernardo Saborío]

cowbird eggs. This may be due to the fact that the parasite eggs are too large for a small warbler to eject, so that burying them is therefore a better strategy.

Even experienced hosts frequently accept cowbird eggs. In a study of Prairie Warblers, it was found that younger females were more likely to desert a parasitized nest than were older females; one reason for this may be that a young bird that deserts a nest and then fails to rear any young will in subsequent years try the different strategy of accepting the cowbird egg. A study of Yellow Warblers revealed that the timing of the cowbird's egg-laying was important in determining whether cowbird eggs were accepted, and this is probably true for other warbler species, too. Yellow Warblers were more likely to accept cowbird eggs if these appeared when there were already at least two of the warbler's own eggs in the nest. This may be because the warbler has already invested heavily in the nesting attempt by the time when it has laid two or more eggs, and it may be a better strategy to accept the alien egg or eggs than to begin another nesting attempt at this late stage. There are at least two possible reasons why acceptance may be a better strategy at this point in the breeding cycle. One is that, by the time a clutch is half-complete, it may be too late to start again; in other words, the warbler may risk having no breeding success if it deserts at this late stage, while there may be more chance of rearing some of its own young if it accepts the cowbird eggs. The other reason is that cowbird eggs generally hatch a day or two earlier than Yellow Warbler eggs. If the cowbird lays before the warbler has started its clutch, its chicks will hatch first and have a good head start over the warbler chicks when it comes to begging for food. If there are at least two warbler eggs already in the nest, however, these should hatch before the cowbird eggs and those chicks, at least, will have a head start over the cowbird chicks and stand a reasonable chance of making it to the fledgling stage. A different study found that cowbird eggs hatch before Yellow Warbler eggs, despite being larger and even if they are laid a day or two later, because they have a more rapid embryonic development than that of the warbler eggs, and the presence of cowbird eggs also has the effect of delaying development in the warbler eggs, although the precise mechanisms of this are not known.

Forest-dwelling species in North America appear to be more successful in continuous forest than in fragmented forest. One of the principal reasons for this is nest parasitism by Brown-headed Cowbirds, as fragmented stands provide the open habitat favoured by the cowbirds. In a recent study of Hooded Warblers in large and small forest fragments, it was found that fledgling survival rates did not differ significantly between the two forest types, but that nest productivity was significantly higher in continuous forest. This indicates that it is the number of young leaving the nest, rather than their post-fledging survival, that contributes to higher productivity in more continuous forests.

The effect of cowbird parasitism on tropical New World warblers is far less well known. Among the *Basileuterus* warblers, there is one record of a Rufous-capped Warbler nest being parasitized by a Bronzed Cowbird (*Molothrus aeneus*) in Mexico. In Central America, the Grey-crowned Yellowthroat is parasitized by both Brown-headed and Bronzed Cowbirds, although the extent of this parasitism is unclear. In the Caribbean, the resident races of the Yellow Warbler, sometimes referred to collectively as the "Golden Warbler" (see Systematics), are parasitized by Shiny Cowbirds (*Molothrus bonariensis*); of 87 nests of this warbler in one study in Puerto Rico, as many as 65, or 74·7%, were parasitized. Shiny Cowbirds arrived in the Bahamas in 1994, and there may, therefore, be a risk that it will have a serious adverse effect on the endemic Bahama Yellowthroat and the endemic race *flavescens* of the Yellow-throated Warbler, although the latter species breeds in pine woodland, rather than open country.

Hybridization is fairly frequent in occurrence among temperate-breeding parulids, but, so far as is known, is far more rare among tropical ones. The phenomenon has been studied quite intensively with regard to the North American parulids, and it falls into three main categories: pairings between members of species pairs, including those between members of a superspecies; other intrageneric pairings; and intergeneric pairings. The first of these categories is the most frequent and also the easiest to explain. The pairs most often involved are the Blue-winged and Golden-winged Warblers, the "Myrtle" and "Audubon's" groups of the Yellow-rumped Warbler (see Systematics) and Townsend's



Less than 25% of the original bottomland forest remains at the heart of the breeding range of the ***Prothonotary Warbler*** *in the southern USA. The highest remaining breeding densities are in the lower Mississippi alluvial plain, the central Panhandle of Florida, and eastern North Carolina. Food availability, and consequently reproductive success, appear to be greatest in undisturbed cypress-gum swamp. Prothonotary Warblers nest in natural cavities, in trees surrounded by water. The deeper the water, the less likely they are to lose eggs and nestlings to raccoons, which are probably the major nest predator. Human activities that reduce the water level, such as draining wetlands or channelizing streams, can make the nests more vulnerable, although in some years, flooding and the wash from boats can also cause nest failure. The Prothonotary Warbler suffers locally from competition with the Northern House Wren* (Troglodytes aedon)*, which usurps its nest-sites, destroying the eggs by piercing them with its bill, and sometimes dropping them out of the nest. Prothonotary Warblers take readily to nestboxes, favouring milk cartons painted in natural colours. Populations may have increased in some areas because of the creation of artificial wetlands such as reservoirs.*

[*Protonotaria citrea*, Four Hole Swamp, North Carolina, USA. Photo: M. P. Kahl/DRK]



*In one study of the **Red-faced Warbler**, females dramatically increased their rate of hover-gleaning during the period when they were feeding their nestlings. Hover-gleaning uses much more energy than more leisurely perch-gleaning, but probably enables the birds to increase their rate of prey capture. As insect prey becomes available earlier in the year because of climate change, the Red-faced Warbler may be encouraged to begin nesting earlier. This could put them at greater risk from the late snowstorms which occasionally hit their breeding grounds in pine–oak* (Pinus–Quercus) *or conifer forests at 2000–3000 m. One such storm which struck a site in Arizona in late May 2008 caused 13 out of 19 nests to be abandoned. Nine of these pairs began building again immediately, and five days later had laid their first eggs.*

[*Cardellina rubrifrons*, Scheelite Canyon, Huachucas, Arizona, USA. Photo: Rob Curtis/ The Early Birder]

and Hermit Warblers in the temperate region, and the Spectacled and Golden-fronted Whitestarts in South America. Hybridization between Mourning and MacGillivray's Warblers, long suspected but also much disputed, has recently been confirmed by a study combining molecular and morphological data sets.

Blue-winged and Golden-winged Warblers regularly interbreed where their ranges overlap, producing fertile first-generation hybrids known as "Brewster's Warblers". This fairly standardized hybrid combines the dominant traits of both parent species. These hybrids usually then back-cross with one or other of the parent species, so that, over time, the "Brewster's" traits are lost. Very occasionally, a pairing of an "impure" Blue-winged or Golden-winged Warbler with a "Brewster's Warbler", or between "impure" Blue-winged and Golden-winged Warblers, produces a hybrid with only recessive characters, this being known as "Lawrence's Warbler". The male of this very distinctive hybrid has the body like that of a male Blue-winged Warbler, but the black ear-coverts and throat of the Golden-winged Warbler on an otherwise yellow head; the female "Lawrence's Warbler" is similar to the female Golden-winged, but typically has two pale yellowish wingbars, rather than a yellow wing patch, and has the underparts tinged yellow and the upperparts more olive. Hybridization between these two *Vermivora* species usually occurs in situations in which one or other of them is rare, and mixed pairings can account for 5–10% of all pairings in such areas. Over the past century, Blue-winged Warblers have been steadily extending their range northwards, into the breeding range of the Golden-winged Warbler, which is also expanding its range northwards. As a result, the hybrid zone also is gradually shifting northwards, Blue-winged Warblers coming to dominate an area quite soon after first moving into it. There has been speculation that Golden-winged Warblers, if they run out of breeding areas in which there are no Blue-winged Warblers, may eventually become extinct as a pure species. One reason why Blue-winged Warblers eventually become dominant in the hybrid zone is that they appear to be more catholic in their choice of habitat than Golden-winged Warblers, which tend to specialize in early-successional scrubby-woodland habitat. It has also been suggested that Blue-winged Warblers may "genetically outcompete" Golden-winged Warblers in areas where the two hybridize, but detailed studies do not support this hypothesis, genetic introgression being equal in the two species in such areas.

Townsend's and Hermit Warblers hybridize in a relatively narrow zone in the Pacific north-west, where the former is slowly replacing its *Dendroica* congener. Studies have shown that this is because male Townsend's Warblers are more aggressive and better at holding on to territories and attracting mates than Hermit Warblers and hybrids, and they also lay larger clutches. In one study, it was found that Townsend's Warblers lay an average of 0·6 eggs per clutch more than Hermit Warblers and 1·15 more eggs per clutch than hybrids between the two species. This also suggests that hybrids are less biologically fit than "pure" individuals of both species and are therefore selected against, and it helps to explain why the hybrid zone is maintained as a narrow belt, rather than gradually widening.

The most likely reason for successful hybridization between the members of these, and the other, species pairs is that the species concerned are very closely related. In addition, being largely allopatric, they have not had much contact with each other, nor have they had sufficient time for effective isolating mechanisms to evolve when they do meet.

Apart from the species pairs mentioned above, there are relatively few cases of intrageneric hybrids, with the majority of these involving Yellow-rumped Warblers of the "Myrtle Warbler" group. The latter has hybridized with several other *Dendroica* species, including the Bay-breasted, Palm, Pine, Cape May, Townsend's and Magnolia Warblers. In addition to this, in North America, hybridization has been reported between Nashville and Tennessee Warblers, Yellow-rumped of the "Audubon's group" and Grace's Warblers, Townsend's and Black-throated Grey Warblers, and Townsend's and Black-throated Green Warblers.

In the tropics, hybrids between two *Basileuterus* species, the White-bellied and Golden-crowned Warblers, have been reported in the south Brazilian state of Minas Gerais and in Paraguay. An odd-looking *Basileuterus* specimen in the British Museum of Natural History, in Tring, originating from Rio Grande do Sul, in south-east Brazil, is considered to be a hybrid between the White-browed Warbler and the nominate race of the Riverbank Warbler, although interbreeding between these two has yet to be officially documented.

In North America, at least, intergeneric hybrids are considerably more common than intrageneric ones. Such unexpected pairings are being discovered quite regularly, and the number of reports is increasing as awareness of this phenomenon grows. Recently, in 2009, R. Vallender and co-workers described a brood of hybrids between captive Black-and-white and Yellow-rumped Warblers that resembled one of the parent species, the Black-and-white Warbler, to the extent that they probably would have gone unnoticed in the field; this raises the distinct possibility that such hybrids are occurring even more regularly than is currently realized. The best-known intergeneric pairings relate to the numerous hybrids between the Northern Parula and the Yellow-throated Warbler, which were originally described as a new species, "*Dendroica potomac*", and given the English name "Sutton's Warbler". This hybrid was first recorded in 1939, since when there have been more than 15 sight records, including seven from the West Virginia–Virginia border area. The most recent was in April 2005, when one was seen and photographed in the Fabyon Forest Reserve, in Illinois.

At first, this relative glut of intergeneric hybrids seems strange, as one would intuitively suspect that more closely related species would be more likely to interbreed than less closely related ones. It is notable, however, that most of these hybrids originate from a region where one or the other parent species is rare, and it may be, therefore, that these species have not developed reproductive isolating mechanisms, as they do not normally have much contact with each other; and yet, owing to the relatively rapid speciation within the North American warblers (see Systematics), they are still sufficiently close to produce viable young when "mistakes" do occur. If this is the case, it would be expected that sympatric parulid species, in regular contact with each other, would have evolved isolating mechanisms and therefore would hybridize only very infrequently, if at all. It is noteworthy that there are very few records of hybridization among all the parulid warblers that nest in the boreal forests of northern and eastern North America. One of the few records of this nature involved a hybrid between a Northern Waterthrush and either a Blackpoll Warbler or a Cape May Warbler. Although the ranges of the waterthrush and these two *Dendroica* species are similar, the habitats and niches occupied by them are very different and intimate contact on the breeding grounds is unlikely. There is presumably, therefore, little selective pressure for isolating mechanisms between the two to evolve. Those boreal-nesting warblers which occupy one and the same habitat have presumably evolved reproductive isolating mechanisms through a long period of close contact, and these prevent their interbreeding.

Movements

New World warblers are traditionally separated into two main groups. The temperate species, breeding in North America, are mostly migratory, whereas the tropical species, in Middle and South America, including the Caribbean, are mostly sedentary. The tropical species often wander outside the breeding season, and some may make limited altitudinal movements, but they do not perform the medium-distance or long-distance migrations regularly undertaken by their northern counterparts. In the southernmost part of its range, the Masked Yellowthroat breeds in temperate regions of Argentina, migrating north during the austral winter, but the wintering grounds are not known. The principal reason for the difference between the two main groups is that parulids are largely insectivorous, and the severe winters of the northern parts of North America, and even temperate Argentina, reduce the insect supply, forcing these species to move to warmer climes for the non-breeding season. It is generally thought that warblers originated in North/Middle America during the warm period of the Miocene; during later cooler periods they were forced southwards, but many species evolved to move north to breed, in



*The long hours of summer daylight in the north enable the **Yellow Warbler** races of the "*aestiva *group" to spend more of the day feeding their young. Their nestlings grow more rapidly than those of more southerly and tropical populations. At the northernmost edge of the range, where the breeding season is shortest, Yellow Warblers often arrive while snow is still on the ground, and build larger, better-insulated nests. The males feed the young more frequently not only than their mates, but also than the males of southern populations.*

[*Dendroica petechia aestiva*, Fulton County, New York, USA. Photo: Warren Greene/ VIREO]

order to take advantage of the huge volume of insects available in the northern summer, returning southwards in the winter.

The majority of northern-breeding warblers spend the boreal winter in Middle America and the Caribbean, although many also winter partly or entirely in South America. For some species having a southerly distribution in North America, such as Grace's Warbler and the Painted Whitestart, the northern populations are migratory and the more southern ones are sedentary. Many southern populations of the Common Yellowthroat, as well as most of the Mexican breeding populations of the Yellow Warbler and Yellow-breasted Chat, are also sedentary, unlike the more northerly breeding populations of these species.

Some tropical species do wander quite widely at times, and there are several records of vagrancy involving northward wandering into the southern USA by the northern Mexican species. The Rufous-capped Warbler has occurred in southern Texas and south-eastern Arizona on numerous occasions, and has even bred in Arizona. As this species is common less than 100 km south of the USA border, this is perhaps not too surprising. The Golden-crowned Warbler also occurs northwards to within 100 km of the Texas border in north-eastern Mexico, and has been recorded several times in southern Texas. The Neotropical Fan-tailed Warbler occurs in north-west Mexico to within about 300 km of the Arizona border, and it has appeared several times in south-east Arizona; more remarkable is a record of a vagrant in north-west Baja California. Two other parulids, the Crescent-chested Warbler and the Slate-throated Whitestart, have ranges extending northwards into northern Mexico, and both have turned up a few times just across the border in the USA.

Although the Bahama Yellowthroat is essentially sedentary in those north Caribbean islands, there are three unconfirmed reports of its occurrence as a vagrant in Florida, a short distance away on the south-east USA mainland. One of these reports involved the remains of a yellowthroat, apparently of this species, found in the stomach of a tiger shark (*Galeocerda cuvier*). Even if the identification of the warbler was correct, however, tiger sharks can wander widely, and the yellowthroat was not necessarily consumed off the Florida coast.

With migratory parulids, the males generally arrive on the breeding grounds before the females, usually preceding them by several days, and older, more experienced individuals of both sexes arrive before naive first-year birds. The reasons for this are to do with the acquisition of the best territories and mates, but there are conflicting pressures concerned with less predictable food supplies early in the season (see Breeding). In addition, males of several migratory species have been shown to winter farther north than females, which is presumably an adaptation to enable males to arrive back on the breeding grounds as soon as possible in the spring. In autumn, the adults tend to migrate earlier, on average, than the first-year birds. A recent study of Wilson's Warblers provided evidence for this, revealing that, in spring, males reached the breeding grounds earlier than females and, moreover, made shorter stopovers, as they had larger fat stores and higher rates of weight increase than the females. In the autumn, variation in migration stopovers was age-related, rather than sex-related, the adults tending to arrive earlier and having larger fat stores and shorter stopover periods compared with the immatures. It was surmised that first-years, because of their lower social status and inexperience, would be more vulnerable than adults to habitat degradation at stopover sites. Comparison of different species shows that there is a correlation between timing of migration and location of wintering areas, the species having more northerly wintering grounds tending to arrive at migration stopovers earlier in the spring and later in the autumn.

The migration routes of North American warblers have been well studied, and there seem to be three main routes used by those migrating east of the Rocky Mountains. Those wintering in the Caribbean, the Cape May, Black-throated Blue and Prairie Warblers being three such examples, first move east to the Atlantic seaboard and then follow the coastline and coastal plain, east of the Appalachian Mountains, southwards to Florida, from where they cross the relatively short distance to the Caribbean islands. Other species move south on a fairly broad front through the vast Mississippi Basin area to the Gulf of Mexico coast. From here, many fly directly across the Gulf to the Yucatán Peninsula, some remaining there for the winter months and others continuing on



Cowbirds (Molothrus) *have laid their eggs in the nests of at least 41 of the 51 New World warbler species which nest regularly in North America. Species that nest in open country are the most likely to suffer. The* ***Blue-winged Warbler*** *breeds in woodland edges and clearings, neglected fields and similar successional habitats. When woodland habitats are left intact, the birds are unlikely to become victims; just one nest out of 212 was affected in one study. But when the habitat is fragmented, data show up to 67% of nests being parasitized.*

[*Vermivora cyanoptera*, SW Ohio, USA. Photo: Dave Maslowski/ Maslowski Productions]

to Central America or the northern parts of South America; these are often referred to as "trans-Gulf migrants". Others follow the western shore of the Gulf to wintering grounds in the same areas, although such birds tend to winter in the more northerly and westerly parts of Central and South America; these are often called "circum-Gulf migrants". These three basic routes are utilized also in spring for the return migration. Once returning migrants reach North America, however, they may then proceed northwards on a broader front, on a more direct route to their individual breeding grounds, and many species have a more westerly component to their spring migration route compared with that in the autumn (see below).

It could be assumed that a route following the Gulf shoreline would be the safer and therefore the preferable option, but most warblers in fact cross the Gulf to Yucatán. This implies that there are many hazards involved in taking the shoreline route, or, at least, that there are clear advantages in making the long sea crossing. The circum-Gulf route is certainly less direct than the trans-Gulf route and will, therefore, take longer; this may result in birds being more likely to face unfavourable weather conditions en route and, perhaps, being forced to linger in areas with an unpredictable food supply. Whatever the reasons, they must be formidable to make the trans-Gulf route a better option. Along with other trans-Gulf migrants, parulids will wait for favourable conditions before setting off. With strong tailwinds they can make the journey in 12 hours or so. With light tailwinds it usually takes around 20 hours, still well within their abilities. If they encounter strong headwinds, however, the journey may require up to 30 hours of flying, and many individuals will not reach the coast. Weather patterns are not always predictable, and migrants may set off in favourable conditions, only later to encounter strong headwinds as a result of weather fronts on the other side of the Gulf. When this happens in spring, as birds are moving northwards, it can result in spectacular "falls" of birds along the Texas coast. At such times, oases of good feeding habitat, such as High Island, are abuzz with activity as exhausted migrants drop into the trees and bushes, many spending several days feeding in order to replenish exhausted energy reserves before continuing their journey. Conversely, in favourable weather conditions, many birds will make it across the Gulf with energy reserves to spare and, instead of stopping on the coastline, will continue inland for some distance before stopping to feed; by doing this, they will be spread out and less likely to face competition for food, and they will also reach the breeding grounds sooner.

As a general rule, trans-Gulf migrants tend to be those which spend the winter in the southern part of Central America and adjacent South America, examples being the Blackburnian, Bay-breasted, Cerulean and Canada Warblers. Circum-Gulf migrants tend to be those with non-breeding ranges in Mexico and northern Central America, such as the Nashville and Hooded Warblers. There are exceptions, most notable among these being the Mourning Warbler, which winters in the southern part of Central America and north-western South America, and yet is a circum-Gulf migrant.

Migration routes of New World warblers breeding in and west of the Rockies tend to be more straightforward than those of their eastern counterparts, the former following the mountain chains and coastline to and from the wintering grounds. These western temperate-breeding warblers tend to be shorter-distance migrants than the eastern breeders, wintering mostly in the northern part of Central America; some MacGillivray's Warblers reach western Panama and some Wilson's Warblers winter as far south as eastern Panama, although the latter may be eastern, rather than western, breeders. Several parulids breeding in extreme north-western North America, in Alaska and adjacent Yukon Territory and northern British Columbia, have breeding ranges extending eastwards across the boreal-forest zone. These include the Yellow-rumped Warbler, the Blackpoll Warbler, the Northern Waterthrush and the American Redstart, and even the north-westernmost breeders of these species tend to follow what is, presumably, the ancestral migration route to the south-east, rather than moving directly south through the western part of North America. It is thought that these north-western areas have been colonized relatively recently, as part of a westward expansion by these species, and that the western breeders therefore follow the same migration routes as those used by their



Most New World warblers dispose of tell-tale faecal sacs by dumping them elsewhere, though they have occasionally been recorded swallowing the droppings of very young nestlings. ***Louisiana Waterthrush*** *nests are usually well hidden, like this one, but they are still frequently parasitized by the Brown-headed Cowbird* (Molothrus ater). *From first laying to the end of fledgling care takes 48–55 days, and the Louisiana Waterthrush is among the first North American breeding migrants to return to its wintering grounds. Even so, as many as 5% of pairs may attempt a second brood, delaying both their moult and their departure date.*

[*Seiurus motacilla*, near Lesterville, Montana, USA. Photo: Rob Curtis/ The Early Birder]



Double-brooding is relatively frequent in the ***Black-throated Blue Warbler****, particularly when the male is an older and more experienced bird. In a four-year study of a population in unfragmented habitat in the White Mountains of central New Hampshire, females laid an average of 6·6 eggs per season, of which 5·2 hatched and 4·3 fledged. This high success was partly due to the absence of brood parasites, for the Brown-headed Cowbird* (Molothrus ater) *is uncommon in undisturbed forest. Altogether 35% of marked females in this population fledged two broods in one season, and one female even managed three. These warblers are found at higher densities in forest with thick undergrowth, and birds in this kind of habitat also fledge significantly more young than those where the shrub layer is more sparse. A six-year study involving 239 nests found that female Black-throated Blue Warblers made less contribution to feeding the first brood than the second, whereas the males' chick-feeding rate did not differ between broods. The researchers concluded that the males' contribution relieved the female of some of the energetically-costly work of raising the first brood, and made it possible for her to undertake the second brood.*

[*Dendroica caerulescens caerulescens*, W Pennsylvania, USA. Photo: Dave Maslowski/ Maslowski Productions]



*The first confirmed nest of the **White-winged Warbler** was found in June 2004, in closed-canopy montane broadleafed forest, in the Dominican Republic. Hidden 2·5 m up in a dense vine tangle, the cup-shaped nest contained a nestling which fledged the next day, and an egg which subsequently disappeared. The young of tropical New World warblers may remain with the adults until the next breeding season, and even stay on to help defend the territory. In temperate-breeding parulids, the fledged brood is split between the two parents, which feed them at a diminishing rate for up to a month.*

[*Xenoligea montana*, Pueblo Viejo, Sierra de Bahoruco National Park, Dominican Republic. Photo: Eladio Fernández]

more easterly counterparts. Northern Waterthrushes are regular, if quite rare, migrants in coastal California, but these individuals are the exception, and most migration by this species is to the east of the Rockies.

The Blackpoll Warbler undertakes the longest and most demanding migration of all the Parulidae. Some Alaskan breeders spend the northern winter in Brazil and travel more than 8000 km to get there. As already seen, Blackpoll Warblers breeding in north-western North America initially head south-east to the Atlantic seaboard in autumn, as does the rest of this species' population. What is particularly astonishing about this warbler, however, is that some, perhaps most, individuals head out over the Atlantic Ocean from north-eastern North America and appear to fly directly over the ocean to the northern coast of South America, a distance of up to 3500 km, which could necessitate flying non-stop for up to 88 hours. The existence of this oceanic route is somewhat controversial, and is still not fully accepted by all ornithologists. The evidence for it is strong, but not entirely conclusive. Blackpoll Warblers are one of the most abundant parulid migrants along the north-eastern seaboard of North America, particularly between Nova Scotia and Cape Hatteras, in North Carolina, whereas they are surprisingly scarce in coastal south-eastern USA; this would suggest that most Blackpolls head out to sea from the north-east, rather than moving down the Atlantic seaboard and across to the Caribbean from Florida, as most other eastern migrants do. Observers on boats in the north-western Atlantic have observed Blackpoll Warblers in their hundreds, often moving at the same time as known transoceanic migrants such as shorebirds (Charadriiformes), but other passerine species being absent or very scarce. They are common in the autumn in Bermuda, which would lie directly on their transoceanic route, but they are very rare in the western Caribbean at this time. They are known also to accumulate large reserves of body fat prior to setting out from the north-eastern seaboard. In one study, it was estimated that the fat-free weight of a Blackpoll Warbler was 11·2 g, and individuals captured on the New England coast weighed between 20 g and 23 g, approximately double the fat-free weight. This gave a strong indication that the warblers were about to set out on a long non-stop flight. A similar phenomenon occurs in western Europe, where Sedge Warblers (*Acrocephalus schoenobaenus*) double their body weight before setting off to cross Europe, the Mediterranean Sea and the Sahara Desert in a single non-stop flight. A study in Bermuda showed that Blackpoll Warblers captured there weighed 13–16 g. This is 2–5 g more than the fat-free weight, and it suggests that the birds had sufficient fat reserves to overfly the island and had probably been forced down by accident. It is also noteworthy that all large concentrations of Blackpoll Warblers in Florida and the Bahamas have been associated with unusual weather conditions that are thought to have forced them well to the west of their usual migration route.

Most Blackpoll Warblers leave the north-eastern seaboard on the north-westerly tailwinds that follow the passage of a cold front. As they near the Tropic of Cancer they encounter the north-east trade winds, which would assist them in reaching the Lesser Antilles and the north coast of South America.

Although most evidence supports the transoceanic theory, there are some criticisms. These include the fact that the timing of arrivals in Bermuda apparently do not match the peak departures from the north-eastern seaboard; that bird movements detected on ships' radar in the Atlantic do not always show a constant orientation; and that the average weight of Blackpoll Warblers caught in Florida, 16·5 g, is higher than would be expected for a bird that has been diverted from a long transoceanic flight that started on the north-eastern seaboard, but consistent with a departure from a closer point, such as West Virginia. It seems likely, therefore, that some Blackpoll Warblers, at least, do depart from the Atlantic seaboard at a point farther south than New England and reach the South American non-breeding quarters via the Caribbean.

The spring migration of Blackpoll Warblers is certainly well to the west of the autumn oceanic route. Most individuals pass through the western Caribbean to reach south-eastern North America, and then move north and north-west on a broad front to reach the breeding grounds. They are of less than annual occurrence in Bermuda in spring, in contrast to their autumn status there.

Several other members of this family show slight differences in their spring and autumn migration routes. These are not usually as pronounced as those of the Blackpoll Warbler, but, like that species, many warblers, of both eastern and western species, have a more easterly element to their autumn migration routes. Hermit



*Still common within its restricted range, the **Olive-capped Warbler** occurs in two Endemic Bird Areas. In the Bahamas, it is found in pine forests, including some protected areas, though resort development is an ever-present threat. In Cuba, it is confined to the highlands of Pinar del Río and north-east Oriente. Cuba is including data on Important Bird Areas in its forthcoming protected areas plan, with the assistance of BirdLife's Cuban Affiliate, the Centro Nacional de Áreas Protegidas. The endemic species are the subject of an increasing volume of research at the island's scientific institutions.*

[*Dendroica pityophila*, Las Terrazas, Sierra del Rosario, Cuba. Photo: Eladio Fernández]

Warblers moving south in autumn are common in the mountains of south-east Arizona and south-west New Mexico. On the spring migration, they tend to follow the coast and coastal mountain ranges and are notably rare as far west as eastern Arizona. Cerulean Warblers are trans-Gulf migrants, and in spring are common on the Texas coast but rare in Florida. In autumn they are scarce in Texas, the majority flying south to the eastern Gulf shores between eastern Louisiana and Florida, and from there crossing to Central America.

Connecticut Warblers head south-east in autumn, flying from the breeding grounds through the Great Lakes region to New England and the middle part of the US Atlantic coast. From here, they may move south along the coast to Florida and then across the Caribbean to the north coast of South America. There are very few autumn records of this species in the West Indies and, although this may be partly due to the secretive nature of this parulid, it is thought that many or, perhaps, most fly direct to South America. Indeed, there is some evidence that they may leave North America from the middle Atlantic coast in favourable conditions, undertaking a non-stop transoceanic flight similar to that of the Blackpoll Warbler. Connecticut Warblers occur regularly in Bermuda in autumn; they are usually uncommon, but there was a notable grounding there, involving some 75 individuals, on 26th September 1987 during hurricane "Emily". In spring, they make their way north through or over the Caribbean to Florida, and most then move north-west through the Mississippi and Ohio Valleys to the breeding grounds. This spring route, at least in North America, is well to the west of the autumn passage, which occurs largely east of the Appalachians.

Like many other long-distance migrants, the New World warblers are highly prone to vagrancy, especially in autumn, when the majority of lost birds are inexperienced first-years undertaking their first migration. Many of the eastern species appear almost regularly in autumn on the west coast of North America, and two species, the Blackpoll Warbler and the nominate race of the Palm Warbler, are particularly regular, with more than 100 of each species recorded there in most years. The majority of these vagrants are recorded in California, although this may partly reflect the greater extent of observer activity in that state, and many eastern species have appeared in most or all of the western coastal states. The only eastern breeders that have not yet been recorded in western North America are Kirtland's Warbler and the presumably extinct Bachman's Warbler, although Swainson's Warbler has yet to be recorded on the west coast, most of the very few western records of this last species coming from Colorado and New Mexico.

One theory which has been used in an attempt to explain the regular occurrence of eastern parulids in western North America, especially in the autumn, is that of mirror-image misorientation, or "confusing left with right". According to this theory, warblers with mirror-image misorientation would migrate south-west, instead of south-east; as most eastern warblers initially migrate in a south-easterly direction to reach the south-eastern USA, such misorientation would result in their reaching, instead, the southern part of the west coast of North America. Orientation experiments with captured vagrant Blackpoll Warblers on the Farallon Islands, off California, demonstrated that some individuals orientated to the mirror image of the "correct" heading of south-east; in other words, they did orientate to the south-west. Other birds in this experiment, however, correctly orientated to the south-east, and still others to the north-west and north-east, and so this theory does require further testing.

Western North American warblers turn up as vagrants in the north-east of the continent. In this region, the majority of Hermit Warbler records are in the spring, most records of the Black-throated Grey Warbler are in the autumn, and the Townsend's Warbler records are divided almost equally between the two seasons, with some winter records. The pattern of occurrence of MacGillivray's Warbler in the east is confused by the difficulty of separating this species from the Mourning Warbler, especially in the autumn, although there are records in spring and autumn. In contrast, eastern warblers are generally much rarer in western North America in the spring. Exceptions to this seem to be species which breed in the south-eastern corner of the continent, such as the Northern Parula, the Yellow-throated, Kentucky and Hooded Warblers and the Louisiana Waterthrush, all of which are more common in the west in spring than they are in autumn. In 1992, there was an unprecedented "invasion" of Kentucky Warblers in western North America, along with several records of Hooded Warblers and Northern Parulas. It is thought that this was due to the presence at this time of easterly winds over the Gulf of Mexico, which displaced many trans-Gulf migrants.

Bermuda, lying about 1000 km off the shore of eastern North America, may appear to be outside the migration routes of all



The remote Santa Marta mountains of north Colombia are rich in endemic species and subspecies. Isolated from other whitestart species, the ***Yellow-crowned Whitestart*** *is thought to be still common within its tiny range of just over 5000 km². The size of its population is unknown, but it appears to be declining, as the forest is lost to logging and encroachment by farmers and marijuana growers. As little as 15% of the original vegetation may be left.*

[*Myioborus flavivertex*, Santa Marta, Colombia. Photo: David Southall]

except the Blackpoll and Connecticut Warblers, which are known to make transoceanic migrations across the western Atlantic. Nevertheless, at least 38 members of the family have been recorded on the island, which is a notable proportion of all the North American parulid species, and the list includes all of the eastern breeding species; the island's first Kirtland's Warbler was recorded in December 2004. Of these 38 species, 15 are described as common or very common migrants, and the majority of the others occur regularly. The commonly occurring warblers on Bermuda are the Northern Parula, the Yellow, Yellow-rumped, Palm, Blackpoll, Black-and-white and Prothonotary Warblers, the American Redstart, the Ovenbird, the Northern Waterthrush and the Common Yellowthroat. As may be expected, all of these are species which winter in the Caribbean or in South America, and their arrival normally coincides with certain weather conditions, principally the strong south-west winds associated with the passage of an eastward-moving weather front. Perhaps surprisingly, the Connecticut Warbler is only a scarce, albeit regular, migrant, although its secretive nature may lead to its being overlooked more than the other species. The only western-breeding species of parulid that has been recorded in Bermuda is Townsend's Warbler.

Outside the Americas, warblers appear regularly as vagrants in Europe, where as many as 24 species have been recorded so far. Almost all of the European New World warbler records are in the autumn, the very few spring and winter records almost certainly relating to individuals that had crossed the Atlantic in the previous autumn. It does seem astonishing that such tiny birds can fly, unaided, across the Atlantic Ocean and reach Europe alive. The principal reason for this is the weather systems prevailing at this time of the year. Fast-moving, eastbound depressions can cross the Atlantic in as little as 36 hours, and southbound migrants moving along or just off the east coast of North America can become caught up in these weather systems and thus have a chance of being blown, alive, to the shores of western Europe. In a paper published in 1979, N. Elkins showed that the arrival of some 75% of American vagrants in Britain is linked to the arrival of such fast-moving depressions across the Atlantic. These depressions typically head north-east from the south-western North Atlantic to north-western Europe, and most records of American warblers are from Britain, Ireland and Iceland, with several in recent years from the Azores, too. Britain has more records than Ireland and Iceland, but this may be due partly to observer bias, and in recent years both of these last two countries, as well as the Azores, have been recording greater numbers of American vagrants in autumn, perhaps as a result of increased observer coverage.

Not surprisingly, the Blackpoll Warbler is the parulid most often recorded in Europe, where more than 40 have been identified up to 2005. This species is obviously particularly susceptible to being caught up in eastward-moving depressions while making the crossing to South America. The Yellow-rumped and Black-and-white Warblers and the Northern Parula are the other species recorded with some regularity. These are not such long-distance migrants as is the Blackpoll Warbler, and prior to migration they do not store fat to the same degree. Nevertheless, they are all common on the east coast of North America and in Bermuda in the autumn, and they spend the winter in the Caribbean, the Black-and-white Warbler extending also to South America, so they are capable of making quite lengthy non-stop flights over the ocean. The remaining species are all much rarer as vagrants, most having occurred only once or a handful of times in Europe.

Among the more unusual records are those of the Hooded Warbler, recorded twice in Britain up to 2005. This species has a south-easterly distribution in North America and is normally a relatively short-distance migrant, wintering in Middle America and the Caribbean, most of its population crossing the eastern Gulf of Mexico to Yucatán in the autumn. Smaller numbers, however, do move down the Atlantic coast to winter in the Caribbean, and so it can be classed as a potential, if not very likely, vagrant to Europe.

Finally, it should be noted that vagrancy in a westward direction has been documented, although on a far smaller scale. The Northern Waterthrush is an accidental visitor to the Chukotskiy Peninsula, and the Yellow-rumped Warbler has been recorded on the Bering Sea islands and in Chukotka. In extreme west Alaska, only just outside the Russian border, the Orange-crowned Warbler is of almost annual occurrence on St Lawrence Island, where eleven other parulid species have been recorded, including the Blackpoll Warbler and the Northern Waterthrush; the Yellow Warbler has reached this island on several occasions. Wilson's Warbler is a vagrant to Japan, where it has been recorded on Hegura-jima, west of Honshu.

Relationship with Man

The New World warblers living in North America are among the best-known and most beloved of birds to many people in this part of the world. The gaudy eastern *Dendroica* species are particular favourites, this being no doubt due partly to the spectacular plumage of the spring males, especially, but also to the migratory habits of these species. In the spring, the arrival in the southern parts of the USA of wave after wave of these colourful gems, which then make their way north through the countryside, and towns, uttering "chip" calls all the while, is the highlight of many people's birding year. Indeed, the present author has spoken to some whose virtual sole interest in birds is in going out in the spring to witness this spectacle. The west has its special warblers, as well, but it is the sheer diversity and relative abundance of the eastern species that make their spring migration such a spectacle.

In complete contrast, most of the tropical warblers are virtually unknown to all except fairly dedicated birders. This is partly the result of their inaccessibility and the fact that many of the species are relatively skulking and difficult to observe, but also perhaps because many of them have relatively dull plumage, at least in comparison with their temperate-breeding cousins. One exception to this is the tropical *Myioborus* whitestarts, which, with their bright plumage and confiding, even inquisitive, behaviour, are often well known to local people. That they are not more widely known is due mainly to the fact that they inhabit the higher altitudes of mountain ranges, often remote ones. One species, the Collared Whitestart of Costa Rica and Panama, often follows cattle in order to feed on the insects that these disturb, and it will frequently follow humans for the same reason; this habit has earned it the local name of *amigo del hombre*, "man's friend".

Humans have a particularly close relationship also with the globally Near-threatened Kirtland's Warbler. Owing to its great rarity, its very specialized breeding habitat (see Habitat), and the fact that Brown-headed Cowbirds recently came to the point of posing a very real and serious threat to its survival, this species may now be more or less dependent on man for its continued existence. It is thought that if it were not for the efforts of local conservationists, who manage its habitat through a careful regime of controlled burning and continually trap cowbirds in the breeding area in order to reduce brood parasitism, the species might very quickly become very rare again, or even extinct.

New World warblers of many species have a beneficial effect on man, albeit mainly an aesthetic one, rather than in terms of economics, but the reverse is not always true. Many warbler species rely on intact primary forest, and they may be placed at risk in the future through the degradation and destruction of these forests in both North and South America. For some species, as illustrated by the Cerulean, Kentucky and Canada Warblers, there is already evidence that this is happening, and for some Neotropical species with very small ranges, such as the Grey-headed Warbler and Yellow-faced Whitestart, the situation is already very serious (see Status and Conservation). It is not just forests and their associated wildlife that are affected by man's activities. One member of the Parulidae, Belding's Yellowthroat of Baja California, is now Critically Endangered primarily as a result of modification and destruction of its limited wetland habitat by humans. Two other Mexican yellowthroats, the Black-polled and the Altamira, are also threatened, for similar reasons.

Status and Conservation

The current status of the world's parulid warblers varies greatly. Some members of the family are abundant and widespread, whereas, at the opposite extreme, at least two species are extinct or almost certainly extinct. BirdLife International, in its most recent assessment, lists a total of 15 species as being globally threatened, with a further nine currently classified as Near-threatened. Many of these are, in addition, restricted-range species, meaning that they have a small global range. A further 17 species, although not currently considered of conservation concern, are also restricted-range species. Several other parulids have undergone marked declines in recent decades, and this has been particularly noteworthy among species that are largely dependent on tropical rainforests during part or all of their life.

The two species that are almost certainly extinct are Bachman's and Semper's Warblers. Indeed, Bachman's, although



Although its entire global range amounts to just 38,300 km² in eastern Cuba, the ***Oriente Warbler*** *has a wide habitat tolerance, and occurs in all the island's forest types. It tends to be found in semi-arid scrubby woodland near the coast and in more humid forests higher in the mountains, requiring only a relatively undisturbed understorey for breeding. The Oriente Warbler has been found in several protected areas, including Siboney-Juticí Ecological Reserve and Sierra Cristal National Park. Outside the breeding season it is usually found in groups of up to 16 individuals, and also acts as the nucleus of mixed-species foraging flocks. Although its overall numbers are unknown, the species is thought to be common.*

[*Teretistris fornsi*, Cayo Coco, Cuba. Photo: Pete Morris]

*Within a total range of less than 270 km², the **Vitelline Warbler** occurs as three races. The nominate is common on Grand Cayman, and* crawfordi *is very common on Cayman Brac and Little Cayman. The race* nelsoni *is the only resident passerine on the Swan Islands, which are just a few square kilometres in extent. Although formerly common,* nelsoni *may have suffered from clandestine military activities including the training of soldiers for Nicaragua's internal conflicts. The Vitelline Warbler is classed as Near-threatened, although it tolerates a range of habitats and is even found in urban areas.*

[*Dendroica vitellina vitellina*, Grand Cayman, Cayman Islands. Photo: Michael Gore]

listed by BirdLife as Critically Endangered, is herein considered already to be extinct (see HBW7, page 61). This parulid formerly bred in river-bottom swamps in the south-eastern USA, spending the winter months in forest habitat in Cuba. It is believed to have been common in the breeding area until at least the mid-nineteenth century, and P. Hamel provided evidence that it may have been at its most abundant during the Pleistocene glacial maxima, when a lowered sea level probably resulted in far greater tracts of suitable habitat being available in both its breeding and its wintering areas. Sea-level rises following the end of the last Pleistocene glaciation may have started the decline by reducing the extent of breeding and non-breeding habitat and increasing the distance between them. Bachman's Warbler appeared to favour clearings in the swampy forest where a dense understorey of cane flourishes, and it could well have been a specialist of this habitat. It is possible, therefore, that the initial clearing of forests in the breeding range benefited the species by providing a short-term increase in its habitat. In contrast, the large-scale clearance of forests that took place in the breeding range in the early twentieth century, and a little later in the winter range, was the beginning of the end for this enigmatic species. In the breeding area, although some suitable habitat does remain, it has been estimated that more than 75% of Bachman's Warbler breeding habitat has been lost to agriculture and other non-forest uses over the last 100 years. In the winter range, an increasing human population has led to the clearance of most of the suitable forest in Cuba, although a small amount of potential habitat does still exist.

Although Bachman's Warbler was first discovered in 1832 and formally described in the following year, substantial populations were not found until the mid-1880s. Large-scale destruction of the swampland forests began early in the twentieth century, and by the 1920s the species had become scarce over most of its range. There have been very few records since 1930. The last specimen was taken on the breeding grounds in 1949 and the last known population persisted at I'On Swamp, in South Carolina, until 1953; the final undisputed sighting on the breeding grounds was of a singing male near I'On Swamp in 1962. Since then, a handful of unconfirmed sightings were reported in the 1970s and one in 1988, keeping alive the faint hope that the warbler may still survive. The last confirmed record from the wintering grounds was in 1940; of eight unconfirmed reports since then, all between 1978 and 1988, at least one is now considered to refer to a misidentified Common Yellowthroat. Hamel considered that the final blow for the species could have been a series of hurricanes in Cuba in the early 1930s that decimated the remaining populations to such an extent that individuals could no longer find one another.



Semper's Warbler is confined to the island of St Lucia, in the eastern Caribbean. First described in 1877, it may have been lo-

*Measures proposed for reversing the population decline of the Near-threatened **Golden-winged Warbler** include burning blocks of forest of 10–20 ha to recreate the early successional habitat it favours. Cowbirds* (Molothrus) *would need to be controlled in these newly opened habitats; they already parasitize 35% or more of nests in some populations, and can reduce hatching success by 50%. The Blue-winged Warbler* (Vermivora cyanoptera) *is expanding into parts of the Golden-winged Warbler's range, and hybridization with, and eventual replacement by, this species will be a much harder problem to tackle.*

[*Vermivora chrysoptera*, Galveston County, Texas, USA. Photo: Brian E. Small]





Conservation action succeeded in increasing the population of ***Kirtland's Warbler*** *from a low of 167 singing males detected in both 1974 and 1987 to 1826 singing males in 2009. In 2007, it bred in Canada for the first time in 60 years. Management replicating the optimal breeding conditions, fire-maintained stands of jack pine* (Pinus banksiana) *2–4 m tall, has expanded available habitat to over 500 km² from the 18 km² occupied in 1994. But the breeding area is still so small that returning first-year birds may miss it, and there are threats to the wintering grounds in the Bahamas. Though downlisted from Vulnerable, it is still considered Near-threatened.*

[*Dendroica kirtlandii*, Lower Peninsula, Michigan, USA. Photo: Dave Maslowski/ Maslowski Productions]

cally common in the 23 years until the turn of the century. Since then, however, there have been very few records, with only five, or possibly six, since the 1920s, despite many extensive searches. The last definite sighting was in 1961. Reported sightings in 1965, 1989, 1995 and 2003 have not been confirmed. Semper's Warbler inhabited lower montane and montane rainforests, and elfin woodland, with an undisturbed understorey, and habitat degradation is one possible cause of its apparent demise. Destruction or degradation of the rainforest habitat on the island is continuing at an estimated 2% per year, and feeder roads are causing disturbance over a much wider area. Nevertheless, there is still a reasonable amount of suitable habitat on St Lucia, and many researchers think that habitat destruction in itself cannot have been enough to cause the extinction of this species. They point out that a predatory carnivore, the small Indian mongoose (*Herpestes auropunctatus*), was introduced on the island in 1884 in an attempt to control the population of the fer-de-lance (*Bothrops*), a highly venomous snake, and that the timing of this introduction coincides with the disappearance of Semper's Warbler. Although the warbler's ecology is essentially unknown, it is thought to have been an understorey species which nested on or near the ground; nest predation by mongooses could, therefore, have played a major part in its decline. It is imperative that the remaining forests within the historic range of this parulid are preserved while the search continues for an extant population. Whether or not it is possible to control the mongoose population on the island is another matter. Meanwhile, this species is listed as Critically Endangered, rather than Extinct.

Of the remaining globally threatened members of the family, one other, Belding's Yellowthroat, is classed as Critically Endangered. In the past, this species was locally common on the Baja California peninsula, where it inhabited lowland freshwater marshes, but most populations have collapsed recently owing to the almost complete destruction of its habitat. This has been largely due to human activity, but natural events such as droughts and hurricanes have also played a part. The total population is now no more than a few thousand at the very most. The last count of the nominate race gave a figure of about 550 individuals. Most of these, however, were in a single population at San José del Cabo that had been feared to be extinct owing to the destruction of the marsh there. The other subspecies, *goldmani*, is found at a dozen or so localities, at one of which, San Ignacio, the population is estimated at 537–648 individuals; it appears to be common at most of these sites, but the extent of suitable habitat is likely to be very small. This subspecies was last estimated to number 1100 individuals, although the current total is almost certainly higher than that. The species as a whole has been extirpated from at least one site in recent decades.

Recent surveys have provided a better knowledge of the distribution of this yellowthroat, which is now known from a total of at least 26 sites. One of the main sites, the Estero de San José del Cabo, a 42-ha freshwater coastal lagoon at the southern tip of the Baja California peninsula, was designated a Ramsar site in February 2008; two small local groups in the adjacent town have traditionally taken an active interest in the conservation of the area. Current conservation initiatives include the development of a "Conservation Area Plan" identifying the main threats and setting up a conservation strategy, and continuation of a programme of research and monitoring to ascertain the present status of and threats to this species in the Estero de San José del Cabo Ecological Reserve and at other historically important sites. In addition, educational boards are to be erected at the San José del Cabo reserve and informative material is to be distributed to local schools. By the end of 2008, a total of 86 local bird guides had been trained, their role being to raise the profile of Belding's Yellowthroat and to reinforce ties between local economic practices and conservation of this species.

Five species are classified as Endangered. These are the Golden-cheeked Warbler, the Whistling Warbler, the Black-polled Yellowthroat, the Yellow-faced Whitestart and the Grey-headed Warbler (*Basileuterus griseiceps*). The Grey-headed Warbler, confined to the Cordillera de Caripe mountain chain in north-eastern Venezuela, has a very limited range and a very low population, and it has suffered extensive destruction of its forest habitat. It has apparently always been very localized, and probably uncommon, even the collector of the type specimen reporting it as being very rare. The vast majority of records come from just two mountains, Cerro Negro and, in the Serranía de Turumiquire, Cerro Macanilla. The species was reported irregularly from these and two other localities until 1963. From then until 1993 there was only one report, of a single individual on Cerro Negro in 1987, and the species was considered by Ridgely and Tudor to be "virtually unknown in life" because, with the exception of the 1987 sighting, almost all other reports had merely referred to

specimens collected. In 1993, two individuals were seen near the summit of Cerro Negro during a search for the species, and further searches in the following year produced five reports, including one of a family party in August. More recently, the species has been seen on Cerro Turumiquire, in 1998 and 2001. Away from the historical localities, an apparent moulting juvenile was seen on two consecutive days on Los Cumbres de San Bonifacio, some 25 km north-east of Cerro Negro.

Destruction of its forest habitat, mainly for coffee plantations and vegetable plots, is undoubtedly the most serious threat facing this species, and the situation is critical on Cerro Negro, but less so in the Turumiquire Range. Within its historic range deforestation is virtually complete on Cerro Negro, the only known remaining habitat, near the summit, covering no more than about 2 km². There is now known to be more habitat remaining in Turumiquire, and this may be the species' current stronghold. The population on Cerro Negro has been estimated, on the basis of the cluster of sightings in 1993 and 1994 and the amount of habitat remaining, as consisting of just 2–5 pairs. Cerro Negro lies within El Guácharo National Park and is thus protected in theory. The laws relating to this protection, however, are not enforced and the remaining habitat is still under threat, especially from continued conversion to coffee plantation, which destroys the understorey on which the warblers depend, and from *campesinos*, peasant farmers who settle on the slopes and burn small patches in order to cultivate vegetables. The recent sightings and estimate of suitable habitat in Turumiquire are encouraging, and every effort should be made to discover the extent of the population there, which may well number 2500 or more individuals on the basis of the amount of habitat thought to be available. The sighting of a moulting juvenile at Los Cumbres de San Bonifacio should also be followed up in case there is an undiscovered population in the area.

Another Endangered parulid, the Golden-cheeked Warbler, breeds only in central Texas, in the southern USA, migrating through the highlands of Mexico to non-breeding grounds in montane pine–oak forests from southern Mexico to northern Nicaragua. It has probably always been uncommon and restricted in range, and in 1990 it was listed as "endangered" by the US Fish & Wildlife Service because of loss of breeding habitat caused by urban encroachment and clearance for agriculture. There was an estimated 25% decline in this species' numbers between 1962 and 1981, and estimates in 1990 indicated a population of between 5000 and 16,000 individuals in 30,000–105,000 ha of suitable habitat across 30 counties in central Texas. In 2004, the total post-breeding population was calculated as numbering 21,000 individuals, with an average density of 15 males/km² in about 350 km² of occupied habitat. Both its range and its numbers are decreasing. The Golden-cheeked Warbler has very specialized breeding requirements: it needs forest with a mature oak-dominated canopy and with admixed stands of Ashe juniper, as it is depends on strips of mature juniper bark for nest-building (see Habitat). This habitat has been eroded in the breeding range in recent decades through various human activities, and there was a sudden loss of key habitat in 1990 when the species' imminent federal listing as "Endangered" in the USA became known. The problem of brood parasitism by Brown-headed Cowbirds has increased as the habitat has become fragmented, allowing the cowbirds access to more of the population. It has also been suggested that nest predation by increasing numbers of Blue Jays may be preventing Golden-cheeked Warbler populations from sustaining themselves in suitable habitat near recently developed suburban areas. The Golden-cheeked Warbler is not so specialized in its choice of wintering habitat, occurring in montane coniferous and pine–oak forest, cloudforest, and also submontane tropical forest, usually above 1000 m. The threats on its wintering grounds are thought not to be so severe as those on the breeding grounds, but they include timber extraction, clearing of forest for firewood and agriculture, and mineral extraction. The recovery plan for this species, published in 1992, includes measures to protect sufficient breeding habitat for at least one viable population, estimated as consisting of 3000 pairs, in each of the eight subregions of the breeding range, to allow for potential gene flow between these populations, to protect an adequate area of habitat in the wintering range, and the protection of all breeding populations on public lands.

The Yellow-faced Whitestart has an extremely limited distribution on the Paria Peninsula, in north-eastern Venezuela. Within this tiny range, the vast majority of records, including all except a few of the recent ones, have come from just one mountain, Cerro Humo. Elsewhere there have been just a few records from two or three areas, including several seen on Cerro El Olvido in January 1999. These records may be indicative of another small population, separate from the main one on Cerro Humo, or they may involve seasonal dispersal eastwards from Cerro Humo. Further surveys are needed to clarify the situation. This whitestart is reliant on humid forest and cloudforest, where it occurs mostly in clearings and at the forest edge; it is also found on the edges of coffee plantations, but only where these are adjacent to forest habitat. On Cerro Humo it is still fairly common or common, with observations of 4–6 individuals per day during several visits in the 1980s and early 1990s. The extent of suitable habitat here, however, is only an estimated 1500 ha, and the total population could be very small. The Paria Peninsula National Park covers most of the species' range, but the south slope of Cerro Humo, which may now support most of the population, is outside the boundaries of the park. This area has recently become accessible by road and is, therefore, increasingly subject to disturbance, and in some places the forest is still being cleared for agriculture. In addition, it was reported in the mid-1980s that this species was being captured for the cagebird trade. The extent of the trade is not known, but its continuation could have a significant impact on a species with such a tiny total population. In the late 1980s, it was proposed that a gas pipeline be constructed through the Paria Peninsula; although it has not yet been built, it does remain a potential threat for the future.

In the highlands of central Mexico, the Black-polled Yellowthroat is particularly associated with a specialized habitat of lakeshores and river marshes containing cat-tails and hard-stemmed bulrushes. Drainage of this habitat is the main threat to this parulid's survival, and the species has declined dramatically in recent years, with several populations extirpated. It formerly occurred from Michoacán eastwards to the Valley of Mexico, but it is currently known from only four small, discrete areas: Lago Yuriria, in Guanajuato, Lago Cuitzeo and Lago Pátzcuaro, in



Over the bulk of its range in Guatemala and the highlands of Chiapas, Mexico, the Vulnerable ***Pink-headed Warbler*** *was historically very common. But in central Chiapas its cloudforest habitat has been fragmented into 18 widely scattered pieces, many at unsuitable altitudes, while just 3% of the original cloudforest remains in Guatemala. Protected areas in Guatemala cover much of the range of this species, but the protection is not enforced. In Chiapas it is under continual threat from the eruptions of the active Volcán Chichonal, which in 1982 is thought to have reduced the warbler's numbers to an all-time low.*

[*Ergaticus versicolor*, Volcán Tacaná, Chiapas, Mexico. Photo: Nick Athanas]



Cerulean Warbler *numbers have declined at the steepest rate of any North American warbler, and the bird is listed as Vulnerable. In the USA, there are efforts to acquire and safeguard large tracts of the mature forest the species requires for breeding, and in Colombia, ProAves Colombia has created the Cerulean Warbler Bird Reserve in 220 ha of oak forest. Shade-grown coffee plantations are being managed and extended to provide winter habitat for this and other neotropical migrants.*

[*Dendroica cerulea*, Shawnee State Park, S Ohio, USA. Photo: Dave Maslowski/ Maslowski Productions]

Michoacán, and the upper Lerma River, in México. The Lerma River is utilized for supplying Mexico City with water, which makes it difficult to achieve adequate protection measures; the drainage associated with water supply and for agriculture is continuous, and the remaining populations are seriously threatened. In the other three areas, water levels are falling as a result of both land drainage and a build-up of organic material, with consequent loss of the reedbed habitat on which this species depends. The global population of this Endangered parulid is not known, but is certain to be very small.

The last of the Endangered members of this family is the Whistling Warbler, an attractive species confined to the island of St Vincent, in the Lesser Antilles. This parulid is largely reliant on primary rainforest and palm brakes, although it occurs also, less commonly, in elfin forest and humid secondary growth and forest edge. It is still locally fairly common, and in a survey in 1986 the population was estimated at 1500–2000 pairs. The primary forest on which it depends, however, has been extensively cleared, and it has been calculated that only about 80 km² of the preferred habitat remains; this is little more than half of the estimated available habitat in the 1900s. The fact that the Whistling Warbler will tolerate suboptimal secondary forest will probably help its survival, at least in the short term. In addition to clearance of its forest habitat by local human inhabitants, there have been two eruptions of the volcano Soufrière in the twentieth century, and these destroyed large tracts of rainforest in the northern mountains. Nevertheless, the birds have returned as regeneration of the vegetation has taken place.

A further seven globally threatened species are classed as Vulnerable. These are the Cerulean Warbler, the Elfin Woods Warbler, the Altamira Yellowthroat, the Pink-headed Warbler, the Pirre Warbler (*Basileuterus ignotus*), the Santa Marta Warbler and the White-winged Warbler.

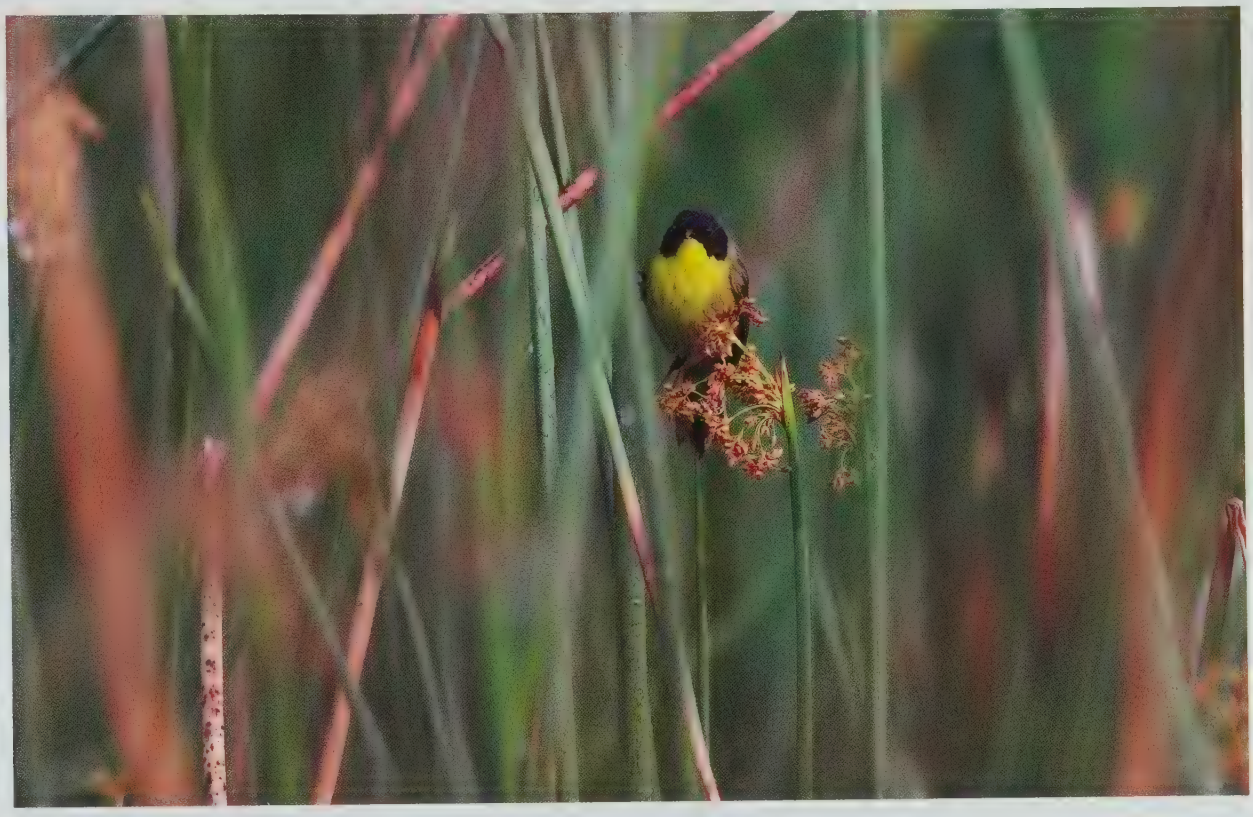
Considerable concern has been expressed in recent years over possible declines in Neotropical migrants, particularly those which breed in North America and spend the northern winter in tropical rainforests. The warbler species causing most concern in this category is the Cerulean Warbler. Breeding Bird Survey data from 1966 to 1987 indicated an annual decline of 3·4%, the steepest decline of any North American parulid, and there was an estimated 80% decline across the breeding range between 1966 and 2003. This species is dependent to a large extent on primary old-growth forests, both on the breeding grounds and in the wintering areas, and the loss of large tracts of this habitat to agriculture and, on the breeding grounds, to short-rotation, even-age managed forest, is probably one of the main causes of the decline. Other contributory factors on the breeding grounds include habitat fragmentation and the resultant brood parasitism by Brown-headed Cowbirds, which invade fragmented forests, and the loss of key tree species such as oaks, elms (*Ulmus*), sycamores (*Platanus*) and American chestnuts (*Castanea dentata*) through disease.

The Elfin Woods Warbler is restricted to the Caribbean island of Puerto Rico, where it is locally common. The remaining habitat, however, is relatively limited and the total population was thought to number no more than 300 pairs, although recent, more accurate counts suggest a population of some 1830 individuals. First



The humid forests of Colombia's Santa Marta Mountains, on which the restricted-range ***Santa Marta Warbler*** *depends, are rapidly succumbing to conversion for agriculture and forestry. So extreme is the change to the habitat that the Black-backed Antshrike* (Sakesphorus melanonotus)*, a bird of dry shrublands, has begun to colonize the mountains. In 2004, the warbler was declared Vulnerable, joining the alarming list of Santa Marta endemics that are redlisted.*

[*Basileuterus basilicus*, El Dorado, Colombia. Photo: George M. Jett]



Unlike other yellowthroats (Geothlypis), *the* ***Black-polled Yellowthroat*** *will not tolerate degraded habitats. It is restricted to lake shores and riverine marshes with extensive beds of cat-tails* (Typha) *and bulrushes* (Schoenoplectus), *and is currently known only from four shrinking areas in central Mexico. None of these areas have been censused since the 1980s, and while the global population is estimated at less than 10,000 birds, it might be as few as 2500. In view of its small and declining range, the Black-polled Yellowthroat is listed as Endangered. There are no protected areas within its range, and no known conservation measures for the species.*

[*Geothlypis speciosa speciosa*, Toluca, Mexico. Photo: Manuel Grosselet]

discovered as recently as 1971, the species was believed to occur at four disjunct localities, two in the west and two in the east, but it may be confined to just two widely separated sites: Maricao State Forest, in the west, and the Sierra de Luquillo, especially in El Yunque National Forest, in the east. At present, there seems to be sufficient protected undisturbed habitat to prevent the species from being put at immediate risk. On the other hand, its small population size and restricted range render it vulnerable to natural disasters and possible habitat modification in the future. Moreover, *Podocarpus*-dominated forest, which may be of major importance to the warbler, accounts for only a tiny percentage of the remaining forest and continues to be replaced by development projects, including facilities for tourism in protected areas.

Immediately to the west of Puerto Rico, the White-winged Warbler is found in mountain forest on the much larger island of Hispaniola, its only home. Deforestation has led to considerable declines in the species' numbers throughout its small range and, although it is still fairly common in a few areas in the Dominican Republic, the situation in Haiti is critical and this parulid is considered to be the most seriously threatened species in the country. In Haiti, an increasing human population and the concomitant clearing of forest for agriculture and timber for firewood and house construction have resulted in almost complete deforestation. The White-winged Warbler has been recorded from two disjunct areas in Haiti, the Massif de la Hotte, in the southwest of the country, and the Massif de la Selle, near the Dominican Republic border. It was last recorded from the Massif de la Selle in 1975 and it is feared that it is now extinct there. In the Massif de la Hotte, records of single individuals in 1982 and 1984 seemed to have been the last until recent observations were made at Pic Macaya National Park, where the species appears to be fairly common in wet karst limestone forest. Haiti is severely overpopulated, and the government has apparently has done little to enforce the nominal protection measures for the tiny amount of forest remaining. With the situation in that country so dire, this parulid is probably dependent for its survival on the forest in the Dominican Republic, where the situation is considerably less serious. Here, it is present in up to four protected forest areas and may be locally common, but it has still declined notably, primarily following habitat destruction. Another reason for its decline throughout Hispaniola may be nest predation by mongooses that were introduced on the island in 1934; this is a very difficult problem to address, but efforts to ensure that the species' remaining habitat is protected, and, if possible, increased in area, will help. In 2004, the total population was estimated to consist of approximately 3300 adults.

Formerly common throughout its range in South Mexico and northern Central America, the Pink-headed Warbler is now very rare and local in central Chiapas, although still locally common on Volcán Tacaná, in extreme SE Chiapas, and in Guatemala. The Chiapas populations are continually threatened by eruptions from the active Volcán Chichonal. They probably reached an all-time low following a major eruption of this volcano in 1982, which covered a large area of the species' range in Chiapas with ash and perhaps caused a major insect die-off, which affected its food supply. An apparent slight increase occurred at two locations in this area from the late 1980s. The total population is currently unknown, but it is estimated at between 20,000 and 50,000 individuals. The decline in Chiapas may have been exacerbated by the 1982 eruption, but the main threat is undoubtedly habitat degradation and destruction, especially the clearing of the understorey and subsequent grazing in the forests where it lives. Clearance for timber, charcoal, agriculture and road-building are also threats to these forests. Currently, no more than an estimated 400 km² of highly fragmented cloudforest survives in central Chiapas, and not all of it is at suitable altitudes for this species. In Guatemala, an estimated total of 900 km² of cloudforest remains, but this is only a tiny proportion of the original area, and only about half of it is presently occupied by the warbler.

Another New World warbler having a tiny global range is the Pirre Warbler, which is found only on the two mountains of Cerro Pirre and Cerro Tacarcuna, on the Panama–Colombia border. Its estimated total range is about 180 km², of which it is thought to occupy less than 100 km² of suitable habitat. No systematic surveys have been undertaken, but the population is thought to number fewer than 2500 individuals. The Pirre Warbler is generally uncommon, but in 1985 it was found to be fairly common above 1400 m on Alturas de Nique, in the south part of Pirre. Having such a small range, the species is bound to be seriously affected by any habitat alteration, although this has not yet occurred to any great extent. Habitat degradation has taken place in this region, for mining, agriculture and coca cultivation, but to date not within the altitudinal range of the warbler. Most of the species' range lies within the protected Darién National Park; the



The Endangered ***Yellow-faced Whitestart*** *is endemic to the Paria Peninsula in Sucre, north-east Venezuela. The majority of recent records come from one mountain, Cerro Humo. Most of the species' range is covered by a 37,500-ha national park—patrolled by three under-equipped rangers—but the south slope of Cerro Humo, where the main population may be, lies outside the boundary. The humid forest is regularly cleared by "conuco" farmers, who move on to a new patch after a couple of harvests have exhausted the thin mountain soil. Reports from the 1980s suggest the whitestart was, and possibly still is, collected for the cagebird trade.*

[*Myioborus pariae*, Sucre, Venezuela. Photo: David Southall]

completion of the Pan American Highway through this area would, however, lead to further damage and destruction of the forests.

The Altamira Yellowthroat is confined to eastern Mexico, where it is reliant on freshwater marshes containing extensive reedbeds. It has declined seriously in recent years, principally as a result of habitat loss, with several populations now extirpated. Its present stronghold is in Tamaulipas, where a large population exists in the Laguna Champayán area, although this may be under threat from drainage associated with industrial development. The species is now very rare in Veracruz, the stronghold there being the area inland from Tecolutla, and a further population is found near El Naranjo, in San Luis Potosí. The yellowthroat was previously reported from the Laguna de Tamiahua area and near Tamuín and Ebano, on the Veracruz–San Luis Potosí border, but there are no recent records from these areas. In addition to the drainage linked with industrialization, further drainage of marshes for cattle-ranching is a potential threat in many areas. The Altamira Yellowthroat is able to persist in small fragments of habitat, but these may prove to be unsustainable in the long term and there may now be insufficient habitat to support a viable population in Veracruz.

The last of the seven Vulnerable parulids, the Santa Marta Warbler, is limited to a small area in north Colombia. It lives in humid montane forest and secondary woodland, especially with areas of *Chusquea* bamboo, in the Sierra Nevada de Santa Marta, where it varies from being locally common in some places to being rare at others. Its range is already fragmented owing to forest clearance, and is declining in extent because of continuing deforestation, primarily for the development of cattle ranches and the establishment of commercial pine plantations. More than one-fifth of the montane forest has already been lost, and most of the original vegetation has been greatly modified by such illegal activities as agricultural expansion, logging and burning. Unfortunately, the most degraded area is the northern slope of the Santa Marta Mountains, and it is here that the majority of the warbler's population lives. The species possibly persists in scrubby habitat above the tree-line, suggesting that it may be tolerant of some extent of deforestation. Although its global population is not known, it is thought to number fewer than 2500 individuals. The Santa Marta Warbler, formerly considered Near-threatened, was altered to Vulnerable mainly because of its continuing loss of habitat. If it is subsequently found to be able to thrive in scrubby high-montane habitats, it may perhaps be returned to its former category.

Kirtland's Warbler, in contrast to the previous species, was previously considered globally threatened, but is now listed as Near-threatened. Like the congeneric Golden-cheeked Warbler in Texas, it has a very limited breeding range, restricted to a small area in Michigan, in the north USA, and a highly specialized breeding habitat (see Habitat). Noticeable declines in its numbers were recorded in the first two decades of the twentieth century and again in 1961–1971, and in the annual censuses the number of singing males located dropped as low as a meagre 167 in both 1974 and 1987. Since then, however, a steady increase has occurred. The total population, estimated at around 4000 individuals in 2009, is still far lower than that of Golden-cheeked Warbler, and its survival currently appears to be dependent on human management of its nesting habitat and control of Brown-headed Cowbirds in its breeding range. The species' only known wintering grounds are in the Bahamas and associated islands. Its ecology in the non-breeding season is poorly known, but it is not currently thought to be significantly threatened by any factors operating there.

The stands of young jack pine that Kirtland's Warblers require for breeding typically appear following forest fires. When the stands reach a height of 7 m or so, the dense ground cover needed for nesting becomes shaded out and the birds move elsewhere; historically, the warblers would have moved around to find such areas when the pine habitat was more extensive than it is today. As the required habitat is so specialized, a large area of jack pines in the breeding area is continually managed, by burning, so that there are always enough trees of the right height and in large enough stands to provide adequate nesting habitat.

Brood parasitism by Brown-headed Cowbirds is another major threat to Kirtland's Warbler. It has probably been occurring for more than 100 years, but the situation became critical during the 1960s and early 1970s when the warbler population fell by 60%, and in one study of 29 nests it was found that 70% were parasitized, and only two Kirtland Warbler chicks fledged successfully. At this rate, it was feared that cowbirds could cause the extinction of the warbler by 1980 and, as an emergency measure, the trapping and removal of cowbirds in the breeding

area was begun in 1972. This had an immediate beneficial effect and brood parasitism dropped very quickly to about 3%, allowing a dramatic increase in the fledging rates of the warbler. This trapping has not, however, resulted in a decrease in cowbird numbers, nor would it be expected to, and it may therefore have to continue indefinitely to ensure the survival of Kirtland's Warbler.

Fortunately, the warbler has responded very well to the management measures put in place, and has increased markedly in recent years. After totals of 432 territorial males in 1951 and 502 in 1961, in the first censuses, the population of Kirtland's Warbler settled at around 200–250 territorial males for the 1970s and 1980s. Following the trapping of cowbirds, the population did not immediately respond very markedly, even though the fledging success did, but it grew steadily, with 265 males in 1990 and 347 in 1991. After this, there was suddenly a more dramatic upturn and by 1999 numbers had reached 904 territorial males, with a slight spread from the core range evident. Throughout the 2000s, numbers have increased almost every year and by 2009 some 1826 singing males were counted. The main breeding area is in central Michigan, but the species has recently started to spread to the Upper Peninsula of Michigan and to the adjacent state of Wisconsin, and in 2007 it nested in Canada for the first time since 1945.

Despite this undoubted success, the total Kirtland's Warbler population is still very small. Among the reasons for this are the fact that it appears to depend both on the removal of cowbirds from the core nesting area, and on human management of its specialized breeding habitat. Another possible problem is that the breeding area is so small that inexperienced individuals, migrating back from the Bahamas for the first time, may inadvertently miss it altogether. This could account for the sporadic appearance of singing males in adjacent areas, and for the delay in recovery of the population following the start of the cowbird-removal programme. If the population continues to increase, however, it may facilitate colonization of new breeding areas in the future. In addition to the ongoing cowbird threat and reliance on human-induced burning to provide suitable habitat, other potential threats include continued habitat fragmentation and degradation in some areas and predation by domestic cats.

A further eight members of the family are currently listed as Near-threatened. They are the Golden-winged and Colima Warblers, the Barbuda Warbler, the Vitelline Warbler, the Guaiquinima and White-fronted Whitestarts, and the Grey-throated (*Basileuterus cinereicollis*) and White-lored Warblers (*Basileuterus conspicillatus*). For the majority of these parulids, this "official" listing is due to a combination of a very limited geographical range and real or potential threats to the habitat. Most are also restricted-range species, having a small global range. In addition, 17 other parulids are listed as restricted-range species and, although none is currently considered at possible risk, all do have a very small global range and their populations should be monitored. They are the Flame-throated, Adelaide's, Olive-capped, Plumbeous, Arrow-headed, Green-tailed, Yellow-headed, Oriente, Grey-and-gold, Three-banded and Black-cheeked Warblers, the Bahama Yellowthroat, the Tepui, White-faced, Collared and Yellow-crowned Whitestarts, and the Wrenthrush.

Of the remaining New World warblers, the majority of the North American species are not thought to have undergone any significant changes over recent decades, while for most of the tropical species there is insufficient information to determine whether any recent population changes have taken place. Nevertheless, altogether eleven warbler species were listed as Birds of Conservation Concern by the US Fish & Wildlife Service in 2002. These are the Golden-winged, Grace's, Prairie, Cerulean, Elfin Woods, Prothonotary, Worm-eating, Swainson's, Kentucky and Canada Warblers, and the Louisiana Waterthrush. The reasons for the decline in Golden-winged Warbler numbers are primarily its specialized habitat and the continuing invasion of this habitat, with associated interbreeding, by Blue-winged Warblers; this is outlined below. The main problem for Grace's and Prairie Warblers appears to be degradation and loss of the breeding habitat. The subspecies *paludicola* of the Prairie Warbler is resident in coastal Florida, where it has declined in numbers, probably a result of a combination of degradation of its mangrove habitat and increased parasitism by Brown-headed Cowbirds; it is now listed by the state as a Species of Special Concern. Most of the other species, however, spend the winter almost entirely in tropical rainforests, and it is thought that threats to the wintering habitat, as well as to the breeding habitat in many cases, may be having a significant adverse effect on their populations.

The Kentucky Warbler, which is largely tied to tropical rainforests in the winter season and which suffered a significant decline over much of its breeding range between 1966 and 1988, as indicated by the North American Breeding Bird Survey, is also in serious decline in some areas. On the other hand, there have



Within its total range of just 910 km², the ***Grey-headed Warbler*** *seems never to have been common, and its remaining habitat is severely fragmented. Although considered Endangered, it might be downlisted to Vulnerable if studies show that it can survive in degraded forest. But conversion to shade coffee, which preserves some canopy trees, and provides year-round habitat for some* Basileuterus *species, destroys the dense undergrowth on which the Grey-headed Warbler depends. Even within the Cueva del Guácharo National Park, forest is being cleared and the understorey replaced with coffee, although large areas of good habitat still remain.*

[*Basileuterus griseiceps*, Monagas, Venezuela. Photo: David Southall]



As far as is known, the Endangered ***Golden-cheeked Warbler*** *has always been confined as a breeding species to central Texas. It nests only in mature stands of Ashe juniper* (Juniperus ashei). *Fragmentation of this habitat has made brood-parasitism by cowbirds* (Molothrus) *a serious problem, as illustrated here. Conservation in the breeding range involves securing habitat and ensuring gene flow between populations. But the main cause of decline may be destruction of its pine-oak wintering grounds, which an alliance of conservation organizations from El Salvador, Guatemala, Honduras, Mexico, Nicaragua and the USA is working to protect.*

[*Dendroica chrysoparia*, Colorado Bend State Park, Texas, USA. Photo: Mark Lockwood/ VIREO]

been short-term increases in a few areas, and it is not clear to what extent these changes are a direct result of habitat alterations in its winter range.

Breeding Bird Survey data indicate also long-term significant declines in populations of the Canada Warbler. This species winters mainly in undisturbed submontane forest and forest edge with an intact understorey, although it will tolerate some disturbance to these habitats. These forests are becoming increasingly threatened in South America, mainly through clearance for agriculture. It is likely, however, that changes in the breeding habitat have been at least as responsible for these declines as have changes in the wintering habitat, and possibly more so. This is indicated by the fact that one of the most serious declines in the species' numbers has been in the north-eastern USA, and since 1950 this whole area has, through drainage and other developments, lost much of the wetland forest that provides optimal Canada Warbler breeding habitat.

The status levels of the Blue-winged and Golden-winged Warblers are closely linked and have undergone quite dramatic changes over the last 200 years. The Golden-winged Warbler is the more northerly breeder of the two and began its range expansion about 200 years ago, probably in response to the abandonment of homesteads which created the early-successional habitat on which it specializes. The more southerly Blue-winged Warbler is more of a habitat generalist. It has been expanding its range northwards since the late nineteenth century, which has brought it into increasing contact with its congener, resulting in extensive hybridization and eventual local replacement of the Golden-winged by pure Blue-winged Warblers. While both are still expanding their ranges, Breeding Bird Survey data reveal that Golden-winged Warblers are now declining in numbers over most of their breeding range, to the extent that this species is now giving cause for concern (see above). As Golden-winged Warblers move north they will eventually run out of habitat, and the northward expansion of the Blue-winged Warbler shows no signs of abating; consequently, continued loss of pure Golden-winged Warblers through interbreeding seems likely. Management proposals designed to offset these declines include regular burning, to provide early-successional habitat, and the control of Brown-headed Cowbirds in key areas, but the interbreeding problem is more difficult to address.

Lucy's Warbler has declined noticeably in its breeding range. The primary cause of this is destruction of its riparian mesquite breeding habitat as a result of water projects and the direct cutting of mesquite bushes. There have, however, been a few local increases, particularly along the Colorado River in the Grand Canyon, where changed flow levels resulting from the construction of an upstream dam have provided extra suitable habitat in the form of tamarisk (*Tamarix*) thickets.

Other temperate-breeding warblers showing local declines in recent decades include the American Redstart, the Blackpoll Warbler, particularly in Newfoundland, and the Pine Warbler. The decline in the Newfoundland population of Blackpoll Warblers is a long-term one; elsewhere, Breeding Bird Survey data suggest that the population in the east of the breeding range increased in the late 1960s and 1970s, but declined from then until at least the mid-1990s. The Hispaniolan subspecies of the Pine Warbler, *chrysoleuca*, is probably threatened in Haiti, owing to almost total deforestation in the country, although it is considerably more common in the Dominican Republic.

In some instances, local population declines have resulted in entire subspecies becoming rare or threatened. The subspecies *stoddardi* of the Yellow-throated Warbler has decreased noticeably and is now classified as "Rare" by the Florida Committee on Rare and Endangered Plants and Animals. The subspecies *sinuosa* and *insperata* of the Common Yellowthroat, occurring in, respectively, Californian coastal saltmarshes and the lower Rio Grande in Texas, have declined steeply over the past century. In the case of *sinuosa*, the decline has been estimated at 80–95% as a result of the loss of 83% of the tidal saltmarshes on which the bird depends. Data on *insperata* are lacking, but it is thought that this taxon is now virtually extinct in Texas. Both subspecies are candidates for federal "Endangered" status, but as yet neither has been listed.

As well as through habitat degradation and destruction, humans have affected New World warbler populations in indirect ways. In North America, many nocturnally migrating warblers are attracted to bright lights such as those at lighthouses, especially in thick fog, when they are likely already to be disorientated. Frequently, the birds fly into the light or adjacent building and are either killed outright or are stunned and drown in the water below. These "lighthouse attractions" provide a useful



The most threatened of all the New World warblers is the Critically Endangered ***Belding's Yellowthroat****, with a global range of just 20 km² of severely fragmented freshwater and coastal marsh habitat in the Baja California peninsula, Mexico. The location of this picture, Estero de San José del Cabo, a 42-ha freshwater coastal lagoon, has been designated a Ramsar site. Dozens of local bird guides have been trained, providing livelihood incentives for conserving the species. Other measures focus on raising local pride in the yellowthroat. But such small and isolated populations are at the mercy of events like hurricanes, which periodically sweep over the area from August to October.*

[*Geothlypis beldingi*, San José del Cabo, Mexico. Photo: Pete Morris]

indicator of nocturnal migration that might otherwise be invisible, but a great many migrating warblers are killed every year as a result of them. It has been found that bright lights at or near the top of skyscrapers can have a similarly disorientating effect on migrating warblers.

Significant population increases have been documented in recent decades for the Pine Warbler in North America, the Palm Warbler, the western subspecies of the Nashville Warbler, and the eastern and northern races of the Yellow-rumped Warbler, these last two races often referred to together as the "Myrtle Warbler" (see Systematics). The increase in numbers of the Myrtle Warbler has not, however, been reflected in the western population of the Yellow-rumped Warbler, known as "Audubon's Warbler", the population of which has remained stable over the same period.

Several species inhabiting spruce woods have populations that fluctuate strongly in response to the cyclical population fluctuations of the spruce budworm, a major food source (see Food and Feeding). This correlation is most strongly evident with the Cape May Warbler, but is pronounced also in the cases of the Bay-breasted and Tennessee Warblers, and is demonstrated to some extent with such other species as the Blackpoll, Blackburnian and Magnolia Warblers. It has been suggested that intensive spraying to control numbers of the spruce budworm could have a long-term negative effect on these species of "spruce-wood warbler".

The Chestnut-sided Warbler, being a specialist of the early-successional habitats of the forest, showed a dramatic increase in range and population following the clearing of the primary forests in eastern North America, rapidly invading the scrub that developed in the cleared areas. The expansion was most notable in the 1800s and early 1900s. Since the 1960s, there have been some local declines, probably the result of urbanization and more intensive agricultural practices, but the species remains one of the commoner eastern parulids, despite having been virtually unknown in J. J. Audubon's time.

There is anecdotal evidence that some other members of this family have benefited from human alteration of landscapes. For example, the Grey-crowned and Masked Yellowthroats, particularly the subspecies *chiriquensis* of the latter, are thought to have increased in many areas as a result of the creation, by deforestation, of suitable early-successional habitat. The race *ralphi* of the Grey-crowned Yellowthroat, however, has disappeared from Texas, which was its only USA locality, and may be declining in parts of Tamaulipas, in north-east Mexico, as a result of overgrazing and other changes in agricultural practice, indicating that not all human-induced changes benefit these yellowthroat species.

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inches 3
cm 8
PLATE 51
1
2
3
ssp celata
4
ssp lutescens
5
6
7
8
9
10
ssp graysoni
ssp speciosa
11
12
ssp pitiayumi
ssp cirrha

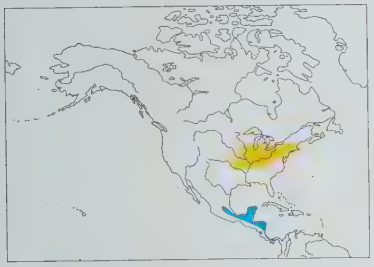
Genus *VERMIVORA* Swainson, 1827

1. Blue-winged Warbler

Vermivora cyanoptera

French: Paruline à ailes bleues **German**: Blauflügel-Waldsänger **Spanish**: Reinita Aliazul
Other common names: Brewster's Warbler, Lawrence's Warbler (hybrids with *V. chrysoptera*); Cincinnati Warbler (hybrid with *Oporornis formosus*)

Taxonomy. *Certhia cyanoptera*, Olson and Reveal, 2009, Philadelphia, Pennsylvania, USA.
Recent studies of mitochondrial DNA indicate that this species and *V. chrysoptera* form a clade, separate from the other species currently placed in genus; a recent study indicates that *Protonotaria citrea* and *Limnothlypis swainsonii* may also be genetically close to this species pair. Hybridizes regularly with *V. chrysoptera* where breeding ranges overlap. Has hybridized also with *Oporornis formosus* (hybrid originally described as a new species, *Helminthophaga cincinnatiensis*; one of the two specimens of this pairing originally thought to have involved *Oporornis philadelphia*), and possibly with *V. ruficapilla*. Until recently, species known as *V. pinus* (see page 675). Monotypic.
Distribution. Breeds in CE North America, from S Wisconsin, S Michigan and New York S to E Missouri, S Appalachians, West Virginia and Pennsylvania; migrates to region from SE Mexico S to Costa Rica, occasionally to Panama.



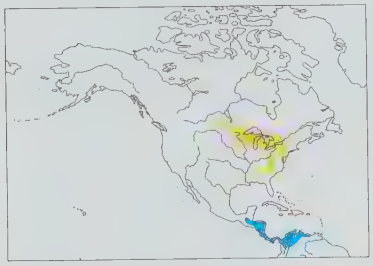
Descriptive notes. 12 cm; 7·2–11 g. Male has bright yellow on front of head, throat and underparts, contrasting short, narrow black eyestripe; nape and upperparts olive-green, undertail-coverts white; upperwing blue-grey, greater and median upperwing-coverts broadly tipped white (two white wingbars); tail blue-grey, large white spots in outer three feathers; iris dark; bill blackish; legs dull yellowish-olive to dark brownish-grey. Female is similar to male but slightly duller, with less yellow on head. Juvenile has head, throat and upperparts olive-brown, tinged yellow, dusky lores, yellow-tinged wingbars, underparts paler ochre-yellow, bill and legs dusky-flesh; first-year male similar to adult female but slightly duller, with less yellow on head, first-year female slightly duller still. Voice. Has two song types. Type 1 song a buzzy, drawn-out "bzeeeee-bzzzzz", second note either lower or higher in pitch. More complex Type 2 song, with variety of rapid, relatively musical notes given after the buzzy notes, is sometimes used, especially early in morning and sometimes in flight. Has been recorded as singing typical *V. chrysoptera* song. Usual call a sharp, rather musical "tchip". Flight call a thin, buzzy "zwee".
Habitat. Breeds in woodland edges and clearings, streamside thickets, neglected brushy fields and similar habitats in the succession from grassland to woodland; tolerates wider range of successional habitat than does *V. chrysoptera*, often replacing latter in habitats that have become too overgrown for that species. On wintering grounds, mainly in rainforest edge and second-growth forest with well-developed brushy understorey, usually not in forest interior.
Food and Feeding. Feeds mainly on insects, especially larvae of Lepidoptera and small crickets and grasshoppers (Orthoptera); also spiders (Araneae). Forages mostly at middle levels of trees. Feeds mainly by gleaning and probing leaves, but occasionally hovers to pick insects from leaves. Specializes in probing dead-leaf clumps for insects, often hanging upside-down in manner of a tit (Paridae) to do so. Frequently joins mixed-species foraging flocks on autumn migration and on wintering grounds.
Breeding. Season May–Jul, egg-laying May–Jun. Nest a cone-shaped cup of grasses, dead leaves and bark strips, lined with hair and fine grasses, placed on or near ground. Clutch 4–7 eggs; incubation period 10–11 days; nestling period 9–10 days (occasionally 8 days). Nests parasitized by Brown-headed Cowbird (*Molothrus ater*): in highly fragmented, suboptimal habitat up to 67% of nests parasitized, but in large areas of intact habitat parasitism very infrequent (1 out of 212 nests in one study).
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds mostly during Aug, arriving on wintering grounds from late Sept, a few remaining in S USA until Oct. Most move S from breeding grounds, mainly W of Appalachians, to Gulf coast and then across to Yucatán (SE Mexico) and on to wintering areas. Spring migration begins in Mar and is basically the reverse of autumn route, with arrival on breeding grounds from mid-Apr in S, early May in N. Regular passage migrant in Bermuda, mainly in autumn. Vagrant to Canada, areas NW & NE of breeding range, much of W North America, Colombia and W Europe (Ireland).
Status and Conservation. Not globally threatened. Fairly common to common throughout breeding range. Increased in numbers and range during 20th century. Range expanding steadily N, displacing *V. chrysoptera* through habitat occupation and interbreeding as it does so. Estimated densities in West Virginia of 71 males/km² (where no contact with *V. chrysoptera*) and 15 males/km² (in areas of sympatry); 39 males/km² in fragmented habitat in Ohio. Continued range expansion towards NE not fully understood, but thought to be due to combination of human-induced habitat change and gradual warming of climate across breeding range. Locally frequent hybridization with *V. chrysoptera* produces fertile hybrids, which may have lower fitness (and therefore lower reproductive success) than do pure offspring; present species gradually comes to dominate in areas of hybridization, *V. chrysoptera* usually disappearing within c. 50 years of initial contact, this thought to be due to genetic, rather than aggressive, displacement.
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2. Golden-winged Warbler

Vermivora chrysoptera

French: Paruline à ailes dorées **German**: Goldflügel-Waldsänger **Spanish**: Reinita Alidorada
Other common names: Brewster's Warbler, Lawrence's Warbler (hybrids with *V. cyanoptera*)

Taxonomy. *Motacilla chrysoptera* Linnaeus, 1766, near Philadelphia, Pennsylvania, USA.
Recent studies of mitochondrial DNA indicate that this species and *V. cyanoptera* form a clade, separate from the other species currently placed in genus; a recent study indicates that *Protonotaria citrea* and *Limnothlypis swainsonii* may also be genetically close to this species pair. Hybridizes regularly with *V. cyanoptera* where breeding ranges overlap. Monotypic.
Distribution. Breeds from S Canada (SE Manitoba, S Ontario) and N USA (Minnesota) E past Great Lakes to Pennsylvania, and S in Appalachians to N Georgia; migrates to wintering grounds from SE Mexico and Guatemala S to Panama, a few reaching N South America.



Descriptive notes. 12 cm; 7·2–11·8 g. Male has bright golden-yellow patches on forecrown and wing, broad white supercilium (broader behind eye), and black ear-coverts and throat separated by broad white stripe; upperparts grey, wing and tail with darker feather centres, large white spots on outer three rectrices; underparts pale greyish-white, greyest on flanks; iris dark; bill and legs blackish. Female similar but rather duller, with ear-coverts and throat grey (rather than black), forecrown greenish-yellow, and grey of upperparts tinged olive. Juvenile has olive-grey crown, nape and upperparts, creamy wingbars on greater and median upperwing-coverts, dusky-olive ear-covert patch with off-white upper and lower borders, dusky throat, pale olive-yellow underparts, pinkish-buff bill and legs; first-year similar to adult, but with broad olive tertial fringes. Voice. Two song types. Type 1 song a buzzy note followed by 2–4 shorter buzzy notes on lower pitch, transcribed as "bzeee bzz bzz bzz". Type 2 song, given early in morning, a fast series of varied, relatively musical notes given after buzzy notes, probably indistinguishable from that of *V. cyanoptera*. Call notes a sharp "tchip" and, in flight, a thin, buzzy "zwee"; virtually identical to and probably indistinguishable from calls of *V. cyanoptera*.
Habitat. Breeds in brushy fields and pastures in early-successional stage of reversion to woodland; also clearings in woods and shrubby borders of streams; in N Wisconsin territories concentrated in young aspen (*Populus tremuloides*) stands 1–10 years old. More of a habitat specialist than is *V. cyanoptera*, and often replaced by latter when abandoned fields and pastures become too scrubbed over. Winters mainly in second-growth forest or forest edge with well-developed understorey, but rarely deep in rainforest; often at slightly higher elevations than *V. cyanoptera*, up to 2000 m.
Food and Feeding. Feeds mainly on insects, especially tortricid moths and their larvae (Lepidoptera); also spiders (Araneae). Forages mainly at low to middle levels of trees and in upper levels of shrubs, sometimes higher up in trees. Feeds mainly by gleaning and probing leaves, but occasionally hovers to pick insects from leaves. Like *V. cyanoptera*, specializes in probing dead-leaf clumps for insects, often hanging upside-down to do so. Frequently joins mixed-species foraging flocks on migration and on winter grounds; on passage (also on breeding grounds once young fledged), often joins flocks led by Black-capped Chickadee (*Poecile atricapillus*).
Breeding. Season May–Jul. Nest a bulky cup of grasses, dead leaves and bark strips, lined with hair, fine grasses and bark shreds, well hidden on or near ground. Clutch 4–7 eggs, usually 4–5; incubation period 10–11 days, occasionally 12 days; nestling period 8–10 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*); in one study of several hundred nests, 30–35% of these contained at least one cowbird egg, which reduced hatching success by 50% and fledging success by 17% compared with non-parasitized nests.
Movements. Long-distance migrant. Leaves breeding grounds in late Aug and Sept (slightly later than *V. cyanoptera*), arriving in wintering areas from late Sept. Most move S on broad front to Gulf coast, cross Gulf of Mexico to Yucatán Peninsula, and then continue S to wintering grounds. Return migration begins in Mar and is basically reverse of autumn route, but with slight shift to W once North America reached; arrival on breeding grounds from early May, slightly earlier in Appalachians (again, slightly later than *V. cyanoptera*). Casual in Saskatchewan, mainly in spring; casual in Ecuador in winter and in Caribbean in autumn/winter. Vagrant W & N of breeding range, to much of W USA; also Bermuda, Peru, Greenland and Europe (Britain).
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Generally fairly common, but has declined significantly in USA in recent years, and listed as a species of conservation concern by US Fish & Wildlife Service. Is still expanding range N & NW in Canada, and no significant declines yet noted there. Locally frequent hybridization with *V. cyanoptera* produces fertile hybrids, which may have lower fitness (and therefore lower reproductive success) than do pure offspring; generally, present species gradually replaced by *V. cyanoptera* in areas of hybridization, usually disappearing within c. 50 years of initial contact, this believed due to genetic, rather than aggressive, displacement. Because of its specialized choice of early-successional habitat, this parulid is heavily parasitized by Brown-headed Cowbird; other threats are loss of habitat to succession, reforestation or urbanization, and perhaps also infiltration of populations by *V. cyanoptera*; territories in earliest stages of succession tend to result in larger clutches and less infiltration by *V. cyanoptera*, but are more prone to brood parasitism by cowbirds. Suggested measures to halt decline include the burning of large blocks of habitat to maintain it in early stages of succession, and control of cowbirds; more controversially, control of *V. cyanoptera* has also been suggested in areas where latter has been thought to be replacing present species through hybridization. In N Wisconsin, it may be necessary actively to manage young aspen habitat in order to keep it suitable.
Bibliography. Anon. (2002, 2009f), Buehler *et al.* (2007), Butchart & Stattersfield (2004), Coker & Confer (1990), Confer (1992), Confer & Knapp (1977, 1981), Confer & Larkin (1998), Confer *et al.* (2003), Englom & Nordin (1999), Ficken & Ficken (1966b, 1968a, 1968b, 1968c), Frech & Confer (1987), Gill (1980, 1987), Gill & Murray (1972a, 1972b), Hands *et al.* (1989), Highsmith (1989), Klein *et al.* (2004), Lewington *et al.* (1991), Martin *et al.* (2007), McCarthy (2006), Murray & Gill (1976), Parkes (1951, 1991), Sangster (2008a), Shapiro (2005), Shapiro *et al.* (2004), Short (1963, 1964).

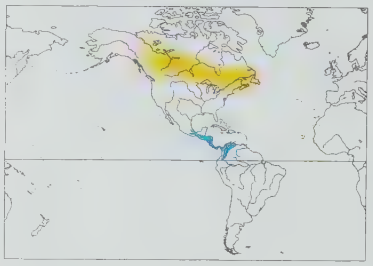
3. Tennessee Warbler

Vermivora peregrina

French: Paruline obscure **German**: Brauenwaldsänger **Spanish**: Reinita de Tennessee

On following pages: 4. Orange-crowned Warbler (*Vermivora celata*); 5. Nashville Warbler (*Vermivora ruficapilla*); 6. Virginia's Warbler (*Vermivora virginiae*); 7. Colima Warbler (*Vermivora crissalis*); 8. Lucy's Warbler (*Vermivora luciae*); 9. Flame-throated Warbler (*Parula gutturalis*); 10. Crescent-chested Warbler (*Parula superciliosa*); 11. Northern Parula (*Parula americana*); 12. Tropical Parula (*Parula pitiayumi*).

Taxonomy. *Sylvia peregrina* A. Wilson, 1811, banks of Cumberland river, Tennessee, USA.
Recent studies of mitochondrial DNA suggest that this species and *V. celata*, *V. ruficapilla*, *V. virginiae*, *V. crissalis* and *V. luciae* form a clade, separate from the two other current congeners, and should be placed in a separate genus, for which the name *Leiothlypis* has been proposed; *Parula gutturalis* and *Parula superciliosa* appear to be sister to this group. Has hybridized with *V. ruficapilla* and *Dendroica caerulescens*. Monotypic.
Distribution. Breeds in Canada (Yukon and British Columbia E to Newfoundland and Nova Scotia) and NE USA (S to N New England); migrates to area mainly from S Mexico S to NW South America, a few in W Caribbean.



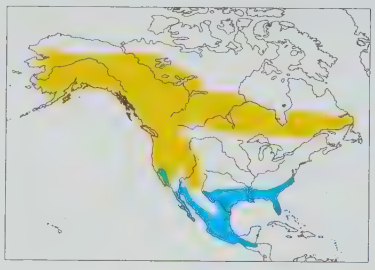
Descriptive notes. 12 cm; 6·2–18·4 g. A rather short-tailed warbler. Male breeding is olive-green above, darker on wing and tail, with contrasting grey head with narrow dark eyestripe and whitish supercilium, occasionally some rufous feathers in crown; throat and underparts white; iris dark; bill blackish; legs grey, often tinged purplish or brownish. Female breeding is similar to male but duller, with head washed olive, supercilium and underparts washed yellowish, especially on breast; never any rufous in crown. Non-breeding plumage (both sexes) is similar to breeding female but often duller still, the dullest individuals (mostly first-year females) mostly pale yellowish below, with contrasting white undertail-coverts, head more or less concolorous with upperparts, yellowish supercilium. Juvenile has olive-grey head and upperparts, obscure dusky eyestripe and pale yellow supercilium, dusky olive-yellow below, paler on lower belly and undertail-coverts, pinkish-buff bill and legs; dull individuals told from rather similar *V. celata* by contrasting white undertail-coverts, stronger eyestripe and supercilium, slightly downcurved bill, shorter tail and somewhat plumper shape. Voice. Song usually consists of three distinct parts: a series of rapid double notes, followed by a series of single notes, which accelerates into terminal trill. Usual call a soft, sharp "tsit"; flight call a thin, clear "see".
Habitat. Breeds in variety of coniferous, mixed and deciduous forest, also alder (*Alnus*) and willow (*Salix*) thickets, with well-developed understorey and extensive herbaceous vegetation in ground flora; prefers open, rather than dense, forest. Winters in open second-growth forest and forest edge, coffee plantations, gardens and other wooded areas with plenty of flowering trees, important flowering trees including *Erythrina* and *Inga* and the vine *Combretum fructicosum*; from sea-level to 2300 m, regularly to 3000 m at end of dry season in Costa Rica, but most common at middle elevations in foothills.
Food and Feeding. Feeds on insects, especially lepidopteran larvae, in summer, and in winter fruits, berries and nectar, as well as insects; flowering trees and bushes an important food source in winter months (the bird's head may become stained red or orange from the pollen). Eats fruit on spring migration, and may concentrate in areas where suitable fruits abundant. Forages mainly high up in trees in summer, often lower down when on autumn migration. Often feeds in terminal branches, hanging upside-down to glean from undersides of leaves. In spring, often probes opening leaves and flowers, and catkins; has been observed to use small sticks with which to probe flowers, apparently to dislodge insects. Frequently in flocks in winter, when often forms the nucleus of mixed-species foraging flocks, and on migration. Individuals often aggressively territorial around blossoming bushes and vines (e.g. *Combretum* and *Erythrina*) in winter.
Breeding. Season Jun–Aug, egg-laying Jun–Jul; rarely double-brooded, but replacement clutch may be laid up to early Aug. Nest a cup of grasses, lined with fine grasses and rootlets, hidden in vegetation on ground, often in peat-moss (*Sphagnum*) bog. Clutch 4–7 eggs, usually 6; incubation period 11–12 days; nestling period 11–12 days. Nests infrequently parasitized by Brown-headed Cowbird (*Molothrus ater*), as little range overlap between the two; parasitism reported in Alberta, Saskatchewan, New Brunswick, Nova Scotia and Michigan.
Movements. Long-distance migrant. Leaves breeding grounds mainly during second half Aug, moving S or SE to Gulf of Mexico coast; most then follow Gulf coast to wintering grounds, but some cross Gulf to Yucatán. Return migration begins in early Apr, with arrival on breeding grounds from mid-May; route much the same as in autumn, but more birds cross the Gulf and move N through North America on broader front. Casual throughout W USA in autumn, but much rarer there in spring; also regularly recorded in NW Mexico (including Baja California) in autumn, and more rarely in Ecuador in winter; also Bermuda on passage and occasionally in winter. Vagrant in Chile, Lesser Antilles, W Alaska, Greenland, and Europe (Britain, Faeroe Is and Iceland).
Status and Conservation. Not globally threatened. Fairly common to abundant throughout breeding range; numbers fluctuate from year to year in response to cyclical fluctuations of spruce budworm (*Choristoneura fumiferana*), but it is one of the most abundant boreal warblers. In one Ontario study, populations increased by a factor of nine from 1979 to 1982, then fell by 30% in following year, in correlation with a spruce budworm outbreak; densities during this outbreak in range 75–610 pairs/km² in intact mature forest, and 0–336 pairs/km² in secondary forest less than ten years old. Breeding densities generally higher in E Canada (E from Ontario) than farther W. Has probably increased overall since 1800s, but spraying as a means of destroying spruce budworm may have caused some recent local declines.
Bibliography. Baird (1967), Crawford (1981), Dick & James (1996), Erskine (1971, 1972, 1980), Lehman (2005), Lewington *et al.* (1991), Martin (1985), McCarthy (2006), McMartin *et al.* (2002), Quay (1989), Raveling (1965), Raveling & Warner (1965), Rimmer & McFarland (1998a), Sangster (2008a), Sealy (1985), Torres-Mura & Hertel (2006), Tramer & Kemp (1979), Winker *et al.* (1991), Yunick (1969).

4. Orange-crowned Warbler

Vermivora celata

French: Paruline verdâtre **German**: Orangefleck-Waldsänger **Spanish**: Reinita Coroninaranja

Taxonomy. *Sylvia celatus* Say, 1823, "Engineer Cantonment, near Council Bluffs" = Omaha, Nebraska, USA.
Recent studies of mitochondrial DNA indicate that this species and *V. peregrina*, *V. ruficapilla*, *V. virginiae*, *V. crissalis* and *V. luciae* form a clade, separate from the two other current congeners, and should be placed in a separate genus, for which the name *Leiothlypis* has been proposed; *Parula gutturalis* and *Parula superciliosa* appear to be sister to this group. Four subspecies recognized.
Subspecies and Distribution.
V. c. celata (Say, 1823) – breeds Alaska and NW & S Canada (E to Quebec); migrates to wintering area mainly in SE USA, smaller numbers S to E Mexico and Guatemala.
V. c. orestera Oberholser, 1905 – breeds W Canada (SW Yukon, interior British Columbia E to SE Saskatchewan) and S in Rockies to SW USA (Arizona and New Mexico); migrates mainly to C Mexico.
V. c. lutescens (Ridgway, 1872) – breeds N British Columbia and S in W USA to C California; winters mainly SW USA and W Mexico.
V. c. sordida (C. H. Townsend, 1890) – coastal S California and extreme NW Mexico (N Baja California), including offshore islands.



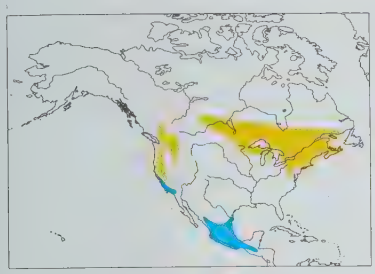
Descriptive notes. 13 cm; 7·3–11·6 g. A rather dull parulid, with variable orange crown patch (seldom visible in the field). Male nominate race is greyish-olive above, often with greyer wash on head, faint pale supercilium, thin dark eyestripe, narrow pale eyering; upperwing and tail darker than back; somewhat paler greyish-olive below, brighter yellowish on undertail-coverts, faint olive streaks on side of breast; iris dark; bill blackish; legs dull grey to blackish, often tinged purplish or brownish. Differs from *V. peregrina* in less distinct eyestripe and supercilium, yellowish (not white) undertail-coverts, faint blurred dark streaking on breast, also longer tail and slimmer shape; from dullest individuals of *Dendroica petechia* by more slender, slightly downcurved bill and lack of yellow in tail. Female is similar to male, but on average slightly duller. Juvenile is mostly brownish olive-grey, paler on lower underparts, with darker mottling on throat and breast, narrow yellowish wingbars on greater and median upperwing-coverts, and pinkish-buff bill and legs; first-year similar to adult, first-year female on average the dullest. Races vary in brightness and to some extent also in size, nominate dullest: *lutescens* is smallest and brightest, quite green above and yellow below; *orestera* is largest, and in plumage intermediate between previous and nominate; *sordida* is dull, like nominate but slightly darker, on average longer-billed than other races, and with more obvious streaking on underparts. Voice. Song a variable trill, usually dropping in pitch and volume towards end. Usual call a hard, sharp "tek" or "chet"; flight call a thin high "seee".
Habitat. Breeds in open deciduous or mixed woodlands, tall shrubby areas, riparian scrub and brushy thickets; race *sordida* breeds also in low scrub on offshore islands, and *lutescens* also in chaparral. Winters in open woodland with brushy understorey, oak (*Quercus*) thickets, hedges, parks and gardens; W populations also in chaparral and desert scrub such as saltbrush (*Atriplex*) and mesquite (*Prosopis*).
Food and Feeding. Feeds on insects and other invertebrates, e.g. spiders (Araneae), in summer; also takes some berries and fruit in winter, when sometimes visits garden feeders, including hummingbird (Trochilidae) feeders. Forages mostly at low to middle levels, gleaning insects from leaves and probing dead-leaf clusters. Generally more territorial in winter than is *V. peregrina*.
Breeding. Season Apr–Jul; race *sordida* may lay as early as late Mar. Nest a cup of grasses, bark shreds and mosses, lined with fine grasses, hair and feathers, placed on ground; sometimes sited low in bush (especially island-breeding *sordida*, and occasionally race *orestera* in Arizona). Clutch 3–6 eggs, usually 4–5; incubation period 12–14 days; nestling period 8–10 days. Nests parasitized rarely by Brown-headed Cowbird (*Molothrus ater*); recorded only in British Columbia (race *lutescens*) and S Saskatchewan (nominate race), both in Canada.
Movements. Race *sordida* is resident or a short-distance migrant; those on offshore islands often move to mainland coast after breeding, and some mainland breeders disperse locally in winter. Races *lutescens* and *orestera* are short-distance to medium-distance migrants, some wintering just S of (or within) S part of breeding range, but majority going S to W & C Mexico; *lutescens* is a fairly early migrant in both spring and autumn, arriving on breeding grounds from late Mar (NW USA) and early May (Alaska), and leaving from late Jul or even earlier, with autumn migration quite protracted; *orestera* is a later autumn migrant than *lutescens*, leaving breeding grounds from Aug and arriving back from late Apr, this race moving mainly through W interior in spring, but more regular on W coast in autumn. Nominate race is a longer-distance migrant, heading S through Mississippi Valley to wintering grounds in SE USA; leaves breeding grounds much later, mainly during latter part of Sept, return migration beginning mid-Mar and arrival back on breeding grounds from mid-May. Casual in Caribbean and Bermuda in autumn and winter (nominate race) and also in Guatemala and perhaps El Salvador in winter; nominate race occasionally occurs in W USA in late autumn. Vagrant in N Alaska, the Pribilofs, far N Canada, Greenland, Belize and Costa Rica; these records probably all involve nominate (a long-distance migrant).
Status and Conservation. Not globally threatened. Generally abundant in W, particularly along Pacific coast (*lutescens*); much less common in boreal forests and E Canada (nominate). Race *sordida* has declined on some coastal islands but expanded its range on mainland during 20th century. Estimated population densities vary from 0·06 nests/ha in Arizona to 3·1 pairs/ha in chaparral in California; c. 1·5 pairs/ha seems typical for W scrubby woodlands.
Bibliography. Bohlen & Kleen (1976), Bull *et al.* (2010), Foster (1967a, 1967b, 1969), Frank (1998), Gilbert (1983, 1986, 1994), Jones & Kingery (2007), Kroll *et al.* (2007), Lehman (2005), Macouzet & Escalante-Pliego (2000a), Martin & Martin (2001a, 2001b), Morrison (1981), Oberholser (1905), Remsen *et al.* (1989), Sangster (2008a), Sogge *et al.* (1994), Zyskowski (1993).

5. Nashville Warbler

Vermivora ruficapilla

French: Paruline à joues grises **German**: Rubinfleck-Waldsänger **Spanish**: Reinita de Nashville
Other common names: Grey-headed Warbler(!)

Taxonomy. *Sylvia ruficapilla* A. Wilson, 1811, near Nashville, Tennessee, USA.
Recent studies of mitochondrial DNA indicate that this species and *V. peregrina*, *V. celata*, *V. virginiae*, *V. crissalis* and *V. luciae* form a clade, separate from the two other current congeners, and should be placed in a separate genus, for which the name *Leiothlypis* has been proposed; *Parula gutturalis* and *Parula superciliosa* appear to be sister to this group. Present species forms a superspecies with *V. virginiae*, sometimes with *V. crissalis* also included; the three have been considered conspecific, but such an arrangement not generally accepted. Has hybridized with *V. peregrina* and probably with *Setophaga ruticilla*. Two subspecies recognized.
Subspecies and Distribution.
V. r. ridgwayi van Rossem, 1929 – breeds from SW Canada (S British Columbia) S in USA to C California; migrates to wintering grounds mainly in W Mexico (a few also in coastal S California).
V. r. ruficapilla (A. Wilson, 1811) – breeds S & SE Canada (Saskatchewan E to S Quebec and S Newfoundland) and NE USA (Minnesota E to New England, and S in Appalachians to West Virginia); migrates to E Mexico and Guatemala, a few also in S Texas (and casually along Gulf coast to NW Florida).
Descriptive notes. 12 cm; 6·7–13·9 g. A small, dainty parulid. Male nominate race breeding is olive-green above with contrasting grey head and neck, bold white eyering and dull whitish lores, and semi-concealed rufous crown patch; yellow below, small whitish area on belly; iris dark; bill grey, with



blacker culmen; legs grey to dark purplish-brown. Female breeding similar to male but duller; less contrast between head and upperparts, and paler yellow below. Non-breeding plumage (both sexes) very slightly duller than breeding. Juvenile mostly olive-grey (greyer on head, more olive on rump), with paler and yellower lower underparts, narrow yellowish wingbars on greater and median upperwing-coverts, pinkish-buff bill and legs; first-winter similar to non-breeding adult but duller still, young female dullest of all, with upperparts washed brownish and underparts pale buffy yellow, often with whitish throat. Race *ridgwayi* is marginally brighter than nominate, with larger area of white on belly. VOICE. Song of nominate is a series of "see-see" notes followed by a trill, similar to that of *V. peregrina* but sounds as if in two (not three) parts; song of *ridgwayi* similar but rather richer overall, with less of a trill at end.

Habitat. Nominate race breeds in tamarack (*Larix*) and spruce (*Picea*) bogs in boreal forest; farther S in young, open mixed forests with well-developed understorey, favouring areas with aspen (*Populus tremuloides*), birch (*Betula*) or alder (*Alnus*) as dominant tree. Race *ridgwayi* breeds mainly in montane coniferous or mixed forest and shrubby riparian corridors in coniferous forest, favouring recently burnt or logged areas where dense understorey present. On non-breeding grounds mainly in pine–oak (*Pinus–Quercus*) forest and scrubby woodland in highlands, and wooded areas in coastal lowlands; also in coffee plantations, and parks and gardens with shrubs and mature trees.

Food and Feeding. Feeds principally on insects, also some other invertebrates; also nectar and berries in winter. Forages at all levels from lower branches to treetops, but mainly fairly low and in outer branches of trees and shrubs. Forages mainly by gleaning from leaves. Often joins mixed-species flocks on wintering grounds; in mountains of Jalisco (CW Mexico), has been recorded following army-ant (Ecitoninae) swarms, to feed on invertebrates disturbed by the insects.

Breeding. Season May–Aug; egg-laying May–Jul, usually Jun–Jul. Nest a cup of moss, bark strips, leaves and grass, lined with fine grass and hair, well concealed on ground. Clutch 4–5 eggs; incubation probably entirely by female, period 11–12 days; nestling period 11 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*) comparatively rarely; study in S Canada (Ontario) suggested 10·5% of nests parasitized, and in smaller study in N USA (Minnesota) two of the eight nests contained cowbird eggs or young.

Movements. Migratory. Nominate race leaves breeding grounds during Aug and Sept, heads mostly S through Mississippi Valley and Appalachians to Gulf of Mexico coast, majority then following Gulf coast to reach wintering grounds from Oct, although some fly across Gulf; return migration follows much the same route but in reverse, and begins in Mar, with arrival on breeding grounds from late Apr in S, mid-May farther N. W populations (race *ridgwayi*) follow coast and mountain ranges between breeding and wintering grounds; timing of migration much the same as for E populations. Casual in Caribbean and Bermuda in autumn, winter and spring, and S to Costa Rica in winter; vagrant to W Alaska and Greenland.

Status and Conservation. Not globally threatened. Generally common. Has probably increased over the last century in many areas owing to local increases in favoured habitat following deforestation. Breeding Bird Surveys have shown a small increase recently in W range, but no significant change in E populations (although a 4·6% decrease was recorded in Nova Scotia). Because this species winters commonly in man-modified habitats such as parks and gardens, it is probably not threatened on wintering grounds.

Bibliography. Alexander (1980), Brush & Johnson (1976), Hutto (1980, 1992, 1994), Johnson (1976), Knapton (1984), Lawrence (1948), Lehman (2005), Lein & Wagner (1982), McCarthy (2006), Roth (1977), Sangster (2008a), Shackford (1983), Small (1994), Sodhi & Paszkowski (1995), Van Buskirk (1984), Williams (1996a).

6. Virginia's Warbler

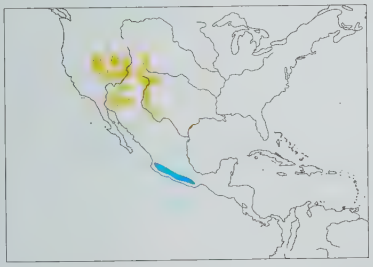
Vermivora virginiae

French: Paruline de Virginia **German**: Virginiawaldsänger **Spanish**: Reinita de Virginia

Taxonomy. *Helminthophaga virginiae* S. F. Baird, 1860, Cantonment [= Fort] Burgwyn, Taos County, New Mexico, USA.

Recent studies of mitochondrial DNA indicate that this species and *V. peregrina*, *V. celata*, *V. ruficapilla*, *V. crissalis* and *V. luciae* form a clade, separate from the two other current congeners, and should be placed in a separate genus, for which the name *Leiothlypis* has been proposed; *Parula gutturalis* and *Parula superciliosa* appear to be sister to this group. Present species forms a superspecies with *V. ruficapilla*, sometimes with *V. crissalis* also included; the three have been considered conspecific, but such an arrangement not generally accepted. Monotypic.

Distribution. Breeds patchily in SW USA from S Idaho and Wyoming S to Arizona, New Mexico and SE Texas. Migrates to W & S Mexico (from N Jalisco and Guanajuato, occasionally from Nayarit, S to S Oaxaca).



Descriptive notes. 12 cm; 6–10·5 g. Male is mostly mid-grey above and paler grey below, with contrasting yellow patches on breast and undertail-coverts, and pale olive-yellow rump; bold white eyering, pale grey lores, and semi-concealed rufous crown patch; iris dark; bill blackish-grey, usually paler on lower mandible; legs blackish. Distinguished from similar *V. ruficapilla* by much greyer appearance, never with olive tones in upperparts. Female is slightly duller than male, with less yellow on breast. Juvenile is mostly plain brownish-grey, slightly paler below and whitish on lower underparts, with obscure pale buff wingbars on greater and median upperwing-coverts; first-year female is duller still than adult female, with little or no yellow on breast, and upperparts washed pale brownish in autumn. VOICE. Song a series of "chwee" notes followed by similar series on lower pitch, rather similar to song of *V. ruficapilla* but less trilling. Usual call a dry sharp "tink" or "chink"; flight call a high, clear "seet".

Habitat. Breeds in highland areas in chaparral, open pinyon–juniper (*Pinus–Juniperus*) and scrub oak (*Quercus*) stands and open ponderosa pine (*Pinus ponderosa*) woodland, often in ravines and canyons; mainly at 2000–3000 m. In N Arizona prefers pine–oak forest over pure pine, and in one study was absent from ponderosa pine stands that did not also contain Gambel oak (*Quercus gambelii*) trees. Winters predominantly in highlands (mainly 500–2000 m) in dense semi-arid scrub, but also in deciduous oak and pine–oak woodlands. On migration frequently uses riparian corridors dominated by cottonwoods (*Populus*) and willows (*Salix*), as well as highland pine forests and oak woodlands in foothills.

Food and Feeding. Feeds almost entirely on insects; apparently, no records of vegetable matter being eaten. Forages principally by gleaning and flycatching, mainly at low levels; seems to specialize in foraging in lower levels of oak trees in mixed pine–oak habitat, even where pines more numerous. On wintering grounds, often probes for insects in flower buds and new green leaves. Frequently joins mixed-species foraging flocks on wintering grounds and during migration.

Breeding. Season May–Jul. Nest a shallow cup of grass and weed stalks, dry leaves and moss, lined with fine grass and hair, placed on ground, often in hollow or under grass tussock. Clutch 3–5 eggs, usually 4; incubation period 11–14 days, usually 12 days; nestling period 10–14 days, usually 11 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*); up to 58% of nests thus affected in areas where cowbirds abundant, e.g. NE New Mexico, but parasitism rare in other parts of the range where cowbirds rare. Breeding success variable, can be severely affected by cowbirds: in one study in NE New Mexico, eight parasitized nests failed to fledge any of host's young, all of the parulid chicks starving within a few days of hatching.

Movements. Medium-distance migrant. Leaves breeding grounds in Aug, following mountain valleys and foothills S to reach winter quarters from Sept; return migration along same route but in reverse, with departure from wintering grounds from Mar and arrival on breeding grounds from late Apr. Casual in coastal California, Oregon and the Great Plains, mainly in autumn. Vagrant in E North America, Belize, Guatemala and Bahamas.

Status and Conservation. Not globally threatened. Generally common throughout much of its range, but documented as a species of management concern by US Fish & Wildlife Service, mainly because of its dependence on a narrow range of mid-elevational xeric habitats on both breeding and wintering grounds. Range has expanded locally into interior S California since 1960s, and it is listed there as a species of special concern; small numbers may breed just across the US border in N Mexico (N Sonora and N Chihuahua). Controlled burning to remove combustible understorey brush in SW Arizona may seriously reduce nesting success there. Populations appear to be stable over most of range, despite severe cowbird parasitism in some areas.

Bibliography. Anon. (1995b), Brush & Johnson (1976), Craves (1994), Fischer (1978), Horton (1987), Howell & Webb (1995), Hutto (1980, 1992), Johnson (1976), Johnson & Garrett (1974), Jones, H.L. *et al.* (2000), Olson & Martin (1999), Pyle & Henderson (1991), Remsen (1978), Rosenstock (1998), Sangster (2008a), Smith *et al.* (1994).

7. Colima Warbler

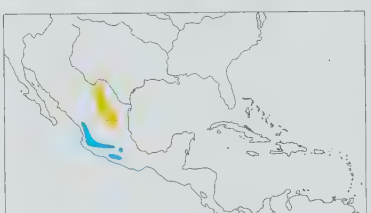
Vermivora crissalis

French: Paruline de Colima **German**: Colimawaldsänger **Spanish**: Reinita de Colima

Taxonomy. *Helminthophila crissalis* Salvin and Godman, 1889, Sierra Nevada de Colima, Mexico.

Recent studies of mitochondrial DNA indicate that this species and *V. peregrina*, *V. celata*, *V. ruficapilla*, *V. virginiae* and *V. luciae* form a clade, separate from the two other current congeners, and should be placed in a separate genus, for which the name *Leiothlypis* has been proposed; *Parula gutturalis* and *Parula superciliosa* appear to be sister to this group. Present species sometimes included in the superspecies formed by *V. ruficapilla* and *V. virginiae*, and the three have been considered conspecific, although this treatment not generally accepted. Some recent authors have suggested a close relationship with *V. celata*, this based on similarities in size, shape, song and habitat. Monotypic.

Distribution. Breeds in extreme S USA (Chisos Mts, in extreme SW Texas) and mountains of NE Mexico (Coahuila, Nuevo León, NE Zacatecas, N San Luis Potosí and SW Tamaulipas). Migrates to non-breeding grounds on Pacific slope of W Mexico from Sinaloa S to Guerrero (mainly Jalisco and Michoacán), also in small numbers in Morelos and Distrito Federal.



Descriptive notes. 13·5 cm; 8–11·5 g. The largest and brownest member of genus. Crown and upperparts are grey-brown, crown with semi-concealed rufous patch, side of head grey, bold white eyering; distinctive pale olive-yellow rump; throat and underparts mostly pale grey, brownish flanks, buffish-yellow undertail-coverts; iris dark; bill blackish-grey; legs dark flesh-coloured. Sexes similar, female's crown patch perhaps on average smaller than male's. Juvenile is significantly duller and drabber than adult, lacks crown patch, has obscure pale buff wingbars on greater and median upperwing-coverts. VOICE. Song a musical trill, varying in pitch, rather similar to that of *V. celata*; usual call a sharp "tink".

Habitat. Breeds in pine–oak (*Pinus–Quercus*), oak and pinyon–juniper (*Pinus–Juniperus*) forest at 1500–3000 m; prefers undisturbed pine–oak woodland with dense, continuous ground cover dominated by bunchgrass (*Muhlenbergia*). Will also tolerate woodlands subjected to light or moderate grazing, burning and selective logging. In winter quarters found in humid and semi-humid oak–conifer forests, mainly between 1500 m and 3000 m.

Food and Feeding. Feeds mainly on insects and other invertebrates, especially spiders (Araneae) and lepidopteran larvae. Gleans and occasionally flycatches at low levels in outer foliage of bushes, and often in undergrowth. Movements rather slow and deliberate compared with those of congeners.

Breeding. Season May–Jul, egg-laying May–Jun. In areas of highest density, inter-nest distance can be as little as 100 m. Nest a cup of dead leaves, grasses and mosses, lined with fine grasses, hair and feathers, placed on ground and concealed in low vegetation or under boulder. Clutch 4 eggs; incubation period 12 days; nestling period 11 days.

Movements. Short-distance migrant, moving S & SW over C plateau of Mexico to reach wintering grounds. Departure from breeding grounds from mid-Jul, all having left by late Sept, arrival on wintering grounds from Sept. Returns to breeding grounds from mid-Mar, mainly in late Apr and early May; lingerers recorded in wintering area into May.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Northern Sierra Madre Oriental EBA. Generally fairly common to common, but local. As breeding areas largely isolated from significant human populations and of little commercial value, habitat degradation not currently considered a major threat. Degradation of habitat by sheep and goat grazing, increases in feral cat and dog populations, and brood parasitism by Brown-headed Cowbird (*Molothrus ater*) considered potential threats in Mexico. Populations appear to be stable, at least in Texas, where 0·6 individuals/km found in linear transect.

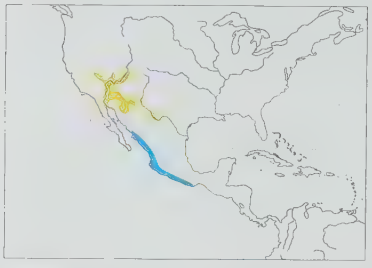
Bibliography. Anon. (2009f), Bangs (1925), Beason & Wauer (1998), Blake (1949), Butchart & Stattersfield (2004), Collar *et al.* (1992), Ely (1962), Howell & Webb (1995), Lanning *et al.* (1990), Phillips (1961), Phillips *et al.* (1964), Sangster (2008a), Snyder (1957), Stattersfield & Capper (2000), Stein (1968), Van Tyne (1936), Wauer (1979, 1985, 1994), Wilson & Ceballos-Lascuráin (1986).

8. Lucy's Warbler

Vermivora luciae

French: Paruline de Lucy **German**: Rotbürzel-Waldsänger **Spanish**: Reinita de Lucy

Taxonomy. *Helminthophaga luciae* J. G. Cooper, 1861, Fort Mojave, near latitude 35° N, Colorado Valley, Arizona, USA.
Recent studies of mitochondrial DNA indicate that this species and *V. peregrina*, *V. celata*, *V. ruficapilla*, *V. virginiae* and *V. crissalis* form a clade, separate from the two other current congeners, and should be placed in a separate genus, for which the name *Leiothlypis* has been proposed; *Parula gutturalis* and *Parula superciliosa* appear to be sister to this group. Monotypic.
Distribution. Breeds patchily in SW USA (from S Nevada and S Utah S to S California, E to extreme W Texas) and extreme N Mexico (N Chihuahua). Migrates to coastal regions of W Mexico, mainly from S Sonora S to W Guerrero.



Descriptive notes. 11 cm; 5·1–7·9 g. A very small parulid. Male is essentially grey above and off-white below, with contrasting rufous patch on crown (more obvious than that of congeners) and prominent maroon-chestnut patch on lower rump and uppertail-coverts; face paler than crown, with rather indistinct white eyering; outer tail feather has white spot; iris dark; bill and legs blackish. Female is on average duller than male, has paler, more tawny-rufous colour on crown and rump, and less white in outer tail. Juvenile is pale grey overall, lacks any hint of crown patch, has buffy-white wingbars on greater and median upperwing-coverts; first-winter female particularly dull, usually lacks noticeable rufous on crown. Voice. Song rather variable, but typically a short twittering trill followed by several slower notes on lower pitch. Usual call a sharp "tink" or "chink"; flight call a weak "tsit".
Habitat. Breeds in mesquite (*Prosopis*) scrub/woodland, principally in riparian growth with mesquite and willow (*Salix*) and/or cottonwood (*Populus*) bushes in semi-arid scrub and desert; generally in lowlands, but to 1500 m in canyons containing mixed woodlands of walnut (*Juglans*), sycamore (*Platanus*), ash (*Fraxinus*) and live oak (*Quercus oleoides*). In lower Colorado Valley will utilize stands of introduced tamarisk (*Tamarix*). On wintering grounds mainly in low scrub and weedy fields in coastal foothills and lower slopes of mountains; perhaps most often in dry watercourses and riparian gallery forest.
Food and Feeding. Feeds almost entirely on insects, but has been recorded as taking spiders (Araneae). Forages mainly by gleaning at low to middle levels in scrub and low woodland, often near top of mesquite bushes. Often in small flocks on wintering grounds.
Breeding. Season Apr–Jul, egg-laying Apr–Jun; probably double-brooded. Nest a compact cup of fine grasses, dry leaves and twigs, lined with hair and feathers, usually 0·7–5 m up in hole in mesquite bush, either natural cavity or old hole of woodpecker (Picidae), or sometimes deserted nest of Verdin (*Auriparus flaviceps*) used; nest occasionally built under loose bark on mesquite bush. Clutch 3–7 eggs, usually 4–5; incubation and nestling periods not documented, incubation has been estimated at 12 days and nestling period at 11 days. Despite being a cavity-nester, nest quite frequently parasitized by Brown-headed Cowbird (*Molothrus ater*), rates of parasitism varying from 5 out of 112 nests (4·5%) to 3 out of 13 (23·1%); in one study, two of the three parasitized nests were in Jun, suggesting that earlier-nesting pairs may be less prone to parasitism.
Movements. Short-distance migrant. Leaves breeding grounds early, mainly during Jul, and moves S along coast and mountain valleys to wintering grounds; return migration also early, with arrival back on breeding grounds from late Mar. Casual on Pacific coast of USA (especially in California in winter). Rare vagrant N of breeding range and in E USA, mainly in late autumn/early winter.
Status and Conservation. Not globally threatened. Fairly common throughout its range. In optimum riparian habitat, densities of up to 12·5 pairs/ha reported, but much lower figures of 200–229 pairs/40 ha more typical for riparian mesquite along Colorado R in Grand Canyon; densities in willow/tamarisk habitat and paloverde–saguaro (*Cercidium–Cereus*) desert scrub were only 109–125 pairs/40 ha and 11–15 pairs/40 ha, respectively. Interestingly, a study of riparian woodlands in SC Arizona reported higher densities in cottonwood habitat (48 pairs/40 ha) than in mesquite (24 pairs/40 ha). Recent loss of riparian breeding habitat has caused local declines and range reductions; brood parasitism by Brown-headed Cowbird may also be causing local declines.
Bibliography. Brown, B.T. (1989, 1994), Dunn & Garrett (1997), Fagan (1995), Heil (1981), Howell & Webb (1995), Hubbard (1973), Johnson, Brown *et al.* (1981), Johnson, Yard & Brown (1997), Lamm (1991), Sangster (2008a), Stamp (1978), Szaro & Jakle (1982).

Genus *PARULA* Bonaparte, 1838

9. Flame-throated Warbler

Parula gutturalis

French: Paruline embrasée **German**: Feuerwaldsänger **Spanish**: Reinita Flamigera

Taxonomy. *Compsothlypis gutturalis* Cabanis, 1861, Irazú, Costa Rica.
A study of mitochondrial DNA has suggested that this species and *P. superciliosa* are close to *Vermivora*, and the two are often placed in latter genus; other studies indicate that both genera as currently constituted are not monophyletic, and suggest that these two species should be placed in a separate genus, for which the name *Oreothlypis* is available. Monotypic.
Distribution. Highlands from NC Costa Rica (Cordillera Central) S to WC Panama.
Descriptive notes. 12 cm; 9·5 g. Male is slate-grey above, with blackish lores and lower ear-coverts and black patch on mantle; throat and breast bright orange, sharply demarcated from and contrasting with greyish-white lower underparts, greyer on flanks; outer tail feathers edged whitish on inner webs; iris dark; bill blackish; legs dark greyish-flesh. Female is similar to male but slightly duller, with slightly paler grey head and upperparts (sometimes with faint brown tinge), smaller black mantle patch, less black on face, and slightly paler and more orange-yellow throat and breast. Juvenile has brownish-grey head and upperparts, obscure buff wingbars on greater and median upperwing-coverts, olive-buff throat and breast, becoming whitish on lower underparts; first-year



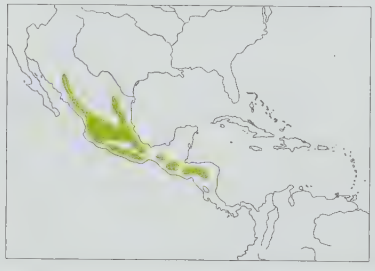
similar to adult but slightly duller, and a few may retain some juvenile brown-tipped greater coverts through first year; first-year female often particularly dull, with head and upperparts tinged brown and throat to breast relatively pale orange to yellow. Voice. Song consists of several high-pitched trilling notes followed by weak, dry, rather insect-like buzz, rising in pitch. Usual call a sharp, high "chip".
Habitat. Mixed montane forest, often favouring oak (*Quercus*), forest edges, clearings and brushy or forested ravines; mainly above 2300 m, but regularly down to 2000 m and occasionally to 1400 m in non-breeding season.
Food and Feeding. Feeds mainly on insects and other invertebrates; also eats berries, especially of mistletoe (Loranthaceae). Forages mainly by gleaning in canopy, sometimes also at lower levels; probes clumps of leaves, lichens and mosses, often hanging acrobatically from terminal twigs to do so.
Breeding. Season Mar–Jun. Nest a cup of mosses and liverworts (Marchantiophyta), lined with finer plant fibres, and shielded from above by epiphytes, grasses or mosses; placed either low on bank or up to 21 m above ground in epiphyte-laden tree. Clutch 2 eggs; no information on incubation and fledging periods.
Movements. Essentially sedentary; in non-breeding season some move to lower altitudes, especially on Caribbean slope, where may descend to 1400 m in latter part of rainy season (Sept–Nov) in Costa Rica.
Status and Conservation. Not globally threatened. Restricted-range species: present in Costa Rica and Panama Highlands EBA. Generally common; rare in extreme N of range.
Bibliography. Curson *et al.* (1994), Lovette & Bermingham (2001), Ridgely & Gwynne (1989), Sangster (2008a), Stattersfield *et al.* (1998), Stiles & Skutch (1989).

10. Crescent-chested Warbler

Parula superciliosa

French: Paruline à croissant **German**: Schmuckwaldsänger **Spanish**: Reinita Cejuda
Other common names: Spot-breasted/Hartlaub's Warbler

Taxonomy. *Conirostrum superciliosum* Hartlaub, 1844, Guatemala.
A study of mitochondrial DNA has suggested that this species and *P. gutturalis* are close to *Vermivora*, and the two are often placed in latter genus; other studies indicate that both genera as currently constituted are not monophyletic, and suggest that these two species should be placed in a separate genus, for which the name *Oreothlypis* is available. Race *sodalis* of questionable validity, may be indistinguishable from *mexicana*. Five subspecies currently recognized.
Subspecies and Distribution.
P. s. sodalis (R. T. Moore, 1941) – NW Mexico (Sierra Madre Occidental from SE Sonora and S Chihuahua S to N Jalisco).
P. s. mexicana Bonaparte, 1850 – E Mexico (Sierra Madre Oriental from Nuevo León S to C Veracruz, thence W through Michoacán to E Jalisco).
P. s. palliata (van Rossem, 1939) – S Jalisco S to Guerrero, in S Mexico.
P. s. superciliosa (Hartlaub, 1844) – highlands of S Mexico (Chiapas), Guatemala, El Salvador and W Honduras.
P. s. parva (W. deW. Miller & Griscom, 1925) – C & E Honduras and NW Nicaragua.



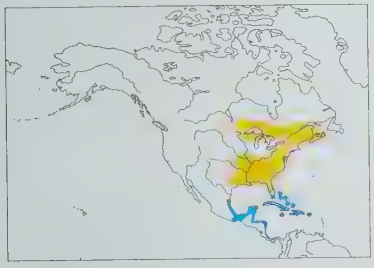
Descriptive notes. 11 cm; 7–13 g. Male nominate race has head to neck and upper mantle grey, darker (blackish-grey) on lores and ear-coverts, broad white supercilium; upperparts mostly olive-green, contrasting grey wing, uppertail-coverts and tail; throat and breast yellow, chestnut crescent across breast, lower underparts white, greyer on flanks; iris dark; bill blackish, flesh-coloured base of lower mandible; legs dark flesh to blackish. Female is similar to male but on average slightly duller, with smaller chestnut breast-crescent. Juvenile has olive-brown head and upperparts, obscure buffy wingbars on greater and median upperwing-coverts, pale buffy-yellow throat and breast, becoming whitish on lower underparts; first-year resembles adult, but chestnut crescent on average smaller and less distinct, and may be absent on first-year female. Races vary only slightly, with mainly subtle differences in brightness and tone of upperparts: *sodalis* has palest grey head and mantle, ear-coverts almost concolorous with crown, rather more yellowish-green mantle patch, and less extensive yellow below; *mexicana* is very like previous, but perhaps slightly darker on head and duller on back, with more extensive yellow below, olive-tinged flanks, also a little larger on average than nominate; *palliata* is paler than last, has less extensive yellow below, greyer (less olive) flanks; *parva* is similar to nominate but smaller, possibly with proportionately longer bill. Voice. Song rather insect-like, a short, abrupt buzzy trill c. 1 second in duration. Usual call a thin, high "chip" or "tsip"; high, thin "sip" in flight.
Habitat. Montane humid pine–oak (*Pinus–Quercus*) forest, and cloudforest of pines, firs (*Abies*) and cypresses (*Cupressus*), at 1100–3500 m, mainly 1500–3500 m.
Food and Feeding. Feeds on insects and other invertebrates. Forages mainly by gleaning at middle to high levels, frequently investigating terminal clusters of dead leaves; often hangs upside-down in manner of tit (Paridae) while foraging. Forms flocks in winter; these frequently join mixed-species foraging flocks, and often acts as a nuclear species for such flocks.
Breeding. Season probably Apr–Jun, egg-laying usually Apr–May. Nest a cup of mosses, grasses and pine needles, placed on or near ground and hidden on steep-sided bank or ditch. Clutch 3 eggs; incubation period 13 days or slightly longer; no information on fledging period.
Movements. Mainly sedentary; those breeding at high altitudes may move lower in winter to foothills or even into lowland riparian habitats, at least in N part of range. Vagrant in S USA (Arizona and Texas).
Status and Conservation. Not globally threatened. Fairly common to common throughout its range. No population estimates available, but numbers considered to be stable.
Bibliography. Dunn & Garrett (1997), Gram (1998), Hardy & Webber (1975), Heathcote & Kaufman (1985), Howell & Webb (1995), Lovette & Bermingham (2001), McCarthy (2006), Sangster (2008a), Terrill (1985).

11. Northern Parula

Parula americana

French: Paruline à collier **German**: Meisenwaldsänger **Spanish**: Parula Norteña
Other common names: American Parula, Parula Warbler; Sutton's Warbler (hybrid with *Dendroica dominica*)

Taxonomy. *Parus americanus* Linnaeus, 1758, northern America = South Carolina, USA.
A study of mitochondrial DNA has suggested that genus as currently constituted is not monophyletic, with present species and *P. pitiayumi* closer to *Dendroica*, and *P. gutturalis* and *P. superciliosa* closer to *Vermivora*. Has hybridized with *Dendroica dominica*, as well as with *Setophaga ruticilla* and *Dendroica coronata*. Forms a superspecies with *P. pitiayumi* and sometimes regarded as conspecific, but the two differ in migratory behaviour and in some plumage characters. NE populations proposed as race *pusilla* (described from Pennsylvania) and W ones as race *ludoviciana* (from Mississippi Valley), the latter based on difference in Type 1 song; both generally considered insufficiently differentiated to warrant recognition. Monotypic.
Distribution. Breeds in SE Canada (SE Manitoba E to Nova Scotia) and E USA (Minnesota, Michigan and New England S, excluding most of S Great Lakes area, to Gulf of Mexico coast and C Florida). Winters from E Mexico S to C Panama, and in West Indies; also winters in smaller numbers in S Florida and Bermuda.



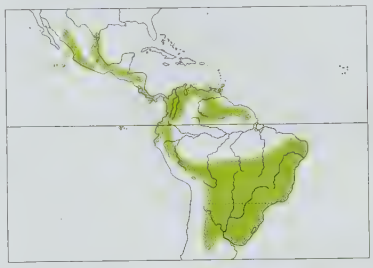
Descriptive notes. 11 cm; 7·1–10·2 g. Male has blue-grey head and upperparts, with large yellowish-green patch on mantle, blackish lores, prominent white eye-crescents, and broad white tips on greater and median upperwing-coverts (two white wingbars), extensive white in outer three tail feathers; throat and breast yellow, narrow blue-grey band across upper breast and broader and more diffuse rufous band immediately below it, with some red on sides of lower breast; rest of underparts white; iris dark; bill orange-yellow to yellowish-flesh, with broadly blackish culmen; legs orange-yellow to brown. Female is similar to male but slightly duller overall, lacking the blue-grey and rufous breastbands. Juvenile has plain grey head and upperparts with olive-brown tinge, and greyish-white underparts; first-winter duller than adult, and first-winter female can be quite dull with less distinct head pattern, relatively little yellow below and indistinct mantle patch; all first-years have flight-feathers, alula and primary coverts edged greenish (as opposed to blue-grey). Voice. Has two song types. Typical Type 1 song is a rising, buzzy, pulsating trill that ends abruptly with sharp note; W populations have slightly upslurred ending of song. Less common Type 2 song is a series of rising buzzy notes with slurred ending. Usual call a high, sharp "tsip" or "chip"; flight call a high, weak, descending "tsif".
Habitat. Breeds in wide variety of woodlands and forests, almost always associated with old man's beard lichen (*Usnea*) in N of range and Spanish moss (*Tillandsia*) in S. In N of range generally occurs in coniferous boreal forest near streams or rivers where *Usnea* abundant; in Appalachians hemlock (*Tsuga*) forests preferred, and in S occurs in cypress (*Taxodium*) swamps, pine–oak (*Pinus–Quercus*) forests and other wet woodlands with abundant *Tillandsia*. In winter found in wide variety of wooded habitats, including lowland deciduous forest, plantations, dry woodland, parks and gardens, and scrub.
Food and Feeding. Feeds mainly on insects and other invertebrates, such as spiders (Araneae); may take some berries, seeds and nectar in winter, and has been observed to eat bud scales on breeding grounds. Forages mainly by gleaning from leaves and twigs, usually high in canopy, often hanging upside-down to investigate terminal twigs and leaf clusters; also flycatches and hover-gleans. In autumn, often forages near ground level in scrub and weed patches.
Breeding. Season Apr–Aug, egg-laying Apr–Jul. Polygyny has been recorded. Nest almost always formed in hanging bunch of *Usnea* or *Tillandsia*, but where these scarce it may be placed in a spruce (*Picea*) or hemlock clump with some *Usnea* or *Tillandsia* added; usually no lining, although sometimes a little grass or hair used. Clutch 3–7 eggs, usually 4–5; incubation by female, apparently (and unusually for this family) sometimes assisted for short periods by male, period 12–14 days; in one study, young left nest at c. 10–11 days while still unable to fly, remained close to parents, fed mostly by female, no information on duration of period of dependence. Rarely, nests parasitized by Brown-headed Cowbird (*Molothrus ater*).
Movements. Migratory. Leaves breeding areas in Aug, majority moving S along Atlantic coast to Florida and then across to West Indies, although many move S through Mississippi Valley and either cross Gulf of Mexico or follow Gulf coast; arrives on wintering grounds from early Oct. Return migration begins in Feb, basically along same route but in reverse, although more of those wintering in Middle America cross the Gulf to Florida and then head N; reaches breeding grounds from early Apr in S, mid-May in N. Casual in Netherlands Antilles in winter and S to Costa Rica in winter and on passage. Vagrant throughout W North America, mainly in California (with more records occurring in spring than in autumn); also to Greenland and Iceland, as well as Britain, Ireland and France in autumn; and in W Mexico, Trinidad, Tobago and Los Roques (off N Venezuela) in winter.
Status and Conservation. Not globally threatened. Generally common throughout range. Populations appear to be stable, although recent short-term declines detected in E range, along with increases in Mississippi Valley and coastal plain. Breeding-density estimates in various habitats in E Texas (per 40·5 ha) include 114·8 birds in floodplain–hardwood forest, 54·2 in palmetto–hardwood, 16·4 in mixed pine–hardwood, and 2·1 in shortleaf pine (*Pinus taeda*) with mixed hardwood; estimates from similar study in West Virginia (per 100 ha) 108 males in hemlock–yellow poplar (*Liriodendron tulipifera*) forest, 91 in cove hardwoods, 91 in virgin hardwoods–white pine (*Pinus strobus*), 77 in mature mixed hardwoods, 67 in hardwoods–hemlock, deciduous hemlock forest and mature deciduous forest, and 49 in second-growth hardwoods. Breeding Bird Survey data include 9–12 pairs/40·5 ha in Oklahoma and 18 pairs/40·5 ha in Vermont. Estimated densities on wintering grounds include 1–2 birds/ha on St Thomas (Virgin Is), 4/ha on St John (Virgin Is) and 6/ha in Puerto Rico. Large-scale hurricane damage may cause local declines by reducing canopy foraging habitat and relative abundance of *Tillandsia* clumps. Brood parasitism of this species by Brown-headed Cowbird rare, probably because of closed structure of nest as well as the forest breeding habitat.
Bibliography. Bay (1987, 1999), Burleigh (1944), Carlson (1981), Graber & Graber (1951), Graves (1993), Haller (1940), Lewington *et al.* (1991), Lovette & Bermingham (2001), McCarthy (2006), Moldenhauer (1992), Moldenhauer & Regelski (1996), Morse (1967a, 1968), Paynter (1957), Staicer (1992), Torres & Leberg (1996), Ulrich & Ulrich (1981), Verner & Wilson (1969).

12. Tropical Parula

Parula pitiayumi

French: Paruline à joues noires **German**: Elfenwaldsänger **Spanish**: Parula Pitiayumi
Other common names: Olive-backed Warbler; Socorro Parula (*graysoni*)

Taxonomy. *Sylvia pitiayumi* Vieillot, 1817, Paraguay.
A study of mitochondrial DNA has suggested that genus as currently constituted is not monophyletic, with present species and *P. americana* closer to *Dendroica*, and *P. gutturalis* and *P. superciliosa* closer to *Vermivora*. Forms a superspecies with *P. americana* and sometimes regarded as conspecific, but the two differ in migratory behaviour and in some plumage characters. Isolated island race *graysoni* sometimes considered a separate species; some authors also consider that *insularis* may be a separate species. Fourteen subspecies currently recognized.
Subspecies and Distribution.
P. p. pulchra (Brewster, 1889) – W Mexico (Sierra Madre Occidental from S Sonora and Chihuahua S to Oaxaca); northernmost breeding birds may move S locally in winter.
P. p. nigrilora Coues, 1878 – extreme S USA (lower Rio Grande, in extreme S Texas) and E Mexico (Sierra Madre Oriental from Coahuila S to E San Luis Potosí and N Veracruz).
P. p. insularis Lawrence, 1871 – Tres Marías Is, off Nayarit (W Mexico).
P. p. graysoni (Ridgway, 1887) – Socorro I and Revillagigedo Is, off W Mexico.
P. p. inornata S. F. Baird, 1864 – S Mexico (S Veracruz and Chiapas) S through N Guatemala to N Honduras.
P. p. speciosa (Ridgway, 1902) – SE Honduras S to W Panama.
P. p. cirrha Wetmore, 1957 – Coiba I, off S Panama.
P. p. nana (Griscom, 1927) – E Panama (Darién area) and adjacent NW Colombia.
P. p. elegans (Todd, 1912) – Andes of Colombia, N Venezuela (including Margarita I), and Trinidad and Tobago.
P. p. roraimae (Chapman, 1929) – S Venezuela (tepuis region), Guyana, Suriname, French Guiana and adjacent N Brazil.
P. p. pacifica Berlepsch & Taczanowski, 1885 – Pacific slope of Andes from SW Colombia (Nariño) S to NW Peru (Cajamarca).
P. p. alarum (Chapman, 1924) – E Ecuador and N Peru (W of Amazon Basin).
P. p. melanogenys (Todd, 1924) – Andes of C Peru (Junín) S to W Bolivia (La Paz and Cochachamba).
P. p. pitiayumi (Vieillot, 1817) – C & E Brazil S to E Bolivia, N & NE Argentina and Uruguay.



Descriptive notes. 11 cm; 5–8·1 g (*insularis*). Male nominate race has bright blue-grey head and upperparts, with black lores and ear-coverts, bronze-olive patch on mantle, and broad white tips on greater and median upperwing-coverts (two white wingbars); white patches in outer three pairs of tail feathers; mostly bright yellow below, orange tint on throat and upper breast, undertail-coverts white; iris dark; bill yellowish, with broadly blackish culmen; legs yellowish-flesh to brown. Differs from *P. americana* in lacking white eye-crescents, being brighter and darker above and more extensively yellow below, with orange tinge on throat but no breastbands. Female similar but slightly duller, with lores and ear-coverts grey (not black), and less of an orange tint on throat/upper breast. Juvenile has fairly uniform dull grey head and upperparts, less distinct wingbars, and yellowish-white underparts washed greyish on flanks; first-year like adult but slightly duller (first-year of N races *nigrilora* and *pulchra* have greenish, rather than blue-grey, edges of flight-feathers, primary coverts and alula, but more study needed to determine whether this is applicable to S races). Races differ only slightly to moderately, mainly in general brightness, size of mantle patch and strength of wingbars: *pulchra* is a little duller than nominate, has mantle patch slightly larger; *nigrilora* is very like previous, but duller below, with less of a chestnut tinge on flanks; *insularis* is largest race, very dull and pale, relatively pale blue-grey above, ear-coverts concolorous with rest of head, less white in tail, little or no orange tint below; *graysoni* is even duller than last, with less white in tail; *inornata* is bluer above, with narrower wingbars; *speciosa* is brighter than previous, bluer above and more orange-tinged on breast, with usually only one wingbar (on greater coverts); *cirrha* is brighter still, with more extensive black on ear-coverts, orange tinge from throat to belly, smaller olive patch on mantle; *nana* is smallest race, with very small olive mantle patch; *elegans* is brighter than nominate, has smaller mantle patch; *roraimae* is very bright, distinctly blue above, with mantle patch relatively small, and quite orange on throat and breast; *pacifica* resembles previous, the two being the brightest of all races; *alarum* is intermediate between previous and nominate in brightness of plumage, has olive mantle patch medium-sized; *melanogenys* is somewhat duller than last. Voice. Song varies slightly throughout range, but typically an accelerating buzzy trill at different pitches and usually preceded by several high, thin notes; song of race *nigrilora* sounds much more similar to that of *P. americana*, but with buzzier terminal note. Usual call a sharp thin "tsit", repeated rapidly when agitated.
Habitat. Occurs in various forest types, including deciduous forest, gallery forest, humid submontane and lower montane forests, as well as second growth, forest edges, clearings and *chaco* scrub; also mangroves in W Mexico. From lowlands to c. 2500 m. Epiphytes usually a prominent feature of habitat, irrespective of forest type.
Food and Feeding. Feeds mainly on insects and other invertebrates; also takes small berries and protein corpuscles of *Cecropia*. Forages mainly by gleaning, mostly in outer branches of canopy; also hovers to pick insects from undersides of leaves. Usually in pairs or small groups, but regularly in groups of up to 20 on Socorro I. Frequently joins mixed-species foraging flocks.
Breeding. Season protracted in tropics, at least Jan–Oct in Colombia; more restricted farther N, Apr–Jun in Texas and N Mexico and Jun–Jul in Trinidad. Nest dome-shaped with side entrance, constructed from mosses, bark shreds, fine grasses, feathers and hair, placed 3–13 m up in hollowed-out epiphyte clump in tree; in Ecuador described as a mossy cup of *Usnea* lichens, bound with spider web, lined with some hair-like fibres, suspended from horizontal branch and surrounded by *Usnea* moss (gives impression of domed nest). Clutch usually 2 eggs, but up to 4 in N of range (Texas and N Mexico); no information on incubation and fledging periods.
Movements. Mainly sedentary; birds breeding in highlands of Mexico may winter at lower altitudes.
Status and Conservation. Not globally threatened. Generally fairly common to common throughout its range. Has declined in recent decades in S USA (Texas), and is now rare there.
Bibliography. Barnett & Pearman (2001), Chapman (1925), Clements & Shany (2001), Curson *et al.* (1994), Dingle & Greeney (2009), Fjeldså & Krabbe (1990), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Howell & Webb (1995), Lovette & Bermingham (2001), McCarthy (2006), Phillips (1961), Ridgely & Greenfield (2001b), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Sick (1993), Stiles & Skutch (1989).


ssp aestiva
ssp petechia
13
ssp rubiginosa
ssp erithachorides
ssp aequatorialis
14
15
16
17
18
ssp coronata
ssp auduboni
ssp goldmani
PLATE 52
inches 3
cm 8

Genus *DENDROICA* G. R. Gray, 1842

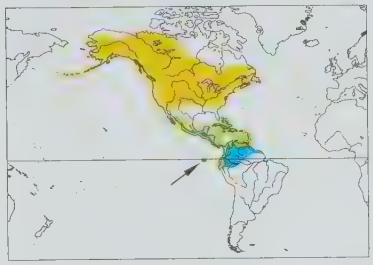
13. Yellow Warbler

Dendroica petechia

French: Paruline jaune **German**: Goldwaldsänger **Spanish**: Reinita de Manglar
Other common names: Golden Warbler ("*petechia* group"); Northern Yellow Warbler ("*aestiva* group"); Mangrove (Yellow) Warbler ("*erithachorides* group")

Taxonomy. *Motacilla petechia* Linnaeus, 1766, northern America = Barbados.
Taxonomy complex, and numerous races described. Has hybridized with (probably) *D. caerulescens* and *Protonotaria citrea*. Races fall into three main groups: "*aestiva* group" of migratory N races occupying variety of damp habitats (*rubiginosa*, *banksi*, *parkesi*, *amnicola*, *aestiva*, *morcomi*, *brewsteri*, *sonorana*, *dugesi*); "*petechia* group" of sedentary, largely mangrove-dwelling taxa (*rufivertex*, *armouri*, *flavida*, *gundlachi*, *flaviceps*, *eoa*, *albicollis*, *chlora*, *solaris*, *bartholemica*, *melanoptera*, *ruficapilla*, *babad*, nominate, *alsiosa*, *rufopileata*, *obscura*, *aurifrons*); and sedentary, mainly S, again mangrove-dwelling "*erithachorides* group" (*castaneiceps*, *rhizophorae*, *phillipsi*, *xanthotera*, *aithocorys*, *iguanae*, *aequatorialis*, *jubaris*, *peruviana*, *aureola*, *oraria*, *bryanti*, *erithachorides*, *chrysendeta*, *paraguanae*, *cienagae*). The two last-mentioned groups are often regarded as collectively forming a separate species, distinct from N group, on account of sedentary nature and restricted coastal habitat. Further, these two groups have sometimes been treated as representing two separate species, but the races of "*erithachorides* group" on coast of NW Venezuela have head pattern approaching that of adjoining races of "*petechia* group"; these anomalies do not occur near any potential zone of contact, and are generally thought to be result of independent evolution of an "*erithachorides*-type" head pattern within "*petechia* group" and vice versa. Chestnut-headed Martinique race *ruficapilla*, usually included in "*petechia* group", is more similar to members of "*erithachorides* group" than to "*petechia* group" (which surrounds it geographically); this has led several recent authors to place *ruficapilla* within the "*erithachorides* group". In recent DNA study, isolated Galapagos population (*aureola*) found to be genetically distinct from both Latin American and North American populations, with mean sequence divergence of 3·7% from former and 6·7% from latter; further research required. Races often intergrade, and some poorly differentiated; review perhaps needed. Distributional limits of N races not always clear; breeding ranges listed below are only approximate. Further proposed races are *inedita*, described from extreme NE Mexico (Matamoros, in extreme NE Tamaulipas), subsumed in *aestiva*; *hypochlora* (from Arizona), synonymized with *sonorana*; and *cruciana*, described from Virgin Is (St Croix), treated as synonym of *bartholemica*. Forty-three subspecies currently recognized.

Subspecies and Distribution.
D. p. parkesi Browning, 1994 – breeds N Alaska and N Canada (E to N Manitoba).
D. p. banksi Browning, 1994 – breeds C Alaska.
D. p. rubiginosa (Pallas, 1811) – breeds coastal S Alaska S through British Columbia (including Vancouver I).
D. p. brewsteri Grinnell, 1903 – breeds W USA (coastal Washington, Oregon, California) and extreme NW Mexico (extreme NW Baja California).
D. p. amnicola Batchelder, 1918 – breeds across C Canada (NW British Columbia E to Newfoundland and New Brunswick).
D. p. morcomi Coale, 1887 – breeds SW Canada (S Yukon and interior British Columbia) S in W USA to NE California and N Texas.
D. p. aestiva (J. F. Gmelin, 1789) – breeds E of Rockies in S Canada (S Alberta E to Nova Scotia) and S in USA to Oklahoma and North Carolina.
D. p. sonorana Brewster, 1888 – breeds S Arizona, SW New Mexico and W Mexico (extreme NE Baja California S through interior to Nayarit and Zacatecas).
D. p. dugesi Coale, 1887 – breeds C plateau of Mexico from San Luis Potosí S to N Guerrero and Puebla.
D. p. rufivertex Ridgway, 1885 – Cozumel I (off Quintana Roo), in SE Mexico.
D. p. flaviceps Chapman, 1892 – Bahama Is.
D. p. gundlachi S. F. Baird, 1865 – extreme SE USA (Florida Keys), Cuba and I of Pines.
D. p. eoa (Gosse, 1847) – Cayman Is and Jamaica.
D. p. albicollis (J. F. Gmelin, 1789) – Hispaniola, including I de la Tortue and I à Vache.
D. p. solaris Wetmore, 1929 – Gonave and Petite Gonave, off W Hispaniola.
D. p. chlora Browning, 1994 – Cayos Siete Hermanos (Seven Brothers Keys), off N Hispaniola.
D. p. bartholemica Sundevall, 1870 – Puerto Rico, Virgin Is, and N Lesser Antilles (Anguilla S to Montserrat and Antigua).
D. p. melanoptera Lawrence, 1879 – C Lesser Antilles (Guadeloupe S to Dominica).
D. p. ruficapilla (J. F. Gmelin, 1789) – Martinique (SC Lesser Antilles).
D. p. babad Bond, 1927 – St Lucia (SC Lesser Antilles).
D. p. alsiosa J. L. Peters, 1926 – Grenadine Is (S Lesser Antilles).
D. p. petechia (Linnaeus, 1766) – Barbados.
D. p. armouri Greenway, 1933 – Old Providence I (I de Providencia), E of Nicaragua, in SW Caribbean.
D. p. flavida Cory, 1887 – I de San Andrés (St Andrew I), E of Nicaragua, in SW Caribbean.
D. p. rufopileata Ridgway, 1884 – Aruba, Netherlands Antilles (Curaçao, Bonaire), Blanquilla I, Margarita I and Los Testigos Is, off N Venezuela.
D. p. obscura Cory, 1909 – islands of Las Aves, Los Roques and La Orchila, off N Venezuela.
D. p. aurifrons Phelps, Sr & Phelps, Jr, 1950 – coastal NE Venezuela (Anzoátegui and W Sucre) and offshore islands (including La Tortuga, Las Tortuguillas and de Pirítu).
D. p. castaneiceps Ridgway, 1885 – NW Mexico (both coasts of Baja California S of 27° N).
D. p. rhizophorae van Rossem, 1935 – Pacific coast of Mexico in Sonora and Sinaloa.
D. p. phillipsi Browning, 1994 – coast from Sinaloa (Mexico) S to Honduras.
D. p. xanthotera Todd, 1924 – Pacific coast of Nicaragua and Costa Rica.
D. p. aithocorys Olson, 1980 – Pacific coast of Panama from Chiriquí E to Coclé, including Coiba I.
D. p. iguanae Olson, 1980 – Iguana I, off Los Santos (S Panama).
D. p. aequatorialis Sundevall, 1870 – Pacific coast of Panama (Panamá Province) and Pearl Is.
D. p. jubaris Olson, 1980 – Pacific coast from SE Panama (S Darién) S to CW Colombia (Buenaventura).
D. p. peruviana Sundevall, 1870 – Pacific coast from SW Colombia (Nariño) S to NW Peru.
D. p. aureola (Gould, 1839) – I de Coco and Galapagos Is.
D. p. oraria Parkes & Dickerman, 1967 – Caribbean coast of Mexico in S Tamaulipas.
D. p. bryanti Ridgway, 1873 – Caribbean coast from SE Mexico (Campeche) S to S Nicaragua.
D. p. erithachorides S. F. Baird, 1858 – Caribbean coast from Costa Rica S to N Colombia.
D. p. chrysendeta Wetmore, 1946 – Guajira Peninsula (NE Colombia and adjacent NW Venezuela).
D. p. paraguanae Phelps, Sr & Gilliard, 1941 – Paraguaná Peninsula (Falcón), in NW Venezuela.
D. p. cienagae J.T. Zimmer & Phelps, Sr, 1944 – Caribbean coast in Carabobo and Aragua and islands off Falcón, in NW Venezuela.



Descriptive notes. 12·5 cm ("*aestiva* group"), 13 cm (others); 7·4–16 g. Male nominate race has crown dark rufous-chestnut (sharply defined cap), rest of head bright yellow; upperparts olive-green with yellowish tinge; upperwing and tail blackish-brown, all wing feathers with bright golden-olive edges, rectrices with much yellow on inner webs (especially on outer feathers); throat and underparts bright golden-yellow, breast and flanks with well-defined dark rufous streaks; iris dark; bill blackish; legs greyish-flesh. Female is duller than male, crown lacks rufous cap, has nape and ear-coverts yellowish-green, underparts unstreaked or only faintly streaked rufous. Juvenile is little known; probably similar to that of "*aestiva* group", which is pale olive-grey or olive-brown, slightly paler on underparts and lacking yellow tones, with bill and legs pinkish-buff. Races differ to varying degrees, mainly in pattern of head and general brightness, males of "*petechia* group" (nominate race and first 17 below) having sharply defined orange-rufous to rufous-chestnut cap, also slightly larger size, more rounded wing and larger feet than those of "*aestiva* group" (next nine races), latter bright yellow on head and underparts and olive-green on upperparts, males of "*erithachorides* group" (last 16 below) similar to nominate but most having whole hood rufous or rufous-chestnut: *rufivertex* male is like nominate but rufous crown paler and less sharply defined, heavier streaking below, female crown and upperparts olive-green; *flaviceps* is like *gundlachi*, but somewhat yellower on head; *gundlachi* male is much duller than nominate, darker olive-green above, including crown (or crown sometimes yellow-tinged, occasionally slightly rufous), female dull grey-olive above and pale whitish to yellowish below; *eoa* resembles previous, but male has slightly more rufous in crown (often extending to ear-coverts) and more obscure streaking below; *albicollis* is like previous but somewhat duller, paler below, male cap generally slightly darker; *chlora* like previous but chestnut of crown darker, back and crown darker green, and margins of flight-feathers greener; *solaris* paler than previous, brighter and yellower above than *albicollis*; *bartholemica* has relatively long bill, male with pale orange-rufous in crown (more mottled in Virgin Is), moderate streaking below; *melanoptera* resembles last, but male crown slightly darker rufous, streaks below narrow, female crown orange-tinged; *ruficapilla* is distinctive, male with whole of head and throat dark rufous-chestnut; *babad* male is like nominate, but cap paler (tips of feathers yellow); *alsiosa* male has forehead golden-yellow (cap extending less far forward); *armouri* male has yellow crown with faint rufous tinge, streaks below merging to form rufous patch on chest; *flavida* male is like *rufivertex*, but cap less extensive, paler and more orange, streaks below heavier; *rufopileata* resembles nominate, but male crown slightly paler, female paler below; *obscura* like previous but darker and greener above, with darker ventral streaking; *aurifrons* slightly paler above than *rufopileata*, with narrower chestnut streaking; *aestiva* male is bright yellow on head and underparts, with forecrown and ear-coverts tinged golden-orange, upperparts yellow-tinged olive-green, breast and flanks with well-defined broad rufous streaks, non-breeding male duller, female much duller; *brewsteri* is like previous, but smaller and a little paler yellow; *amnicola* is slightly duller and darker, male generally duller yellow below and with streaks somewhat darker and thinner, female greyer above; *rubiginosa* resembles last but duller still, greyer above and paler below, male crown and nape concolorous with upperparts; *morcomi* is intermediate between previous and *aestiva*; *banksi* greener above than previous, yellower above than *amnicola*, with chestnut streaking averaging darker and more prominent than both of these races; *parkesi* much darker and greener above than previous, with chestnut streaking less marked; *sonorana* is very pale, male pale yellowish-olive above, often with faint rufous streaking, streaks below narrow and faint, female pale greyish-olive above; *dugesi* is similar to last, but male has pale orange-rufous in crown and heavier streaking below; *erithachorides* male has rufous-chestnut head, slightly paler on throat, upperparts bright yellowish-olive, underparts bright yellow with heavy rufous streaks, female very dull, entirely olive-grey above (rump more olive), pale eyering, pale olive-grey to whitish wing edgings, pale yellowish to buffy below, breast often with light greyish wash; *castaneiceps* is similar to previous but smaller, somewhat darker above, male less heavily streaked below; *rhizophorae* is smaller than previous, has more yellow in tail, male with hood extending less on to throat and with heavier streaking below; *phillipsi* is similar to last but greener on back and rump, with greener edging to feathers of wings and tail, and greener tinge to yellow of underparts; *xanthotera* also is similar, but has more yellow in tail, male with slightly more extensive hood and slightly less heavy streaking on richer yellow underside; *aithocorys* is intermediate between previous race and *aequatorialis*; *iguanae* has darker chestnut hood than previous, also darker olive-green upperparts, heavier rufous streaking on breast and flanks; *aequatorialis* male has hood comparatively pale, light rufous-chestnut, and streaks below broad and heavy; *jubaris* differs from preceding race in having paler, more tawny-coloured hood, throat streaked yellowish, side of head suffused with yellowish (slightly capped effect), breast and flanks less heavily streaked; *peruviana* male lacks hood, has only crown chestnut, often some faint streaks of this colour on face and throat; *aureola* closely resembles previous, but streaking below slightly heavier; *bryanti* is like *erithachorides*, but male hood more sharply demarcated, streaking below less pronounced (can be faint); *oraria* is very like preceding race, but darker, greener and more uniform above, averaging even less streaking below; *paraguanae* has rufous-chestnut on head restricted to crown, with side of head mottled chestnut and yellow, throat chestnut-streaked yellow; *chrysendeta* has entire head to upper breast chestnut, pattern on underparts intermediate between those of *erithachorides* and previous race; *cienagae* is very like *paraguanae*, male with streaked throat but more extensive streaking below. Voice. Members of "*aestiva* group", at least, sing Type 1 and Type 2 songs; "*erithachorides* group" and "*petechia* group" may sing only Type 2 songs. Song very variable, but typically a series of 3–5 high-pitched "swee" notes on one pitch followed by short staccato warble, often transcribed as "sweet sweet sweet I'm so sweet". Type 2 songs generally longer and more variable than Type 1 songs. Songs of all three groups broadly similar to one another, with variation throughout ranges. Female has been recorded as singing. Usual call of

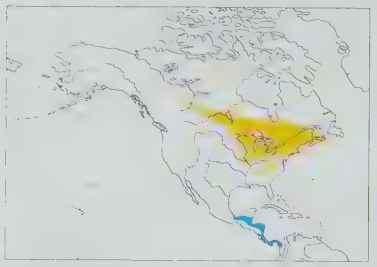
On following pages: 14. Chestnut-sided Warbler (*Dendroica pensylvanica*); 15. Magnolia Warbler (*Dendroica magnolia*); 16. Cape May Warbler (*Dendroica tigrina*); 17. Black-throated Blue Warbler (*Dendroica caerulescens*); 18. Yellow-rumped Warbler (*Dendroica coronata*).

"*aestiva* group" a loud, emphatic "tship"; that of two other groups a slightly drier and stronger "chip"; flight call of "*aestiva* group" a high buzzy "zwee".
Habitat. N populations ("*aestiva* group") breed in variety of damp, early-successional habitats, including overgrown pastures, hedgerows and suburban parks, especially in wet deciduous thickets and riparian scrub dominated by willows (*Salix*); generally at low altitudes, but to 2700 m in California and Arizona. In winter in a similar variety of lightly wooded and scrubby habitats, including parks and gardens, as well as more marshy and riparian areas, usually below 500 m, but occasionally to 2600 m in Colombia; also in mangroves, where may overlap with members of "*petechia* group" and "*erithachorides* group". Last two groups mostly restricted to coastal mangroves, but "*petechia* group" occurs locally also in dry scrub, freshwater marshes and riparian growth, and on Dominica and Martinique in montane forest above 300 m; "*erithachorides* group" also in scrubby habitats on Coco I and Galapagos and on some small islands just off Ecuador coast.
Food and Feeding. Feeds mainly on insects and other arthropods; N populations ("*aestiva* group"), at least, also eat some berries. Forages mainly by gleaning, but also by hovering and flycatching, at all levels from ground to treetops, mainly at low to middle levels. N populations seen to take insects from frozen surface of ponds in early spring; members of "*petechia* group" and "*erithachorides* group" do not perform flycatching sallies so often as do those of "*aestiva* group", but glean at all levels, including on ground, in mangroves. Seldom joins mixed-species foraging flocks; instead, establishes winter territory, within which it has been recorded as defending individual pasture trees against other parulids, especially *D. magnolia*, in S Mexico (Chiapas) and Guatemala.
Breeding. Season Apr–Jul in N of range; for "*erithachorides* group", May–Jun in N populations and Dec–Apr in Galapagos Is; mainly Mar–Jun in S ("*petechia* group"). Polygyny recorded for "*aestiva* group". Nest a cup of grasses, shredded bark and other plant fibres, lined with fine grasses and hair, placed 1–3 m (occasionally up to 13 m in N of range) in tree, bush or mangrove; one record of nest placed in a potted plant in Puerto Rico (race *bartholemica*). Clutch 3–6 eggs but usually 4–5 ("*aestiva* group"), or 1–3 eggs ("*petechia* group" and "*erithachorides* group"), mean of 3 recorded for race *bryanti*; incubation period 11 days in N, 11–12 days for "*petechia* group", no information for "*erithachorides* group"; nestling period 9–12 days in N ("*aestiva* group"), no precise information for other two groups but reported as c. 2 weeks for "*petechia* group". Nests of "*aestiva* group" commonly parasitized by Brown-headed Cowbird (*Molothrus ater*) and those of "*petechia* group" by Shiny Cowbird (*Molothrus bonariensis*); in two of largest studies of former group, 399 (30%) of 1350 nests were parasitized in Ontario and 396 (21%) of 1885 in Manitoba; in study of 87 "*petechia* group" nests in Puerto Rico 65 (75%) parasitized, and study on St Lucia found 47% of nests parasitized; this species frequently responds by building over parasitized clutch to make multi-storey nest (up to six storeys recorded), but more likely to desert if cowbird egg laid early in host's laying sequence (especially before any of its own eggs laid).
Movements. Resident in S. In N "*aestiva* group", although some populations at least of *dugesi* are sedentary, members generally short-distance to long-distance migrants, wintering from W & S Mexico (including S Baja California) S throughout Central America and N South America (S to N Bolivia and Amazonian Brazil), a few farther N (in S California, Arizona, Florida and Caribbean, casual in Texas and Louisiana); apparently wide overlap in wintering ranges of the nine races in this group, although E breeding populations tend to winter in E part of non-breeding range and W ones in W part. E populations leave breeding grounds early, from mid-Jul, and move S on broad front through North America, most following Gulf of Mexico coast, rather than crossing it; arrival on non-breeding grounds from mid-Aug in Mexico, late Aug or Sept in Panama and South America; return migration also early, reaching breeding grounds from early Apr in S, late May in far N; some evidence that autumn migration, at least, is more diurnal than that of most other parulids. W populations migrate a few weeks later, in both autumn and spring. Members of this group regular in Bermuda on passage, especially in autumn. Members of "*erithachorides* group" recorded once in California, and once in Arizona; now sighted regularly in S Texas, at mouth of Rio Grande. Vagrant to Britain ("*aestiva* group").
Status and Conservation. Not globally threatened. Abundant to common or locally common. N populations ("*aestiva* group") generally common to abundant in E of range, with population densities of up to 60 pairs/10 ha in some areas, but has declined in some parts of SE USA. Some W populations, especially *sonorana*, have declined significantly in recent years, this due primarily to loss of riparian habitat through overgrazing, modification of watercourses and replacement with non-indigenous tamarisk (*Tamarix*). Race *sonorana* was formerly common along Rio Grande in Texas, but no longer breeds there; has likely declined also in adjacent NW Mexico. In SE Arizona, densities increased six-fold 2–3 years after grazing was stopped along riparian corridors where the warblers breed. S breeders ("*erithachorides* group" and "*petechia* group") have declined recently in many coastal areas following clearance of mangroves, and race *peruviana* now only locally common in Ecuador; members of "*petechia* group" may have suffered local declines where their range has recently been invaded by Brown-headed and Shiny Cowbirds, but as yet no solid evidence of this.
Bibliography. Aldrich (1942), Bankwitz & Thompson (1979), Berger (1955), Bierman & Sealy (1982), Briskie (1995), Browne *et al.* (2008), Browning (1994), Burgham & Picman (1989), Busby & Sealy (1979), Cilimburg *et al.* (2002), Clark & Robertson (1981), Cosens & Sealy (1986), Dellasala (1986), Ducharme & Lamontagne (1992), Duncan & Weber (1985), Ficken & Ficken (1965, 1966a), Folkers & Lowther (1985), Gill (1995), Gill & Sealy (1996), Goossen & Sealy (1982), Greenberg & Salgado-Ortiz (1994), Greenberg *et al.* (1996), Greene (1942), Gunn (1958), Hobson & Sealy (1989a, 1989b, 1989c, 1989d, 1990), Howell & Webb (1995), Keith (1997), Klein & Brown (1994), Knopf & Sedgwick (1992), Lehman (2005), Lewington *et al.* (1991), Lichtenstein & Sealy (1998), Lowther *et al.* (1999), Lozano & Lemon (1996, 1999), Mannan (1979), McLaren & Sealy (2000), McMaster & Sealy (1998), McMaster *et al.* (1999), Morse (1966b, 1973), Morton (1976), Neudorf & Tarof (1998), Olson (1980), Prather & Cruz (1995), Raffaele (1989), Raffaele *et al.* (1998), Raveling & Warner (1978), Reid & Sealy (1986), Ridgely & Greenfield (2001b), Rimmer (1988), Rodriguez-Mojica (2004a), Salgado-Ortiz *et al.* (2008), Sealy (1992, 1995), Spector (1991), Spector *et al.* (1989), Weary *et al.* (1994a), Wiedenfeld (1991, 1992), Wiley (1985), Yezerinac & Weatherhead (1997), Yezerinac *et al.* (1999).

14. Chestnut-sided Warbler
Dendroica pensylvanica

French: Paruline à flancs marron **Spanish**: Reinita de Pensilvania
German: Gelbscheitel-Waldsänger

Taxonomy. *Motacilla pensylvanica* Linnaeus, 1766, near Philadelphia, Pennsylvania, USA.
Relationship with other members of genus uncertain. Monotypic.
Distribution. Breeds in S Canada (from Saskatchewan E to Nova Scotia), S through Great Lakes region to NE USA (Minnesota E to New England) and S in Appalachians to N Georgia and N Alabama. Migrates to non-breeding grounds mainly from SE Mexico S to Panama; a few winter in Caribbean.
Descriptive notes. 13 cm; 7·5–13·1 g. Male breeding has yellow crown, thick black eyestripe, white forehead and side of face, and narrow black "moustache" which runs into broad chestnut stripe along flanks, contrasting with otherwise white underparts; upperparts olive-green, heavily

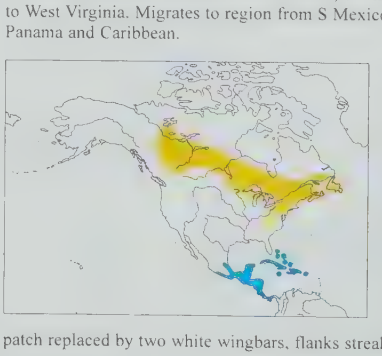


streaked black on mantle, two yellowish-white wingbars on greater and median upperwing-coverts; tail with extensive white in three outer feathers; iris dark; bill blackish; legs grey to purplish-brown or blackish. Non-breeding male is very different, with crown, nape and upperparts quite bright lime-green and essentially unstreaked, face and underparts pale greyish-white (greyest on face), prominent white eyering, two pale wingbars (as in breeding plumage), no moustache but extensive chestnut on flanks. Female breeding is similar to male but duller, with olive-green crown, greyer eyestripe and moustache, less extensive chestnut on flanks, also generally less white in tail; non-breeding plumage similar to that of male, but with less chestnut (sometimes none) on flank. Juvenile has umber-brown crown, nape and upperparts, darker streaks on mantle and pale buffish-yellow wingbars, side of head greyer, underparts paler umber-brown, becoming whitish towards undertail-coverts, bill and legs pinkish-buff; first-year similar to breeding adult but on average slightly duller and with little or no chestnut on flank, first-summer female can be quite dull. Voice. Has two song types. Typical Type 1 song a series of loud whistled notes with terminal flourish, often transcribed as "pleased pleased pleased to meecha". Type 2 song more variable, often lacks terminal flourish, may be very similar to Type 2 songs of *D. petechia* and *Setophaga ruticilla*. Usual call a rather husky "tchip"; flight call a distinctive, rather rough or burry "breet".
Habitat. Breeds in young second-growth deciduous forest, forest edges and clearings, brushy thickets, and abandoned farmland in process of reverting to forest. Was formerly a specialist of early-successional habitats in woodland clearings following fires or storm damage, but became much more widespread following clearance of forests by humans. In winter found in second-growth forest, especially at edges and in clearings, and also in submontane forest, from low levels up to c. 1300 m.
Food and Feeding. Feeds mainly on insects and other arthropods, mainly spiders (Araneae); also some seeds and berries in winter. Forages mainly at low to middle levels in shrubs and in lower branches of taller trees; will forage on ground in inclement weather. Feeds by gleaning; specializes in searching undersides of leaves while perched. Often joins mixed-species foraging flocks on migration and in winter; individual also establishes winter territory, joining mixed flocks which pass through it.
Breeding. Season May–Aug, occasionally to early Sept; egg-laying May–Jul, occasionally as late as early Aug. Nest a cup of grasses, shredded bark and weed stalks, often lined with hair, placed 0·3–1 m up in bush or sapling. Clutch 3–5 eggs, usually 4; incubation period 11–12 days; nestling period 10–11 days, but chicks capable of flight on day 9. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); average rate of parasitism over whole breeding range 29% of nests, but locally in Ontario and Michigan up to 45%.
Movements. Long-distance migrant. Leaves breeding grounds in late Aug and early Sept, arriving on winter grounds mainly during Oct; most move S through Mississippi Valley and Appalachians, then either follow Gulf of Mexico coast or cross the Gulf to Yucatán, and proceed through E Central America to wintering grounds; a few move through Florida to Caribbean. Spring migration begins in Mar, and basically along same route but in reverse, but majority of individuals cross Gulf of Mexico; arrival on breeding grounds from late Apr. Casual throughout W North America, from British Columbia S to NW Mexico, with most records from California in autumn; also in Bermuda, mainly in autumn (one winter record there), and in N Colombia and Venezuela in winter. Vagrant in Trinidad, Alaska, Greenland and Britain in autumn, and in Ecuador in winter.
Status and Conservation. Not globally threatened. Common. Breeds occasionally outside normal range in C Alberta (W Canada) and Colorado (WC USA). Being a bird of scrub and young second growth, this species is one of the few that has benefited from clearing of forests for agriculture, and has increased greatly in numbers over last 150 years; has undergone a steady decline in numbers since middle of 20th century, but is still much more common than it was 150 years ago. Densities recorded during Breeding Bird Census include average of 68 singing males/km² in West Virginia, with highest densities (280 males/km²) in cutover oak–hickory (*Quercus–Carya*) forest at 900 m altitude; 350 pairs/km² in early-successional spruce–fir (*Picea–Abies*) forest regeneration following fires; and 37–50 pairs/km² in mixed forest and edge communities in Vermont.
Bibliography. Byers (1995, 1996), Byers & Kroodsma (1992), Cripps (1966), Dugmore (1902), Ficken & Ficken (1965), Greenberg (1984), Kroodsma (1981), Kroodsma *et al.* (1989), Lawrence (1948), Lein (1978), Lewington *et al.* (1991), McCarthy (2006), Morton (1980), Niemi & Hanowski (1984b), Payne *et al.* (1984), Richardson & Brauning (1995), Sodhi & Paszkowski (1995), Strewe & Navarro (2004a), Tate (1970), Yunick (1969).

15. Magnolia Warbler
Dendroica magnolia

French: Paruline à tête cendrée **German**: Magnolienwaldsänger **Spanish**: Reinita de Magnolia

Taxonomy. *Sylvia magnolia* A. Wilson, 1811, not far from Fort Adams, on the Mississippi River, USA.
Relationship with other members of genus uncertain. Has hybridized with *D. coronata*. Monotypic.
Distribution. Breeds from Canada (from C Northwest Territories, E British Columbia and C Alberta E to Newfoundland) S in USA to C Minnesota, C Wisconsin and New England, and S in Appalachians to West Virginia. Migrates to region from S Mexico S to Nicaragua and, in smaller numbers, to C Panama and Caribbean.



Descriptive notes. 13 cm; 6·6–12·6 g. Male breeding has blue-grey crown, broad white rear supercilium, broad black facial mask extending to sides of neck, narrow white crescent beneath eye; upperparts blackish, yellow rump and prominent white wing patch; large white patches in centre of all except central tail feathers (forming white band when tail spread); throat and underparts yellow, narrow black breastband, broad black streaks on flanks; undertail-coverts white; iris dark; bill and legs blackish. Non-breeding male is duller, with facial mask, nape and breastband grey, no supercilium, upperparts greenish, white wing patch replaced by two white wingbars, flanks streaks slightly less bold. Female breeding is duller

than male, has crown and nape grey, white supercilium, black-mottled ear-coverts, black-streaked olive upperparts, two white wingbars, streaks below less bold, a few individuals brighter and approaching male in appearance; non-breeding female is duller, has ear-coverts grey, underparts less streaked, narrow grey breastband. Juvenile has olive-brown head and upperparts with faint darker streaks, slightly paler rump, whitish wingbars, pale buff throat and underparts with breast darker, more olive-brown, this colour extending as broad streaks onto belly and flanks, bill and legs pinkish-buff; first-winter (both sexes) similar to non-breeding female but generally duller, underparts unstreaked, variable, some brighter and with more obvious streaking, others (especially females) very dull. Voice. Two song types. Type 1 song a short and variable series of rich musical notes, often transcribed as "weety weety wee" or "weechy weechy weechip". Less common Type 2 song a simpler "sing sweet". Usual call on wintering grounds a rather dry, nasal "clenk" or "tzek", distinctly different from calls of congeners; on breeding grounds a full, soft "tship" also given; flight call a high buzzy "zee".

Habitat. Breeds in coniferous forest, especially in dense stands of young spruce (*Picea*), hemlock (*Tsuga*) or balsam fir (*Abies balsamea*), also in mixed forest provided that young dense stands of conifers present. A specialist of young coniferous forests and regenerating clearings, but will also use mature coniferous forest if this has a dense understorey. In Appalachians of Pennsylvania and West Virginia, generally found above 900 m but locally down to 450 m; in boreal zone occurs down to sea-level. In winter found in wide variety of habitats, including forest edges and clearings, plantations, and other wooded habitats such as hedgerows and parks; usually in lowlands, occasionally to 1700 m.

Food and Feeding. Feeds almost exclusively on invertebrates, especially lepidopteran larvae, and such other arthropods as spiders (Araneae); takes large numbers of spruce budworms (*Choristoneura fumiferana*) during outbreaks of this insect. Has been observed to take honeysuckle (*Lonicera*) berries on migration during inclement weather. Forages mainly at low to middle levels, especially on outer branches of trees and bushes. Main technique is that of gleaning; also hovers to pick prey from foliage, and makes aerial flycatching sallies.

Breeding. Season Jun–Aug. Nest a cup of grass and weeds, lined with fine rootlets and hair, placed 0·3–1·7 m up in young conifer, often hemlock. Clutch 3–5 eggs, usually 4; incubation period 11–13 days; nestling period 8–10 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*), with some evidence of recent increase in rates of parasitism; over a 60-year period in S Quebec, of 147 nests studied, 6 (4·1%) were parasitized, and, in study in Ontario, of 111 nests 11 (9·9%) were parasitized.

Movements. Long-distance migrant. Leaves breeding grounds in late Aug and Sept, arriving in wintering areas from early Oct; most follow Mississippi Valley and Appalachians to Gulf coast, cross Gulf of Mexico and carry on through E Central America to wintering grounds; some follow Gulf coast and some move through Florida to Caribbean. Spring return begins in early Apr and is basically along same route in reverse direction, but more individuals follow Gulf coast than cross it, and E breeders take a more E route through North America. Regular migrant in Bermuda, some overwintering in most years. Casual throughout W North America in autumn, with most records from California, and in S Florida, Colombia, Venezuela and Trinidad in winter. Vagrant to W Alaska, Greenland and Britain.

Status and Conservation. Not globally threatened. Generally common throughout its range. Has shown a slight decline in recent years, but also local increases where cleared land has become reforested, creating suitable breeding habitat. In SW New York, density estimated at 71 males/km² in mature hardwood–hemlock forest in 1930–31, but only 12 males/km² in 1983–85. In Maine, surveys estimated 57 males/km² in mature closed spruce forest, 79 males/km² in young spruce, and 17 males/km² in open forest with sparse understorey, and 82 males/km² in bog–shrub habitat. In survey in West Virginia, maximum of 314 males/km² in second-growth spruce forest, but this density figure declined markedly as forest matured and understorey cover declined.

Bibliography. Baird (1990), Crawford *et al.* (1983), Dunn (2000), Hall (1984a, 1994), Hill & Hagan (1991), Hussell *et al.* (1992), Latta *et al.* (1998), Lehman (2005), Lewington *et al.* (1991), McCarthy (2006), Morse (1968, 1976), Robbins, Dowell *et al.* (1992), Stewart & Aldrich (1952), Terrill (1961), Titterington *et al.* (1979), Tramer & Tramer (1977).

16. Cape May Warbler

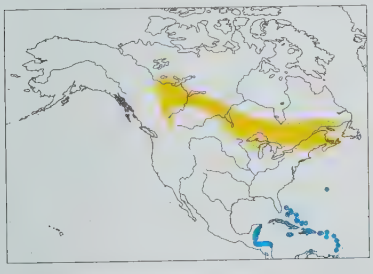
Dendroica tigrina

French: Paruline tigrée **German**: Tigerwaldsänger **Spanish**: Reinita Atigrada

Taxonomy. *Motacilla tigrina* J. F. Gmelin, 1789, Canada.

May be most closely related to *D. striata* and *D. castanea*, but precise relationships unclear. Hybridization with *D. coronata* reported. Reported hybrid between *D. striata* and *Seiurus noveboracensis* now thought probably to have involved present species, rather than *D. striata*; bird described in early 19th century as *Helinaia carbonata* ("Carbonated Warbler") may have been a hybrid of this species with *D. striata*, but generally considered to be a first-summer male of present species. Monotypic.

Distribution. Breeds in Canada (from SW Northwest Territories and NE British Columbia E to S Newfoundland and Nova Scotia) and NE USA (E Minnesota and C Wisconsin E to N New England). Migrates primarily to Caribbean (mainly Greater Antilles), also Bermuda.



Descriptive notes. 13 cm; 8·8–17·3 g. A rather slender-billed parulid with curved culmen. Male breeding has orange-chestnut face with rich yellow surrounds, dark olive crown, olive upperparts with heavy black streaking, olive-yellow rump, prominent white wing patch; tail with extensive white in outer three feathers; throat and underparts yellow, heavily streaked black; iris dark; bill and legs blackish. Non-breeding male is somewhat duller. Female is noticeably duller than male, lacking orange-chestnut on face and with white wingbars (rather than wing patch). Juvenile is olive-grey above, with faint darker streaks on mantle and pale buff wingbars, mottled dusky olive on throat and breast, becoming pale buffy yellow on lower underparts, with diffuse olive streaks on belly and flanks, bill and legs dusky-flesh; first-year on average duller than adult, and first-winter female often very dull, mostly grey-brown above and off-white below, with indistinct streaks on underparts and relatively indistinct wingbars (on such individuals, olive-yellow rump, rather slender bill with curved culmen, narrow whitish supercilium and streaking on underparts are characteristic). Voice. Two song types. Type 1 song a series of very high-pitched, weak sibilant "zi" notes (usually 5–6) on one pitch, but with rising inflection on each note. Type 2 song typically faster, more slurred, and slightly lower-pitched and disyllabic, "seetee seetee seetee seetee seetee". Usual call very high-pitched, thin "sip"; flight call a soft buzzy "zeet"; "chip" call by incubating female when nest disturbed.

Habitat. Breeds in coniferous boreal forest where spruces (*Picea*) dominate. Black spruce (*Picea mariana*) the most critical tree species, but other important ones are white spruce (*Picea glauca*), balsam fir (*Abies balsamea*) and northern white-cedar (*Thuja occidentalis*); favours clearings and edges within forest. In winter found in open second-growth forest, plantations, forest edges, parks and gardens, and mangroves, favouring areas where flowering trees numerous.

Food and Feeding. In summer feeds on insects and other arthropods, especially spruce budworm (*Choristoneura fumiferana*). Forages mostly high in canopy, by gleaning and occasionally flycatching. In winter feeds mainly on nectar and the juice of berries (has a semi-tubular tongue, unique among the warblers, for this purpose; thin, slightly decurved bill may also be an adaptation for nectarivory and fruit-eating); also eats insects in winter, and may visit feeders, especially hummingbird (Trochilidae) feeders, and sapsucker (*Sphyrapicus*) sap wells on migration. In winter defends food sources against conspecifics and other warblers.

Breeding. Season Jun–Jul, egg-laying Jun. Nest a bulky cup of moss, vine stems and twigs, lined with fine grasses, hair and feathers, placed 0–20 m (usually 12–15 m) up on branch of spruce or fir (*Abies*). Clutch 4–9 eggs, usually 6–7, larger clutches in years of spruce budworm outbreak than at other times; incubation period 11–13 days; nestling period 8–10 days; female flushes reluctantly when incubating. Nests parasitized rarely by Brown-headed Cowbird (*Molothrus ater*), which uncommon in dense forest habitat.

Movements. Long-distance migrant. Leaves breeding grounds mainly during late Aug and Sept, arriving on wintering grounds mainly during Oct; some linger in North America until Dec. Most move S or SE, mainly through Appalachians and E to coast, thence to Florida and across to Caribbean islands; some migrate to Bermuda, and species is a casual winter visitor in S Florida, E Middle America, and extreme N South America. Return migration begins in Mar and is basically along same route but in opposite direction, and with slightly more W bias, this species being scarce on Atlantic coast in spring; reaches breeding grounds from mid-May. Casual in Newfoundland, mainly in summer. Vagrant throughout most of W North America, including W Mexico, in autumn, but most regular in California; vagrant also in Britain and Trinidad.

Status and Conservation. Not globally threatened. Generally common throughout its range; numbers fluctuate considerably in response to periodic outbreaks of spruce budworm (an important summer food source). Estimates of breeding density in Ontario (Canada) vary from 34 pairs/km² in 1979 to 370 pairs/km² in early 1980s, with virtually none in 1986. Elsewhere, densities of 20 pairs/km² in balsam fir stands in New Brunswick and E Quebec, 50 pairs/km² in balsam fir stands in W Ontario and 30 pairs/km² in N Maine reported during spruce budworm outbreaks. Has been considered that intensive spraying programmes to control infestations of spruce budworm could have longer-term negative effect on this species, as well as on others which specialize on spruce budworm during outbreaks. Density on winter grounds in Puerto Rico estimated at minimum of 1 bird/ha.

Bibliography. Baltz & Latta (1998), Blanich (1988), Burns (1915), Byars & Galbraith (1980), Cockrum (1952), Emlen (1973), Gray (1958), Hussell (1991), Kale (1967), Kilham (1953), Lewington *et al.* (1991), Lucas (1894), Marks & Willard (1996), McCarthy (2006), McMartin *et al.* (2002), Morse (1978), Parkes (1978, 1985a, 1995), Schnell & Caldwell (1966), Sealy (1988, 1989), Short & Robbins (1967), Staicer (1992), Taylor (1988).

17. Black-throated Blue Warbler

Dendroica caerulescens

French: Paruline bleue **German**: Blaurücken-Waldsänger **Spanish**: Reinita Azulada

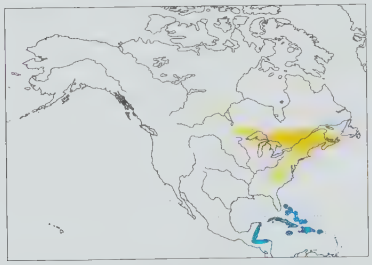
Taxonomy. *Motacilla caerulescens* J. F. Gmelin, 1789, Santo Domingo, Dominican Republic.

One record of hybridization, probably with *D. petechia*. Validity of race *cairnsi* has been questioned, both by earlier ornithologists and by more recent ones, on the basis that, in males at least, differences from nominate are not constant (*cairnsi*-type males occur in nominate population, and vice versa); further research required. Two subspecies tentatively recognized.

Subspecies and Distribution.

D. c. caerulescens (J. F. Gmelin, 1789) – breeds in S Canada from Saskatchewan (irregular) and S Ontario E to Nova Scotia and in NE USA from Minnesota E to New England; migrates to Caribbean (mainly Bahamas and Greater Antilles), small numbers to E Middle America.

D. c. cairnsi Coues, 1897 – breeds E USA in Appalachians from SW Pennsylvania S to N Georgia; migrates to Caribbean, some to E Middle America.



Descriptive notes. 13 cm; 8·4–12·4 g. Male nominate race has dark blue crown, nape and upperparts, black throat and face, white underparts with broad black streak along flanks; white patch at base of primaries, extensive white in outer three rectrices; in fresh autumn plumage, feathers of throat may be narrowly tipped whitish and those of upperparts tipped greenish; iris dark; bill blackish; legs dark flesh-coloured. Female has dark brownish-olive head and upperparts, narrow whitish supercilium and lower eye-crescent, and pale buffy underparts; less white in wing and tail than male, and wing patch can be pale buff. Juvenile is brown above, with creamy supercilium, has heavy brownish mottling on throat, breast and belly; first-year male similar to adult, but edges of remiges, alula and primary coverts greenish (not blue); first-year female similar to adult, but slightly browner above and buffier below, especially in autumn, and wing patch generally indistinct or lacking. Race *cairnsi* male tends to be brighter and darker blue above than nominate, often blackish on mantle, and has larger white wing patch, female is usually darker and browner above and paler below. Voice. Most common song (possibly Type 1) a series of 3–5 (usually 4) buzzy, drawn-out notes, the last one ascending in pitch and even more drawn out; song has lazy and rasping quality. Less common songs (possibly Type 2) are 2 buzzing notes, the second one longer and rising in inflection, and a series of 3–5 notes with more whistled, less buzzing quality and delivered more slowly. Usual call a soft flat "stip" or "tik"; flight call a prolonged "tseet".

Habitat. Breeds in mature deciduous or mixed forest with well-developed understorey, also in old logged areas and clearings, in Appalachians mostly at 800–1600 m, but at lower elevations farther N. Favours forests dominated by maples (*Acer*), birches (*Betula*) and beech (*Fagus*) with varying amounts of eastern hemlock (*Tsuga canadensis*), spruce (*Picea*) and firs (*Abies*). In N Michigan, more abundant in forests with moderate (mean 27%) balsam fir (*Abies balsamea*) understorey than in those with dense deciduous understorey, and actively avoids forests with little or no understorey. In winter found in variety of wooded and scrub habitats, including primary forest, open deciduous woodland, plantations and gardens; in Puerto Rico possible sexual segregation, males occupying

lower-elevation primary forest with sparse understorey and females in higher-elevation second growth and scrub.

Food and Feeding. Feeds mainly on insects and other arthropods; also some seeds, fruit and nectar in winter. In one study, lepidopteran larvae comprised 60–87% of food brought to nestlings. Forages mainly at low to middle levels and sometimes on ground, although males wintering in primary forest in Puerto Rico tend to forage higher in canopy. Feeds by flycatching and gleaning; gleans principally from undersides of leaves. Generally solitary on non-breeding grounds, individuals establishing a winter territory or home range.

Breeding. Season May–Aug, egg-laying May–Jul (occasionally into Aug); sometimes double-brooded. Polygyny recorded, and in recent study extra-pair paternity recorded in nearly half (44·7%) of nests studied, being closely correlated with breeding synchrony among neighbouring females. Nest a cup of bark shreds, leaves and wood fragments, lined with rootlets, hair and fine grasses, placed low in understorey, usually within 1 m of ground. Clutch 3–5 eggs, usually 4; incubation period 12–13 days; nestling period 8–10 days; both sexes will feign injury to distract attention from nest. Nests infrequently parasitized by Brown-headed Cowbird (*Molothrus ater*), which uncommon in this species' preferred breeding habitat of undisturbed forest; study in Ontario found 3 (13%) out of 23 nests parasitized, while one in New Hampshire found no parasitized nests in more than 800 examined.

Movements. Migratory, moving medium to long distance. Leaves breeding grounds in late Aug and early Sept, those from NE part of range following Atlantic coast S to Florida and then crossing to Caribbean, those breeding farther W moving SE, across S Appalachians, to reach Florida; reaches non-breeding grounds from late Sept. Return migration basically in reverse direction along same route, but a few (possibly wind-drifted individuals) cross E part of Gulf of Mexico; leaves wintering grounds from late Mar, arriving on breeding grounds from late Apr in S and mid-May in N. Regular migrant in Bermuda, some overwintering in most years; apparently rare but regular winter visitor in Middle America (E Yucatán Peninsula, Guatemala and N Honduras). Casual throughout much of W North America in autumn, and a few records from California in spring; also in Costa Rica, Panama, N Colombia, N Venezuela and Trinidad in winter. Occasional winter records in E USA, especially Florida. Vagrant in Newfoundland, W Mexico, Iceland; also in Ecuador in Feb–Jun, thus constituting one of the few instances of a temperate-breeding parulid in South America during boreal summer.

Status and Conservation. Not globally threatened. Generally common throughout its range. Numbers are thought to be stable, though there have been some local decreases at the edges of the range, and local increases near the centre of the range. In typical hardwood forest habitat in New Hampshire, breeding densities range from 8–9 pairs/10 ha where the understorey is dense, down to 2–3 pairs/ha where it is sparse. Densities on winter grounds in Jamaica range from 30–36 birds/10 ha in mid-elevation primary forest down to 1–5 birds/10 ha in lower elevation drier forest. In Puerto Rico, winter densities reported as 7–16 birds/10 ha in a variety of habitats.

Bibliography. Black (1975), Chuang *et al.* (1999), Contreras-Balderas *et al.* (1995), Ducharme & Lamontagne (1992), Graves *et al.* (1996), Holmes (1986, 1994), Holmes & Sherry (1992), Holmes, Sherry, Marra & Petit (1992), Holmes, Sherry & Reitsma (1989), Holway (1991), Kearns *et al.* (2006), Lack & Lack (1972), Lewington *et al.* (1991), Marra (1993), Martin *et al.* (2004), O'Neill & Holmes (1996), Parkes (1979), Patten (1993), Petit *et al.* (1988), Rodenhouse & Holmes (1992), Silwa (1991), Silwa & Sherry (1992), Steele (1992, 1993), Stodola *et al.* (2009), Wunderle (1992, 1995).

18. Yellow-rumped Warbler

Dendroica coronata

French: Paruline à croupion jaune **German**: Kronwaldsänger **Spanish**: Reinita Coronada
Other common names: Myrtle Warbler (*coronata* and *hooveri* combined); Audubon's Warbler (*auduboni*); Black-fronted Warbler (*nigrifrons*); Goldman's Warbler (*goldmani*)

Taxonomy. *Motacilla coronata* Linnaeus, 1766. Philadelphia, Pennsylvania, USA.

Nominate race has hybridized with *D. pinus*; one record of hybridization (by race *auduboni*) with *D. graciae*. Races form two groups, formerly considered separate species, the N "Myrtle group" (nominate race and *hooveri*) and the W "Audubon's group" (*auduboni*, *nigrifrons* and *goldmani*). S sedentary races *nigrifrons* and *goldmani* are isolated from N migratory ones, and are now thought possibly to be sister-taxa that separated from N groups in the Pleistocene (N groups separating in the Holocene and still interbreeding in a narrow zone of overlap); these two S resident taxa are, therefore, differentiated to the extent that they may represent two separate species, distinct from N migratory forms. Race *hooveri* weakly differentiated, and sometimes subsumed in nominate, from which differences largely clinal. Proposed race *memorabilis* (described from Boulder County, in Colorado), considered indistinguishable from *auduboni*. Five subspecies generally recognized.

Subspecies and Distribution.

D. c. hooveri McGregor, 1899 – breeds in Alaska and NW Canada (Yukon, C & S Northwest Territories and N British Columbia); migrates mainly to W USA and Middle America.

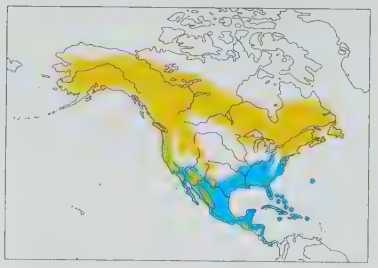
D. c. coronata (Linnaeus, 1766) – breeds in S Canada (from NC Alberta E to Newfoundland and Nova Scotia) and NE USA (Minnesota and Wisconsin E to New England); migrates mainly to SE USA, E Middle America and Caribbean, also Bermuda.

D. c. auduboni (J. K. Townsend, 1837) – breeds W North America from C British Columbia, W Alberta and Montana S in mountains to extreme NW Mexico (N Baja California) and S USA (W Texas); winters mainly in SW USA and Mexico (locally also S to Honduras).

D. c. nigrifrons Brewster, 1889 – W Mexico (Chihuahua and Durango).

D. c. goldmani Nelson, 1897 – C Guatemala; possibly also S Mexico (SE Chiapas).

Descriptive notes. 14–15 cm; 9·8–16·7 g. Has bright and contrasting yellow rump in all plumages. Male nominate race breeding has grey crown with bright yellow central patch, narrow white supercilium, black lores to ear-coverts and area below eye, with white crescent beneath eye; upperparts grey, streaked black, tips of greater and median upperwing-coverts white (two wingbars), tail with extensive white in outer three rectrices; white throat (white extending on to neck side), black breastband, bright yellow patch on side of breast, rest of underparts white, black streaks on flanks; iris dark; bill and legs blackish. Female breeding has similar pattern to that of male, but is duller, with greyer ear-coverts, yellow crown patch faint, and breastband reduced to heavy streaking on sides. Non-breeding plumage (both sexes) is washed brownish on head and upperparts; male considerably duller than in breeding plumage, although, on average, brighter than non-breeding female. Juvenile lacks yellow in plumage, has head and upperparts buffy brown with heavy blackish streaking, throat and underparts whitish with dark streaking, heaviest on breast and flanks, bill and



legs pinkish-buff; first-winter female often very dull, with grey-brown head and upperparts streaked darker, narrow whitish supercilium, pale throat extending to side of neck, off-white underparts faintly streaked darker on flanks, yellow on breast side virtually lacking (but yellow rump still conspicuous). Race *hooveri* is on average marginally longer in wing and tail than nominate, male has slightly less black on breast, and non-breeding plumage greyer on upperparts; *auduboni* breeding male has yellow throat (not extending to neck side), plainer head lacking white supercilium but with distinct white eye-crescents, black restricted to lores and front of ear-coverts, and noticeably more white in wing and tail (in E of range, "*memorabilis*" slightly larger and male often more black on breast and upperparts, especially in S part of breeding area), other plumages correspondingly duller (as for nominate), juvenile marginally paler than that of nominate, dullest first-winter female with whitish throat and little white in wing; *nigrifrons* is on average larger than previous, breeding male more extensively black on head, upperparts and breast; *goldmani* is larger still than last, breeding male almost solidly black on head and upperparts (except for bright yellow areas), more extensively and solidly black on breast and flanks, and has yellow throat narrowly edged white. VOICE. Song of "Myrtle group" a variable and loosely structured rather slow, flat trill, often sounding two-parted and usually rising (but occasionally falling) at end; song of "Audubon's group" similar, and similarly variable, but often delivered more slowly and sounds slightly more musical. Variations in both groups presumably correspond to Type 1 and Type 2 songs. Usual call of "Myrtle group" a sharp, emphatic "chup" or "chek"; usual call of "Audubon's group" a short, sharp "chep" or "chup", sounding softer and less emphatic than that of former; flight call of both a soft, clear, high-pitched "sip" or "tsee".

Habitat. N populations ("Myrtle group") breed in coniferous and mixed forests and woodlands in boreal zone, more often in mixed or deciduous forests in Alaska; W & S populations ("Audubon's group") breed in coniferous and pine–oak (*Pinus–Quercus*) forests in mountains, mainly between 2000 m and 4000 m, but down to sea-level in coastal coniferous forest. Both groups winter in wider range of habitats, including forest and forest edge, woodlands, scrub, thickets, gardens and (mainly "Audubon's") chaparral.

Food and Feeding. Mainly insects and other arthropods in summer. In winter, "Audubon's group" feeds mainly on insects, but takes some fruit and berries and sometimes visits feeders; "Myrtle group" feeds much more on fruit and berries, especially waxmyrtle (*Myrica*) in winter, particularly in N part of wintering range, on Bahamas also regularly visits flowering agave (*Agave*) for nectar. Foraging behaviour of both groups very varied, including gleaning and flycatching from low levels up to canopy; regularly forages also on ground. Usually regarded as a generalist forager. Has been observed to take insects from frozen surfaces of ponds and lakes in Canada in early spring, and seen also to skim over ponds, lakes and even the sea for insects. In mountains of Jalisco, in Mexico, regularly recorded as following swarms of army ants (Ecitoninae) to feed on invertebrates disturbed by the insects. Flocks in non-breeding season.

Breeding. Season May–Aug, egg-laying May–Jul; sometimes two broods in a year ("Audubon's group" probably double-brooded more frequently than "Myrtle group"). Nest a bulky cup of twigs, grasses and moss, lined with hair and feathers, usually placed 3–8 m up in tree (generally a conifer), occasionally lower and even on ground; one record of nest placed on wooden beam. Clutch 3–5 eggs, usually 4; incubation period 12–13 days; nestling period 10–14 days. Nests parasitized quite frequently by Brown-headed Cowbird (*Molothrus ater*), probably owing to this parulid's preferred forest-edge breeding habitat; in Ontario 38 (31%) out of 122 nests were parasitized, and in California young cowbirds seen with 7 out of 31 family groups (suggesting parasitism rate of 23%); in another study, 11 (14%) of 79 nests were parasitized E of Rocky Mts and 2 (22%) of 9 W of them.

Movements. "Myrtle group" a short-distance to long-distance migrant, and in autumn moves later than do most other parulids; leaves breeding grounds from early Sept, moving S on broad front to reach wintering grounds from late Sept, mostly from late Oct, and sometimes not until Dec in Jamaica; those wintering in Middle America generally follow Gulf of Mexico coast, those heading for Caribbean pass through Florida. Spring migration begins in Mar and "Myrtle" is one of earliest warblers to reach breeding grounds, arriving from late Apr in S, mid-May in N; route much the same as in autumn, but more individuals cross Gulf of Mexico. Casual in W North America in autumn (where regular), N South America in winter, and islands in Bering Sea in spring. Vagrant in Trinidad, NE Russia, Greenland, and Europe (mainly Britain, Ireland and Iceland). "Audubon's group" mainly a short-distance to long-distance migrant, although S race *goldmani* essentially sedentary, with perhaps some local altitudinal movements, and most *nigrifrons* sedentary, though some move farther S in Mexico in winter. In North America, assessment of timing of migration complicated by presence of species throughout year in coastal W; generally leaves breeding grounds from late Aug, mainly during Sept, with arrival on Middle American winter grounds from late Sept, but often not until Dec; spring migration begins in late Mar, reaching breeding grounds from late Apr. May also undertake movements on wintering grounds, which can be extensive and occur during night, probably in response to variations in food resources in winter quarters.

Status and Conservation. Not globally threatened. One of the commonest North American parulids; often very abundant, especially in favoured wintering areas, where it may form large flocks. No marked population trends detected in North American Breeding Birds Survey. Estimates of breeding density for "Myrtle group" range from 1 pair or less/10 ha in subalpine forest in Yukon Territory and N hardwoods in New Hampshire to 7–11 pairs/10 ha in spruce (*Picea*) forest in Yukon Territory and 9 pairs/10 ha in mature spruce–fir (*Picea–Abies*) in Ontario. Estimates for "Audubon's group" range from 1·9 pairs/10 ha in subalpine forest in California to 10–15 pairs/10 ha in mixed conifers in Arizona. For both groups, studies have shown that densities do not change significantly in response to most logging practices. Isolated S race *goldmani* generally uncommon, but may be locally fairly common; this race formerly occurred in S Mexico (SE Chiapas), and possibly still present there.

Bibliography. Banks & Baird (1978), Barrowclough (1980), DeSante (1990), Franzreb (1978, 1983), Graves (1993), Holmes *et al.* (1986), Howell & Webb (1995), Hubbard (1969, 1970, 1980), Hunt & Flaspohler (1998), Hussell & Caldwell (1972), Kilham (1961), King (1976), Kunkle (1963), Latta *et al.* (1998), Lehman (2005), Lewington *et al.* (1991), Martin (1960), McCarthy (2006), McNicholl & Goossen (1980), Milá *et al.* (2007), Moore & Phillips (1988), Moore & Simm (1985, 1986), Morse (1968, 1976), Parkes (1985b), Place & Stiles (1992), Scott & Crouch (1987), Snyder (1980), Stewart (1988a, 1988b), Terrill & Crawford (1988), Terrill & Ohmart (1984), Vallender *et al.* (2009), Van Buskirk (1984), Webb *et al.* (1977), Welsh & Healy (1993), Wilz & Giampa (1978), Yunick (1969).

PLATE 53 ➤



PLATE 53

inches 3
cm 8

19. Black-throated Grey Warbler

Dendroica nigrescens

French: Paruline grise **German**: Trauerwaldsänger **Spanish**: Reinita Gris

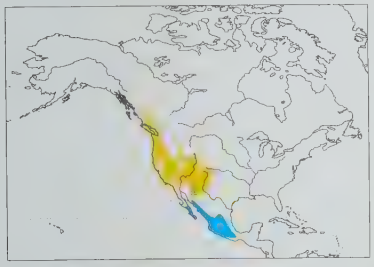
Taxonomy. *Sylvia nigrescens* J. K. Townsend, 1837, no locality = vicinity of Fort William, near Portland, Oregon, USA.

Closely related to the superspecies formed by *D. chrysoparia*, *D. virens*, *D. townsendi* and *D. occidentalis*; probably split off from this prior to initial Pleistocene glaciations and before the four allospecies within it evolved. Hybridization with *D. townsendi* and with *D. occidentalis* reported. Race *halseii* considered invalid by some authors, although nucleotide-sequence divergence between the two races is similar to that between *D. townsendi* and *D. occidentalis*. Two subspecies generally recognized.

Subspecies and Distribution.

D. n. nigrescens (J. K. Townsend, 1837) – breeds SW Canada (S British Columbia) S on coast and in coastal mountain ranges of W USA to N California; migrates to wintering areas mainly in W Mexico (S Sonora S to Oaxaca).

D. n. halseii (Giraud, 1841) – breeds in W USA E of the Cascades (from Washington and Wyoming S to California and New Mexico) and extreme NW & N Mexico (N Baja California, extreme NE Sonora); most migrate to W Mexico (including S Baja California).



Descriptive notes. 13 cm; 6–10·3 g. Male nominate race has black head and throat with broad white supercilium behind eye and broad white submoustachial area (giving striped appearance), small yellow spot on lores; upperparts grey, streaked black, greater and median upperwing-coverts broadly tipped white (two white wingbars); tail with extensive white in outer rectrices; underparts white, streaked black on flanks; throat feathers have narrow pale fringes in fresh non-breeding plumage; iris dark; bill and legs blackish. Female is similar to male but duller, head greyer and throat mottled whitish. Juvenile is similar to dull first-winter female, but with noticeably browner upperparts, greyer underparts and less distinct head pattern; first-year on average slightly duller than adult, especially in autumn, and first-winter female often has throat mostly white with faint black mottling. Race *halseii* is very similar to nominate, but on average marginally larger and purer grey above. Voice. Two song types. Type 1 song variable, consists of several buzzy notes, often doubled, followed by a series of louder notes with crescendo effect and inflected ending, can be transcribed as "weezy weezy weezy weezy wee-to". Type 2 song also highly variable, but typically more complex and warbled than Type 1, and often lacks inflected ending. Usual call a dull, flat "tup", slightly duller and flatter than that of *D. townsendi*; flight call a clear, high-pitched "see".

Habitat. Breeds in dry, open mixed woodland, generally containing pines (*Pinus*) and firs (*Abies*), oaks (*Quercus*) and/or juniper (*Juniperus*), in chaparral and, especially in N part of range, in open coniferous forest with brushy understorey; open forest or woodland with well-developed understorey important to this species. From sea-level, to c. 1800 m (locally to 3000 m) in S Rockies. In winter mainly in dry open woodland, usually with dense understorey, and in tall scrub, generally on lower mountain slopes but also in coastal lowlands, where it occurs also in tropical evergreen forest and mangroves.

Food and Feeding. Feeds principally, perhaps almost exclusively, on insects, especially small caterpillars; a vagrant in Oct (in Georgia, in SE USA) was reported as eating cordgrass (*Spartina*) seeds. Forages mainly by gleaning at low to middle levels in shrubs in understorey and in lower parts of trees. During breeding, tends to glean lower down in shrubs in early part of season and higher up in pines later on, in response to changes in distribution of invertebrate prey. Also hover-gleans and occasionally flycatches. In mountains of Jalisco, in Mexico, has been recorded as following swarms of army ants (Ecitoninae) to feed on invertebrates disturbed by the insects. Joins mixed-species foraging flocks in winter and during migration. Vagrants in E North America sometimes visit birdfeeders.

Breeding. Season May–Jul, egg-laying May–Jun. Nest a cup of plant fibres, grasses and weed stalks, lined with feathers and hair, generally placed 1–3 m (occasionally higher) above ground in tree or shrub. Clutch 3–5 eggs, usually 4; no information on incubation and fledging periods; in mountains of NW Baja California, young, once able to move about, leave the oak belt and move into conifers at higher elevations. Nests rarely parasitized by Brown-headed Cowbird (*Molothrus ater*); of the 20 or so such records, 13 refer to adults of present species feeding recently fledged cowbird chicks.

Movements. Migratory; some of race *halseii* breeding in extreme S of range possibly resident. Difference in wintering range between the two races largely undetermined, owing to difficulty of field identification; nominate race casual in winter in SW USA (N to C California). Leaves breeding grounds from late Aug, following coast and mountain ranges, arriving on wintering grounds mainly during Oct; spring migration begins in early Mar and follows much the same route in reverse direction, arriving on breeding grounds from early Apr in S, late Apr in N. Casual on Gulf of Mexico coast in spring and autumn. Vagrant in E North America from Quebec and Nova Scotia S to Florida, and in Cuba, Guatemala and Belize.

Status and Conservation. Not globally threatened. Generally fairly common throughout range. Overall, population generally regarded as stable. Estimates of breeding density include 24 singing males/40 ha in oak–juniper woodland in SE Arizona, 9 territories and 21 territories in different 40-ha plots in pinyon–juniper woodland in Utah, two territories in 16 ha of oak woodland in California, and average of 1·8 birds/km on transects in juniper woodlands in NE Utah.

Bibliography. Balda (1969), Binford (1989), Erwin (1975), Grant (1986), Guzy & Lowther (1997), Hall *et al.* (1991), Hutto (1980), Jones, H.L. *et al.* (2000), Keane & Morrison (1999), Leck (1983), McCarthy (2006), Morrison (1982, 1990), Morrison & Hardy (1983b), Nettell (1994), Peterson (1994), Rising (1988), Rohwer (1994), Rohwer *et al.* (2000), Salamacha (1995), Stein (1962), Wallace *et al.* (1999).

20. Golden-cheeked Warbler

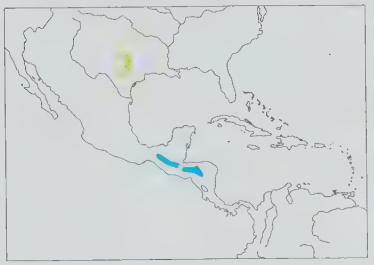
Dendroica chrysoparia

French: Paruline à dos noir **German**: Goldwangen-Waldsänger **Spanish**: Reinita Caridorada

Taxonomy. *Dendroeca* [sic] *chrysoparia* P. L. Sclater and Salvin, 1860, Verapaz, Guatemala.

Forms a superspecies with *D. virens*, *D. townsendi* and *D. occidentalis*, and *D. nigrescens* is closely related to this group. Probably the sister-species of *D. virens*; has occasionally been considered conspecific. Monotypic.

Distribution. Breeds in C Texas (mainly Edwards Plateau and the Balcones Escarpment), in S USA. Migrates to S Mexico (Chiapas), Guatemala, Honduras and NW Nicaragua.



Descriptive notes. 14 cm; 7–14·7 g. Male has side of head yellow, broken by narrow black eyestripe and surrounded by black crown, neck and throat; upperparts also black; wing and tail with grey feather edges, greater and median upperwing-coverts broadly tipped white (two white wingbars), extensive white in outer three rectrices; underparts white, heavy black streaks on flanks; in fresh autumn plumage, black feathers may have narrow yellowish fringes; iris dark; bill and legs blackish. Female is similar in pattern to male but duller, with crown and upperparts olive, heavily streaked black, and throat mottled whitish; also less white in tail. Juvenile has greyish-brown crown, nape and upperparts, white wingbars, paler greyish-brown side of head and underparts, becoming whitish on belly and undertail-coverts, indistinct dusky streaks on breast; first-year duller than adult, first-winter female often quite dull, with crown and upperparts only faintly streaked and black mottling on underparts restricted to sides of throat and breast (similar to *D. virens*, but still has adult head pattern of yellow face and dark eyestripe, upperparts faintly streaked, and no yellow on vent). Voice. Two song types. Type 1 song a series of 4–5 buzzy lisping notes, second one lowest in pitch, similar in quality and delivery to that of *D. virens* but harsher and more buzzy. Type 2 songs more variable and complex, also slower and lower-pitched. Usual call a sharp, high "tsip" or "tchip"; flight call a thin, high-pitched "see", similar to that of others in superspecies.

Habitat. Breeding habitat very specialized, consisting of open, scrubby mixed woodland dominated by oaks (*Quercus*), but containing stands of mature Ashe juniper (*Juniperus ashei*); requires large stands of unmodified habitat. Winters in montane coniferous and pine–oak (*Pinus–Quercus*) forest, including cloudforest, also submontane tropical forest, usually above 1000 m; although also specialized, winter habitat is far less rigorous in requirements, but oak appears to be important as a foraging tree.

Food and Feeding. Feeds almost entirely on insects and other arthropods, especially caterpillars in breeding season, at least. Forages by gleaning and occasionally flycatching and hover-gleaning, mostly high in canopy, but also down to middle levels; shows preference for foraging in canopy of oaks in breeding season and in outer canopy of oaks in winter quarters. Frequently joins mixed-species foraging flocks on wintering grounds and also, after breeding, on summer grounds.

Breeding. Season Apr–Jul, egg-laying Apr–Jun. Nest a large cup made from strips of Ashe juniper bark mixed with spider webs, grasses and rootlets, lined with hair and feathers, placed 2–7 m up in fork of tree (usually Ashe juniper); strips of Ashe juniper bark appear to be an essential component of nest. Clutch 3–5 eggs, usually 4; incubation period 10–12 days; nestling period 9–12 days. Nests commonly parasitized by Brown-headed Cowbird (*Molothrus ater*); of 28 nests in one three-year study, 19 (68%) were parasitized, as were three (14%) out of 21 nests in another.

Movements. Medium-distance migrant, moving between breeding and wintering grounds principally along E slope of Sierra Madre Oriental, in E Mexico. Leaves breeding grounds early, mainly during Jul, arriving on wintering grounds from early Aug; spring migration also early, beginning Feb, with arrival on breeding grounds from mid-Mar, occasionally earlier. A few recent records in Costa Rica and Belize; old sight record from Caribbean (St Croix, in Virgin Is). Vagrant in Florida, also in Farallon Is, in California.

Status and Conservation. ENDANGERED. Restricted-range species: present in Edwards Plateau Secondary Area. Winter quarters mainly in North Central American Highlands EBA. Uncommon. Decreasing both in numbers and in extent of range. Numbers declined by an estimated 25% between 1962 and 1981, and in 1990 population put at 5000–16,000 individuals in 30,000–105,000 ha of suitable habitat; in 2004, total post-breeding population calculated as 21,000 individuals, with average density of 15 males/km² in c. 350 km² of occupied habitat. Estimates of breeding densities include average of 18·8 males/km² at Fort Hood in 1991–1996 and 6·3–29·1 territories/km² in Travis County in 1993–1997. So far as is known, this species has always been confined to C Texas as a breeding species, and has been further restricted by its very specialized breeding habitat, requiring mature Ashe juniper stands for nest-building. This habitat has been eroded from Edwards Plateau in recent years, mainly through clearing of woodlands for fence-post material, fuel, grazing land, reservoir construction and urbanization; there was a sudden loss of key habitat in anticipation of this species' Federal Endangered Listing in Dec 1990. Brood parasitism by Brown-headed Cowbirds is a serious problem, and nest predation by increased Blue Jay (*Cyanocitta cristata*) populations may prevent this species from sustaining itself in suitable habitat near recently developed suburban areas. Large stands of unmodified habitat important, as nest survival adversely affected by greater amounts of forest-edge habitat in breeding territories (which increases predation risk and brood parasitism by cowbirds); trapping of cowbirds has been carried out in some breeding areas. Problems on wintering grounds less well known, but clearance of forests for agriculture, firewood and mineral extraction known to have taken place. The recovery plan for this species, published in 1992, includes measures to protect enough breeding habitat for at least one viable population in each of the eight subregions of breeding range, allowance for potential gene flow between these populations, protection of sufficient habitat on non-breeding grounds, and protection of all breeding populations on public lands.

Bibliography. Anon. (1990, 1992a, 2009f), Arnold *et al.* (1996), Beardmore *et al.* (1996), Beatty (1943), Bolsinger (2000), Bolsinger & Hayden (1992, 1994), Braun *et al.* (1986), Butchart & Stattersfield (2004), Collar *et al.* (1992), Hayden & Tazik (1991), Howell & Webb (1992b, 1995), Jetté *et al.* (1998), Johnson, K.W. *et al.* (1988), Keddy-Hector (1993, 1995), Kroll (1980), Ladd & Gass (1999), Lewis *et al.* (1974), Lockwood (1996), Lyons (1990, 1994), Miller & Miller (1992), Peak (2007), Pulich (1976), Pulich *et al.* (1989), Rappole (1996), Rappole *et al.* (1999), Rising (1988), Sexton (1992), Stattersfield & Capper (2000), Stein (1962), Thompson (1995), Vidal *et al.* (1994), Wahl *et al.* (1990), Weinberg, Bolsinger & Hayden (1995), Weinberg, Jetté & Cornelius (1996), Woolfenden (1967).

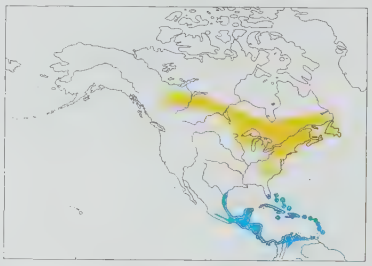
21. Black-throated Green Warbler

Dendroica virens

French: Paruline à gorge noire **German**: Grünwaldsänger **Spanish**: Reinita Dorsiverde

On following pages: 22. Townsend's Warbler (*Dendroica townsendi*); 23. Hermit Warbler (*Dendroica occidentalis*); 24. Blackburnian Warbler (*Dendroica fusca*); 25. Yellow-throated Warbler (*Dendroica dominica*); 26. Grace's Warbler (*Dendroica graciae*); 27. Adelaide's Warbler (*Dendroica adelaidae*); 28. Barbuda Warbler (*Dendroica subita*); 29. St Lucia Warbler (*Dendroica delicata*); 30. Olive-capped Warbler (*Dendroica pityophila*); 31. Pine Warbler (*Dendroica pinus*).

Taxonomy. *Motacilla virens* J. F. Gmelin, 1789, Philadelphia, Pennsylvania, USA.
Forms a superspecies with *D. chrysoparia*, *D. townsendi* and *D. occidentalis*, and *D. nigrescens* is closely related to this group. Probably the sister-species of *D. chrysoparia*; has occasionally been considered conspecific. Has hybridized with *D. townsendi*; hybrid involving *Mniotilta varia* and (probably) present species at Long Point (in Ontario) in 1990. Races weakly differentiated, and species often treated as monotypic. Two subspecies tentatively recognized.
Subspecies and Distribution.
D. v. virens (J. F. Gmelin, 1789) – breeds in S Canada (extreme E British Columbia E to Newfoundland and Nova Scotia) and S in NE USA to Wisconsin, S Michigan and New England, and in Appalachians to N Georgia and Alabama, with isolated population in C Arkansas; migrates to E Middle America and Caribbean, also locally Pacific slope of S Mexico, and in smaller numbers to S USA (S Texas, S Florida) and N Colombia and N Venezuela.
D. v. waynei Bangs, 1918 – breeds coastal E USA (extreme SE Virginia S to S South Carolina).



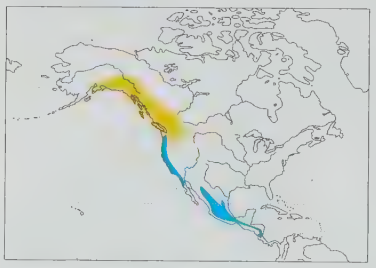
Descriptive notes. 13 cm; 7·4–11·3 g. Male nominate race has olive ear-coverts surrounded broadly by yellow, unstreaked olive-green crown, nape and upperparts; upperwing and tail greyer, greater and median upperwing-coverts broadly tipped white (two white wingbars), tail with extensive white in outer three or four feather pairs; throat and upper breast black (in fresh autumn plumage, feathers have narrow olive fringes), rest of underparts white, broad black streaks on flanks, vent washed yellowish; iris dark; bill and legs blackish. Female similar but duller, with throat mottled yellowish-white, less white in tail. Juvenile is olive-brown above, with white wingbars, paler on side of head and underparts, becoming whitish on belly and undertail-coverts, dusky streaks on breast and often extending to lower underparts; first-year duller than adult, first-winter female quite dull and with throat mostly whitish (dullest birds told from dull *D. chrysoparia* by more olive ear-coverts, from *D. occidentalis* by streaks on flanks and greener upperparts, from more similar first-winter *D. townsendi* by paler olive ear-coverts with yellowish centre and less yellow on breast). Race *waynei* is very like nominate, but on average slightly duller, with slightly smaller bill, and male has slightly less black on throat. Voice. Two song types. Type 1 song a series of 5–6 buzzy, drawn-out notes, with penultimate lower and the last one higher in pitch, can be transcribed as "zee zee zee zoo zee". Type 2 song more variable, but has similar overall quality, "zoo zee zoo zoo zee", third and fourth notes lower in pitch than others. Usual call a sharp, high-pitched "tchip", similar to that of *D. chrysoparia*; flight call a thin, high-pitched "see".
Habitat. Nominate race breeds in open coniferous forest, also mixed forest, especially where birch (*Betula*) and aspen (*Populus tremuloides*) present; may also use primarily deciduous forest at S edge of range, but prefers areas with dense conifer stands and some birch and aspen in boreal forests. To at least 1200 m in Appalachians. Race *waynei* restricted to lowland cypress (*Taxodium*) swamps. In winter, found in montane coniferous forest and lowland rainforest edges, usually at lower elevations than those preferred by *D. occidentalis* and *D. townsendi*, although regularly to 3000 m in elfin oak (*Quercus*) forest near tree-line in Costa Rica; also, less commonly, in secondary forest, and sometimes in scrub, hedges and field edges.
Food and Feeding. Feeds mainly on insects and other arthropods, especially caterpillars in breeding season, at least; takes some berries, especially poison ivy (*Toxicodendron radicans*), when on migration, and protein corpuscles of cecropia trees (*Cecropia*) in winter. Forages at all strata, but especially medium to high levels. Forages mainly by gleaning upper surface of leaves in small branches of trees; also hover-gleans from undersides of leaves, and flycatches. Frequently joins mixed-species foraging flocks in winter quarters, also on nesting grounds after breeding.
Breeding. Season May–Aug, egg-laying May–Jul. Nest a cup of grasses and shredded bark, lined with fine grasses, hair and feathers, placed 3–27 m up in conifer; one record of nest on ground, and three recent records of nest in tree cavity. Clutch 4–5 eggs, usually 4; incubation period 12 days; nestling period 8–10 days. Nests regularly parasitized by Brown-headed Cowbird (*Molothrus ater*), but likely that most occurrences involve pairs nesting near forest edges (parasitism of forest-interior breeders rare); apparently only 33 cases reported up to 1977, although in more recent study of 32 nests in Ontario 11 (34%) were parasitized.
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from late Aug, arriving on wintering grounds from early Oct; most move S through Mississippi Valley and cross Gulf of Mexico to Middle America, others follow Atlantic coast S and cross to Caribbean. Spring migration begins in late Mar, with arrival on breeding grounds from late Apr. Most of those wintering in Middle America follow Gulf coast, rather than crossing the Gulf itself. Precise wintering range of race *waynei* unknown, but this migrates earlier in spring, arriving on breeding grounds from late Mar. At least one record from Costa Rica in Jul. Regular migrant in Bermuda, especially in autumn, some overwintering in most years. Vagrant throughout most of W North America, mostly in autumn; also in Greenland, Iceland and Heligoland (Germany) in autumn, and in Ecuador in winter.
Status and Conservation. Not globally threatened. Common throughout range. Highest densities reported around L Superior and parts of NE USA; estimates range from 0·3–0·5 pairs/ha in primarily deciduous habitat in E Canada to 1·8–2 pairs/ha in favoured mature red spruce (*Picea rubens*) forest in Maine. Generally, populations thought currently to be stable. Numbers thought to have decreased during widespread use of pesticides such as DDT; also marked local decreases in association with use of fenitrothion in control of spruce budworm (*Choristoneura fumiferana*). Degradation of breeding habitat a local threat; although this species will use second growth, noticeable declines have been observed in relation to thinning of forest habitat, and has disappeared from areas thinned to 45% of original cover; fragmentation of habitat also causes local declines. Degradation of winter habitat possibly a local threat, but this species will utilize second growth and coffee plantations in winter range, provided that some tall native trees remain.
Bibliography. Bangs (1918), Brewster (1895), Collins (1983), Hill & Hagan (1991), Lewington *et al.* (1991), McCarthy (2006), Morse (1967b, 1968, 1969, 1976, 1991, 1993), Rabenold (1980), Rising (1988), Robichaud & Villard (1999), Rohwer (1994), Smith & Dallman (1996), Sprunt (1953), Stein (1962), Tozer (2008).

22. Townsend's Warbler

Dendroica townsendi

French: Paruline de Townsend **German**: Townsendwaldsänger **Spanish**: Reinita de Townsend

Taxonomy. *Sylvia townsendi* J. K. Townsend, 1837, forests of Columbia River = Fort Vancouver, Clarke County, Washington, USA.
Forms a superspecies with *D. chrysoparia*, *D. virens* and *D. occidentalis*, and *D. nigrescens* closely related to this group. Probably the sister-species of *D. occidentalis*; has occasionally been considered conspecific. Hybridizes frequently with latter species (producing fertile young); hybridization with *D. nigrescens*, *D. virens* and *D. coronata* recorded. Birds breeding in Queen Charlotte Is (and wintering in Oregon and California) are on average slightly shorter-winged than others, and this has been used as basis for dividing into two races; further study required. Monotypic.
Distribution. Breeds from S Alaska and NW Canada (S from Yukon Territory, E to S Alberta) S in USA to Oregon and Idaho. Migrates mainly to region from N Mexico S to Nicaragua, also in smaller numbers S to Panama; also to coastal W USA and NW Baja California (NW Mexico)



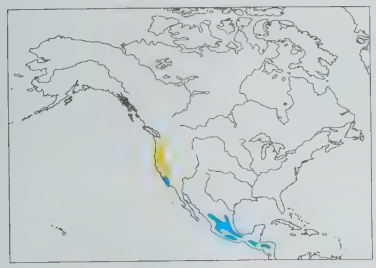
Descriptive notes. 13 cm; 7·3–10·7 g. Male has black ear-coverts broadly surrounded with yellow, yellow lower eye-crescent, black crown and black throat (giving distinctive head pattern); upperparts green, streaked black; upperwing greyer, greater and median upperwing-coverts broadly tipped white (two white wingbars), tail with extensive white in outer three rectrices; breast yellow, lower underparts white, bold black streaks on flanks; in fresh autumn plumage, black feathers have narrow olive fringes; iris dark; bill blackish; legs brownish to blackish. Female is similar to male but duller, with black replaced by greenish to dark olive, chin and most of throat yellow, slightly less white in tail. Juvenile has olive-brown crown, nape and upperparts, white wingbars, head pattern duller than adult, dusky ear-coverts surrounded by pale buff, dusky on throat and breast, becoming whitish on lower underparts, dusky streaks on flanks; first-year on average duller than adult, especially in autumn, first-winter female quite dull, with only indistinct streaking on breast side (told from dull *D. virens* by solid olive ear-coverts and yellow throat and breast). Voice. Two song types. Type 1 song rises in pitch and often drops at end, can be transcribed as "zwee zwee zwee zwee sweezit", similar to that of *D. virens* but more rasping in quality and also more variable. Type 2 song a series of short, fast buzzy notes followed by a few of the more typical rasping notes. Usual call a sharp, high "tchip", very similar to that of *D. virens* but perhaps slightly sharper and higher-pitched; flight call a thin, high "see".
Habitat. Breeds in mature, tall coniferous forest, especially where firs (*Abies*) dominate; associated especially with Douglas fir (*Pseudotsuga menziesii*) in S of range and with white spruce (*Picea glauca*) in Alaska. Prefers unlogged old-growth forest with 70% or more canopy cover, but occurs also in late-successional second growth; uncommon in logged forest. In winter mainly in highland coniferous and pine–oak (*Pinus–Quercus*) forests, but also in plantations and secondary forest; generally above 2000 m, but at lower elevations in S of wintering area and at much lower levels in coastal California, where also in live oaks, chaparral and parks.
Food and Feeding. Feeds almost exclusively on insects and other arthropods; takes some seeds and honeydew. Forages by gleaning and flycatching, mainly high in canopy in breeding season, but more often lower down in winter. In mountains of Jalisco, in Mexico, recorded as following swarms of army ants (Ecitoninae) to feed on invertebrates disturbed by these insects. Generally joins mixed-species foraging flocks, often with *D. occidentalis*, in winter and also on migration.
Breeding. Season May–Jul, egg-laying May–Jun. Nest a bulky, shallow cup of bark strips, twigs, grasses and lichens, lined with hair and feathers; few nests found have been 4–5 m up in fir tree, but most are probably placed much higher; nests sited higher in conifers may be more likely to escape parasitism by bird blowflies (Calliphoridae). Clutch 3–5 eggs; incubation period 11–14 days; nestling period 9–11 days. Nests only rarely parasitized by Brown-headed Cowbird (*Molothrus ater*), which is scarce in this species' closed-forest breeding habitat.
Movements. Short-distance to long-distance migrant, most moving through W mountains and along coast between breeding and wintering grounds. Those breeding in coastal British Columbia may winter mainly in California. Leaves breeding grounds from early Aug through Sept, arriving in winter quarters from late Sept; spring migration begins in Apr, with arrival on breeding grounds from early May. Vagrant in much of E North America in spring and autumn; also in Bermuda in autumn and in Colombia in winter.
Status and Conservation. Not globally threatened. Generally common throughout range. Breeding density higher in mature coniferous forests than in younger managed ones; one study in NE Oregon reported 2·7–4·4 pairs/10 ha in mature forest, compared with 0·1–0·5 pairs/10 ha in managed forest; in other studies, estimated densities of 4·8–8·1 pairs/10 ha in mature mixed forest and 9·8 pairs/10 ha in mature white spruce forest in Alaska. No recent population trends detected, but preferred breeding habitat of old-growth coniferous forest has declined in extent and abundance since 1940s and degradation of winter habitat has also occurred recently; this species has been identified as one of the long-distance migrants most likely to be adversely affected by alteration of tropical forests on its wintering grounds. Frequent hybridization with *D. occidentalis* (producing fertile young) in three narrow zones in area of range overlap in N Cascades and E Olympic Mts; these hybrid zones are gradually moving as present species replaces its congener, being more aggressive and better at defending territories and attracting mates than are *D. occidentalis* and hybrids, and also laying larger clutches on average.
Bibliography. Dobkin (1994), Greenberg, Caballero & Bichier (1993), Hejl & Woods (1991), Hejl *et al.* (1995), Hutto (1980), Jackson *et al.* (1992), Jaramillo (1995), Jewett (1944), Lehman (2005), Mactavish (1996), Mannan & Meslow (1984), Mannan *et al.* (1983), Matsuoka, Handel & Roby (1997), Matsuoka, Handel, Roby & Thomas (1997), McCarthy (2006), McNicholl (1980), Morrison (1983), Morrison & Hardy (1983a), Pearson & Manuwal (2000), Pearson & Rohwer (1998), Ratti (1984), Rising (1988), Rohwer (1994), Rohwer & Martin (2007), Rohwer & Wood (1998), Spindler & Kessel (1980), Stein (1962), Tramer & Kemp (1980), Wright *et al.* (1998).

23. Hermit Warbler

Dendroica occidentalis

French: Paruline à tête jaune **German**: Einsiedelwaldsänger **Spanish**: Reinita Cabecigualda

Taxonomy. *Sylvia occidentalis* J. K. Townsend, 1837, forests of Columbia River = Fort Vancouver, Clarke County, Washington, USA.
Forms a superspecies with *D. chrysoparia*, *D. virens* and *D. townsendi*, and *D. nigrescens* closely related to this group. Probably the sister-species of *D. townsendi*; has occasionally been considered conspecific. Hybridizes frequently with latter species (producing fertile young); has hybridized with *D. nigrescens*. Monotypic.
Distribution. Breeds in W USA from coastal mountains of S Washington S to C & S California (including Sierra Nevada). Migrates to non-breeding grounds mainly from N Mexico S to N Nicaragua, casually S to Costa Rica; also in smaller numbers to coastal S California.
Descriptive notes. 14 cm; 7·7–12·8 g. Male has head mostly yellow, with black throat and hindcrown–nape area; upperparts grey, streaked black, greater and median upperwing-coverts broadly tipped white (two white wingbars), tail with extensive white in outer three feather pairs; underparts white; in fresh autumn plumage, black throat feathers have narrow yellowish fringes; iris dark; bill and legs



blackish. Female is similar to male but duller, with ear-coverts faintly edged olive, throat mottled yellow, and slightly less white in tail. Juvenile has olive-brown head and upperparts, off-white wingbars, pale greyish olive-brown throat and breast, becoming whitish on lower underparts; first-year on average duller than adult, especially in autumn; first-winter female quite dull, with ear-coverts broadly edged olive, upperparts only faintly streaked, and throat yellowish with little or no black. VOICE. Two song types. Type 1 song variable (with distinct dialects), but usually consists of a series of "che" or "see" notes followed by descending "cheeo" and ending with rapid series of buzzy "ze" notes, final one higher in pitch. Type 2 song consists of 3–4 buzzy notes followed by a "zee-o-seet" phrase, rising and falling in pitch. Usual call a sharp, high-pitched "tchip", essentially identical to that of *D. virens*; flight call a thin, high-pitched "see".

Habitat. Breeds in mature, tall coniferous forest, especially where Douglas fir (*Pseudotsuga menziesii*) and spruces (*Picea*) dominate; not dependent on a well-established shrub layer, but does require dense canopy cover. In winter mainly in highland coniferous and pine–oak (*Pinus–Quercus*) forests, also cloudforest; mainly at 1500–3000 m, but at much lower levels in coastal California, where occurs also in live oaks and conifer plantations.

Food and Feeding. Feeds almost entirely on insects and other arthropods, mainly spiders (Araneae). Forages mainly by gleaning high in canopy, often hanging upside-down in outer branches to probe clumps of pine needles. Generally joins mixed-species foraging flocks, often with *D. townsendi*, in winter and on migration.

Breeding. Season May–Jul, egg-laying May–Jun. Nest a cup of woody plant fibres and pine needles, held together with spider webs, placed 1–42 m (usually 8–15 m) above ground in conifer (often a Douglas fir); one record of nest on ground. Clutch 3–5 eggs, usually 4; incubation 12 days; nestling period 8–10 days. Nests parasitized very rarely by Brown-headed Cowbird (*Molothrus ater*), which is scarce in closed forest; one record of cowbird chick being fed by pair of present species.

Movements. Migratory, most moving through W mountains between breeding and wintering grounds; some follow coast, especially on spring migration. Leaves breeding grounds early, mainly late Jul/early Aug, arriving on wintering grounds mainly from Sept, perhaps earlier in coastal California, though situation there complicated by through passage of migrants; spring migration begins in Mar, with arrival on breeding grounds from late Apr. Has occurred in N Baja California (extreme NW Mexico) in Jul. Vagrant in Alaska, C & E North America, Belize and Panama.

Status and Conservation. Not globally threatened. Fairly common throughout range. In coastal mountains of Oregon, densities of 69·6 birds/40 ha were recorded in young stands of Douglas fir, compared with 41·2/40 ha in mature stands and 48·3/40 ha in old-growth stands. Status not thought to have changed significantly in recent decades, although numbers may have declined by up to 40% since pre-settlement times, at least in NW California. Some studies suggest that this species is being outcompeted and replaced by *D. townsendi* in many parts of zone of distributional overlap between the two: frequent hybridization with latter species (producing fertile young) in three narrow zones in area of range overlap in N Cascades and E Olympic Mts; these hybrid zones are gradually moving as present species is replaced by *D. townsendi*, which is more aggressive and better at defending territories and attracting mates than are present species and hybrids.

Bibliography. Airola & Barrett (1985), Anon. (2008b), Carey *et al.* (1991), Chappell & Ringer (1983), Jackson *et al.* (1992), Janes & Ryker (2006), Jaramillo (1995), Jewett (1944), Jones, H.L. *et al.* (2000), Mactavish (1996), McCarthy (2006), Morrison (1982), Morrison & Hardy (1983a), Munson & Adams (1984), Pearson (1997), Pearson & Manuwal (2000), Pearson & Rohwer (1998), Raphael *et al.* (1988), Ratti (1984), Rising (1988), Rohwer & Martin (2007), Rohwer & Wood (1998), Rohwer *et al.* (2000), Stein (1962).

24. Blackburnian Warbler

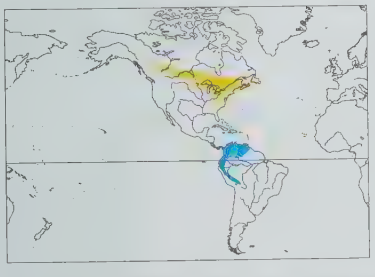
Dendroica fusca

French: Paruline à gorge orangée **German**: Fichtenwaldsänger **Spanish**: Reinita Gorjinaranja

Taxonomy. *Motacilla fusca* Statius Müller, 1776, Guyane = French Guiana.

Affinities within genus uncertain; some suggestions that closest relative may be *D. cerulea*, this based mainly on similarity of songs. Has hybridized with *D. castanea* and at least once with *Mniotilta varia*, also possibly with *D. pensylvanica* and possibly with *D. kirtlandii*. Monotypic.

Distribution. Breeds from S Canada (C Saskatchewan, locally from Alberta, E to S Newfoundland and Nova Scotia) S in NE USA to C Wisonsin and New England, and in Appalachians to extreme N Georgia. Migrates to Central America and NW South America, S in Andes to C Peru and, less commonly, C Bolivia.



Descriptive notes. 13 cm; 9·7 g. Male breeding has crown and ear-coverts black, orange lower eye-crescent, fiery orange forecrown patch, supercilium, neck side, throat and upper breast; upperparts black, white "tramlines" on mantle, broad white wing patch, extensive white in tail; underparts off-white, tinged orange on breast, with black streaks on flanks; iris dark; bill grey to blackish; legs dull brownish to blackish. Non-breeding male is duller, with orange colour less intense, black areas mottled brownish, has less white in wing (white forming two broad wingbars on greater and median upperwing-coverts). Breeding female is similar to non-breeding male but duller, with head and upperparts slightly paler, olive-brown, streaked black; non-breeding female slightly duller still. Juvenile has dark olive-brown head and upperparts, broad buff supercilium behind eye, buff streaks (including "tramlines") on upperparts, whitish wingbars, buff below, paler on belly and undertail-coverts, with olive-brown mottling on throat, breast, flanks and belly, and with bill and legs pinkish-buff; first-year duller than adult, especially in autumn/winter; first-winter female quite dull, with orange areas on head and underparts replaced by pale peachy buff, and flank streaks olive and relatively indistinct (first-year female can resemble equivalent-plumaged *D. cerulea*, but is more buff and less yellow below, with more orange-buff supercilium curving right around rear of ear-coverts). VOICE. Two song types. Type 1 song a series of thin, very high-pitched, whistled "swee" notes, rising slightly in pitch and ending with terminal flourish on even higher pitch. Type 2 song similar in overall quality, but highest-pitched notes usually in middle of song. Usual call a sharp, very high-pitched "tsip" or "chip"; flight call a thin, buzzy "seet".

Habitat. Breeds in mature coniferous and mixed forests, especially where hemlocks (*Tsuga*) dominate; also sometimes in advanced second growth. In S Appalachians occurs more in largely or completely deciduous forests. In winter mainly in humid submontane and montane forests, also cloudforest, coffee plantations and advanced second growth, at 500–3000 m.

Food and Feeding. Feeds mainly on insects and other arthropods; occasionally takes berries in winter. Forages mainly by gleaning in canopy, also sometimes flycatches and hover-gleans; has been seen to take insects from surface of frozen lakes in spring in Canada. Sometimes joins mixed-species foraging flocks in winter and perhaps more so on migration in South America, as well as after breeding in N.

Breeding. Season May–Jul. Nest a cup of small twigs, grass and plant down or *Usnea* lichen, lined with rootlets, hair and fine grass, placed 0·7–28 m up on horizontal branch in conifer. Clutch 4–5 eggs, usually 4; incubation period 11–13 days; no information on nestling period. Nests rarely parasitized by Brown-headed Cowbird (*Molothrus ater*), probably owing to mature forest breeding habitat, where cowbirds scarce; on Maine coast (extreme NE USA) all records of such parasitism involved nests on edges of spruce (*Picea*) forest.

Movements. Long-distance migrant. Leaves breeding grounds mostly during Aug, moving S chiefly through Mississippi Valley and Appalachians to Gulf of Mexico coast, then either following Gulf coast or flying across it, and through E Central America to arrive on wintering grounds from late Sept; a few may reach South America via Caribbean. Spring migration begins early Apr and is basically along same route but in reverse direction, although most cross the Gulf; arrival on breeding grounds from mid-May. Casual in Bermuda in autumn. Vagrant in much of W North America, N to British Columbia, mainly in autumn; also in Greenland, Iceland and Britain in autumn, and Trinidad, Suriname and E Brazil in winter.

Status and Conservation. Not globally threatened. Fairly common throughout range. Breeding densities vary with habitat, with 0·7–1·1 pairs/ha in mature red spruce (*Picea rubens*) and white spruce (*Picea glauca*) forests in Maine, but only 0·4–0·6 pairs/ha in young growth of these forest types. In primary deciduous forest in New Hampshire (NE USA) density variable, 0·2–0·7 pairs/ha. Population thought to be stable overall.

Bibliography. Bain (1996), Brooks (1940), Chipley (1980), Doepker *et al.* (1992), Hilty (1980), Hurley & Jones (1983), Latta & Parkes (2001), Lawrence (1953b), Lehman (1987), Lewington *et al.* (1991), McCarthy (2006), McNicholl & Goossen (1980), Morse (1967b, 1968, 1976, 1994), Nice (1932), Parkes (1983), Whitney (1994).

25. Yellow-throated Warbler

Dendroica dominica

French: Paruline à gorge jaune **German**: Goldkehl-Waldsänger **Spanish**: Reinita Gorjiamarilla
Other common names: Sutton's Warbler (hybrid with *Parula americana*)

Taxonomy. *Motacilla dominica* Linnaeus, 1766, Santo Domingo, Dominican Republic.

Forms a superspecies with *D. graciae*, *D. adelaidae*, *D. subita* and *D. delicata*. Isolated race *flavescens* quite distinctive, and some authors have suggested that it may merit full species rank. In contrast, some recent work has suggested that the three mainland races are so weakly differentiated, with variation primarily clinal, that they should be combined as one. Proposed race *axantha* (described from Ohio) considered inseparable from *albilora*. Hybridization with *Parula americana* recorded. Four subspecies provisionally recognized.

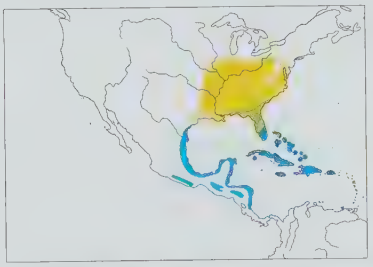
Subspecies and Distribution.

D. d. albilora S. F. Baird, 1873 – breeds EC USA from E Iowa, SE Kansas and C Texas E to Appalachians; migrates to Middle America (mainly E Mexico S to Nicaragua, casually Costa Rica).

D. d. dominica (Linnaeus, 1766) – breeds E of Appalachians from Pennsylvania S to C Florida; winters in SE USA (South Carolina S to Florida) and Caribbean (mainly Bahamas and Greater Antilles).

D. d. stoddardi Sutton, 1951 – NW Florida and coastal Alabama.

D. d. flavescens Todd, 1909 – N Bahama Is (Grand Bahama and Great Abaco).



Descriptive notes. 14 cm; 8·8–10·8 g. Well-patterned parulid with noticeably long bill. Male nominate race has black face and forecrown, white supercilium, lower eye-crescent and neck side, yellow supraloral stripe (usually) and yellow throat to breast; rear crown to nape and upperparts grey, streaked black on rear crown, upperparts may have very faint brownish tinge in fresh autumn plumage; greater and median upperwing-coverts broadly tipped white (two white wingbars), extensive white in outer four rectrices; lower underparts white, black streaks on flanks (extending down from black face patch); iris dark; bill blackish; legs dull purplish-brown to blackish-grey. Distinguished from others in superspecies e.g. *D. graciae*, by striking black-and-white pattern on side of head. Female is slightly duller than male, forecrown usually grey, streaked black, tail on average less white. Juvenile has greyish olive-brown head and upperparts, darker streaks on mantle, buffy-white wingbars, buffy white below, olive-brown mottling on throat and upper breast, bill and legs flesh-coloured; first-year on average slightly duller than adult, first-winter female can be quite dull and have upperparts washed brownish and throat pale yellow. Race *albilora* always has white supraloral stripe, and bill on average shorter than that of nominate; *stoddardi* resembles nominate in plumage, but has longer, more slender bill; *flavescens* is more distinctive, with yellow on throat paler than in other races and extending to vent, upperparts duller grey, and white neck patch smaller and less distinct. VOICE. Song a series of loud, clear whistled notes descending in pitch and ending with flourish, its ringing quality and pattern reminiscent of *Seiurus motacilla* song. A second song occasionally reported, more musical and consisting of 4 notes on even pitch, then a series of 3 descending notes and ending with one on higher pitch; not clear whether this corresponds to a Type 2 song. Usual call a loud, sweet "chip"; flight call a loud, clear, high-pitched "see".

Habitat. Nominate race and *stoddardi* breed primarily in live oak (*Quercus*) woodlands and cypress (*Taxodium*) swamps, especially where Spanish moss (*Tillandsia usneoides*) abundant; also in mixed woodland of pine (*Pinus*) and deciduous trees, but close association with Spanish moss remains, and in lowland South Carolina absent from woodlands where this does not occur. Race *albilora* breeds mainly in bottomland sycamore (*Platanus*) forests, especially along streams and creeks, also in cypress swamps, and occasionally in mixed pine–deciduous forest or pure coniferous forest. Race *flavescens* inhabits pine woodlands. Resident races and migrants wintering in North America favour breeding-type habitat in non-breeding season, but elsewhere winters in wider variety of habitats, including open woodland, second growth and gardens with tall trees.

Food and Feeding. Feeds mainly on insects and other arthropods, especially lepidopteran larvae, flies (Diptera) and scale insects (Coccoidea). In Bahamas, and elsewhere on wintering grounds,

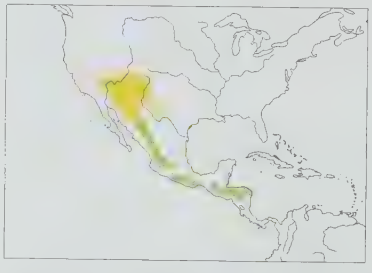
both residents and winter visitors regularly visit flowering century plant (*Agave braceana*) and coconut palms (*Cocos nucifera*) to feed on insects attracted to these plants; in Yucatán Peninsula, regularly feeds on flies attracted to drying copra. Visits feeders in North America in non-breeding season. Forages mainly high in canopy, creeping along main branches and using its long bill to probe bark crevices, pine cones, and clumps of pine needles and Spanish moss. Sometimes flycatches, often switching from probing to flycatching as temperature rises during morning. Single individuals may join mixed-species foraging flocks in winter.
Breeding. Season Apr–Aug, egg-laying Apr–Jul; usually double-brooded in SE USA. Nest a cup of grasses, bark strips and weed stems, lined with plant down and feathers, placed 3–40 m up and concealed in clump of Spanish moss in live oak or among pine needles in pine tree (nominate race) or on horizontal limb of sycamore (race *albilora*). Clutch 3–5 eggs, usually 4; incubation period 12–13 days; very few data on nestling period, but at one West Virginia nest young left 10 days after apparent hatching day. Nests parasitized only infrequently by Brown-headed Cowbird (*Molothrus ater*), this due mainly to scarcity of cowbird in present species' forest habitat.
Movements. Resident and medium-distance migrant. Races *stoddardi* and *flavescens* sedentary, as are those populations of the two other races in far S of respective breeding ranges. More N breeders of *albilora* and N-breeding nominate populations migratory. Many leave breeding grounds early, from Jul, although others linger much later; *albilora* migrants move S through Mississippi Valley, then either cross Gulf of Mexico to Yucatán or follow Gulf coast to reach wintering grounds, and nominate populations move S along Atlantic lowlands and coast to Florida and across to Caribbean; early migrants reach wintering grounds from late Jul. Spring migration, basically along same route but in reverse direction, begins early, with arrival on breeding grounds from early Apr. Common migrant in Bermuda, some overwintering in most years. Vagrant in W North America (mainly California), N of breeding range (mainly in Ontario in spring), and in Panama and Colombia.
Status and Conservation. Not globally threatened. Generally fairly common to common throughout range; *stoddardi* rare in NW Florida, and federally listed as a special-status taxon. Range currently expanding in N. Density estimates in various habitats in Okefenokee Swamp (Georgia) include 6 males/km² in slash pine (*Pinus elliottii*) 45–60 years old, 19 males/km² in 80-year-old longleaf pine (*Pinus palustris*), 17 males/km² in mixed shallow-water swamp, 39 males/km² in mixed deep-water swamp, 23 males/km² in shallow-water cypress swamp, and 44 males/km² in deep-water cypress swamp. Elsewhere, estimated densities include 75 males/km² in mature pine–oak stands in Great Smoky Mountains National Park (Tennessee–North Carolina), 71 males/km² in "immature" loblolly pine (*Pinus echinata*)–shortleaf pine (*Pinus taeda*) stand in Maryland, 26 males/km² in second-growth river swamp in Maryland, and 14 males/km² on Grand Bahama. Shiny Cowbird (*Molothrus bonariensis*) has recently entered SE part of breeding range of Bahama race *flavescens*, and could represent a possible threat in the future.
Bibliography. Amos (1991), Browning (1978), Brudenell-Bruce (1988), Carlson (1981), Cockrum (1952), Emlen (1971, 1973), Ficken *et al.* (1968), Friedmann & Kiff (1985), Gaddis (1980), Hall (1996), Haller (1940), Jaramillo (1993), Kendeigh & Fawver (1981), Lack (1976), McKay (2007, 2008), Meyers & Odum (1991), Morse (1974), Olson (2010), Parkes (1953), Paynter (1955), Potter *et al.* (1980), Russak (1955), Stevenson (1957), Stevenson & Anderson (1994), Strewe & Navarro (2004a), Ulrich & Ulrich (1981).

26. Grace's Warbler

Dendroica graciae

French: Paruline de Grace **German**: Arizonawaldsänger **Spanish**: Reinita de Grace

Taxonomy. *Dendroica graciae* S. F. Baird, 1865, Fort Whipple, near Prescott, Arizona, USA.
Forms a superspecies with *D. dominica*, *D. adelaidae*, *D. subita* and *D. delicata*. In the past, it was suggested that present species might be conspecific with the last three of these, but it shows constant plumage differences. One record of hybridization with *Dendroica coronata* (of race *auduboni*). Geographical variation mostly clinal. Four subspecies recognized.
Subspecies and Distribution.
D. g. graciae S. F. Baird, 1865 – breeds SW USA and NW Mexico; winters mainly in W & C Mexico.
D. g. yaegeri A. R. Phillips & Webster, 1961 – E slope of Sierra Madre Occidental (from S Sinaloa and Durango S to W Jalisco), in W Mexico; in winter S to Michoacán.
D. g. remota Griscom, 1935 – highlands from S Mexico (Michoacán) S to W Nicaragua.
D. g. decora Ridgway, 1873 – lowlands in Belize, E Honduras and Nicaragua.



Descriptive notes. 13 cm; 7·5–9·1 g. Male nominate race has grey crown, laterally edged black, broad yellow supercilium becoming white behind eye, yellow lower eye-crescent, throat and breast; rest of head and upperparts grey, streaked black on crown and mantle (upperparts may have faint brownish wash in fresh autumn plumage); greater and median upperwing-coverts tipped white (two white wingbars), tail with extensive white in outer two rectrices; lower underparts white, streaked black on flanks; iris dark; bill blackish; legs blackish-brown. Female is like male, but slightly duller. Juvenile has greyish olive-brown head and upperparts, darker streaks on mantle, buffy-white wingbars, buffy white below, olive-brown mottling on throat and upper breast, bill and legs flesh-coloured; first-year on average slightly duller than adult, first-winter female may be quite dull with upperparts washed brownish, throat and supraloral pale yellow and flank streaks relatively indistinct. Races vary mainly in brightness and size, nominate race dullest and longest-winged: *yaegeri* is slightly brighter and less heavily streaked above than nominate, also more orange-tinged on throat and breast; *remota* is more bluish-grey above and more orange on throat than previous, upperparts heavily streaked, lower underparts whiter; *decora* is brightest, blue-grey above, upperparts only lightly streaked, deep orange-yellow throat and breast sharply demarcated from white of lower underparts. Voice. Song a series of downslurred whistled notes, given rapidly, and accelerating and rising in pitch towards end; each individual can give several variations on this theme, but not clear whether these correspond to Type 1 and Type 2 songs. Usual call a soft, sweet "chip", perhaps slightly softer than that of *D. dominica*; flight call a very thin, high-pitched "sip".
Habitat. In N & C parts of range breeds in pine and pine–oak (*Pinus–Quercus*) forests, especially where ponderosa pines (*Pinus ponderosa*) dominate, mainly at 2000–2500 m; winters also in highland pine–oak forests. Pine appears to be an essential component of breeding habitat of nominate race, although fir (*Abies*) forests sometimes used at edge of range. In S Mexico (S Guerrero) occurs also in submontane *Cecropia* and *Inga* forests with scattering of pine, down to 800 m. S race *decora* occurs in lowland pine ridges and pine savanna.
Food and Feeding. Feeds predominantly on insects and other arthropods. Forages mainly high in canopy, gleaning from leaves and twigs and probing terminal clumps of pine needles; also flycatches. In N of range, at least, forages principally in pine trees. Single individuals or pairs often join mixed-species foraging flocks in winter.
Breeding. Season May–Jul, egg-laying May–Jun. Nest a compact, rather flat cup of oak catkins, grass and spider webs, lined with hair, rootlets, fine grass and feathers, placed 7–20 m up in pine tree, usually in terminal clump of pine needles. Clutch 3–4 eggs, usually 3; incubation period estimated at least 10–12 days; no data on nestling period. Nests regularly parasitized by Brown-headed Cowbird (*Molothrus ater*) in SW USA and N Mexico; in Los Alamos County (New Mexico) apparently the most heavily parasitized bird species, accounting for 38% of cowbird-parasitized nests.
Movements. Resident and medium-distance migrant. S races sedentary, although some *remota* may move to lower elevations in winter. Race *yaegeri* partially migratory: some sedentary, others short-distance migrants moving S as far as Michoacán in winter. Nominate race a medium-distance migrant, leaving breeding grounds from Aug, some lingering to late Sept (occasional records to late Oct), returning to breeding grounds from early Apr (exceptionally from late Mar). Vagrant in USA in California, E Texas (E of breeding range) and Illinois.
Status and Conservation. Not globally threatened. Fairly common throughout most of range. Density estimates include 2·25 pairs/km of transect in S Arizona and N Mexico, 20 pairs/40 ha in pine forest and 3 pairs/40 ha in pine–oak–juniper (*Pinus–Quercus–Juniperus*) woodland in SE Arizona, 10–30 pairs/40 ha in N Arizona, and 10 pairs/40 ha in lowland pine savanna in Nicaragua.
Bibliography. Anon. (2002), Balda (1969), Binford (1989), Howell, S.N.G. & Webb (1995), Howell, T.R. (1972), Levad (1998), Maurer (1983), McCarthy (2006), Nocedal (1994b), Phillips & Webster (1961), Staicer (1989), Staicer & Guzy (2002), Webster (1961).

27. Adelaide's Warbler

Dendroica adelaidae

French: Paruline d'Adélaïde **German**: Antillenwaldsänger **Spanish**: Reinita Puertorriqueña

Taxonomy. *Dendroica adelaidae* S. F. Baird, 1865, Puerto Rico.
Forms a superspecies with *D. dominica*, *D. graciae*, *D. subita* and *D. delicata*. Formerly considered conspecific with last two, but the three have recently been shown to have a level of genetic differentiation similar to that of some continental American species. Monotypic.
Distribution. Puerto Rico and Vieques I.



Descriptive notes. 12–13·5 cm; 5·3–10 g. Crown grey, forecrown laterally edged black, short yellow supercilium becoming white behind eye, black lores, broken yellow eyering often becoming white at rear; rest of head and upperparts grey, upperwing darker, broad white tips on greater and median upperwing-coverts (two white wingbars); extensive white in outer three rectrices; throat and underparts yellow, becoming white on lower belly and undertail-coverts; iris dark; bill blackish, cutting edges often pale; legs olive to greyish or brownish. Sexes similar, male on average brighter than female. Juvenile has brownish-grey head and upperparts, browner on mantle, buffy-white wingbars, yellow areas of adult plumage pale yellowish-white, becoming whiter on lower underparts and with dusky spotting on side of breast; first-year similar to adult, first-year female dullest and often with black on head lacking and upperparts washed olive. Voice. Two song types. Type 1 song a variable trill, often ascending or descending in pitch, and Type 2 song typically slightly more complex and lower in pitch. Usual call described as "chick".
Habitat. Lowland dry scrub forest and forest edge; replaced, with some overlap, in humid montane forest by *D. angelae*.
Food and Feeding. Feeds mainly on insects and other arthropods. Forages by gleaning, mainly high in canopy. Pairs apparently remain together on territory throughout year.
Breeding. Eggs laid in Mar–Jul and nestlings observed in mid-May. Nest a cup placed 1–2·5 m up in shrub or tree; clutch 2–3 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Puerto Rico and the Virgin Islands EBA. Not uncommon. Population thought to number more than 10,000 individuals, but has not been quantified.
Bibliography. Anon. (2000), Cruz & Delannoy (1984a), Evans (1990), Keith (1997), Lovette *et al.* (1998), Pashley & Hamilton (1990), Raffaele *et al.* (1998), Staicer (1996a,1996b), Stattersfield *et al.* (1998).

28. Barbuda Warbler

Dendroica subita

French: Paruline de Barbuda **German**: Barbudawaldsänger **Spanish**: Reinita de Barbuda

Taxonomy. *Dendroica subita* Riley, 1904, Barbuda.
Forms a superspecies with *D. dominica*, *D. graciae*, *D. adelaidae* and *D. delicata*. Formerly considered conspecific with last two, but the three have recently been shown to have a level of genetic differentiation similar to that of some continental American species. Monotypic.
Distribution. Barbuda, in N Lesser Antilles.



Descriptive notes. 12–13·5 cm; 5·3–8 g. Has crown, nape, neck side and upperparts grey, tinged brown, short yellow supercilium barely reaching beyond eye and slightly paler over eye, lores dusky, broad yellow crescent below eye; upperwing slightly darker than upperparts, greater and median coverts tipped off-white (two pale wingbars), extensive white in outer three rectrices; yellow below, becoming white on lower belly and undertail-coverts; iris dark; bill blackish; legs dark greyish-flesh. Differs from *D. adelaidae* in duller general appearance, with brownish-grey upperparts and slightly duller yellow underparts, lack of black border above supercilium. Sexes similar. Juvenile apparently undescribed, presumably similar to juvenile of *D. adelaidae*. Voice. Little information. Song similar to that of *D. adelaidae*, but more musical. Call presumably similar to that of *D. adelaidae*.

Habitat. Lowland dry shrubby forest, forest edge and scrub.
Food and Feeding. No information.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Lesser Antilles EBA. Fairly common in W Barbuda, but considerably less common in E. Present global population estimated at 1000–2500 individuals. In one study, 12–15 birds found in 5 ha of dry deciduous scrub. Population thought to have decreased, but no evidence that it is currently declining. Very small population and range mean that species is susceptible to stochastic events, and any loss or degradation of its habitat would have potentially serious adverse impact. Main threat is loss of dry forest and scrub to development and unmanaged grazing.
Bibliography. Anon. (2000, 2009f), Butchart & Stattersfield (2004), Cruz & Delannoy (1984b), Evans (1990), Keith (1997), Lovette *et al.* (1998), Pashley & Hamilton (1990), Raffaele *et al.* (1998), Staicer (1996a, 1996b), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

29. St Lucia Warbler

Dendroica delicata

French: Paruline de Sainte-Lucie **German**: Luciawaldsänger **Spanish**: Reinita de Santa Lucía

Taxonomy. *Dendroica delicata* Ridgway, 1883, St Lucia.
Forms a superspecies with *D. dominica*, *D. graciae*, *D. adelaidae* and *D. subita*. Formerly considered conspecific with last two, but the three have recently been shown to have a level of genetic differentiation similar to that of some continental American species. Monotypic.
Distribution. St Lucia, in C Lesser Antilles.



Descriptive notes. 13·5 cm; 5·3–8·2 g. Has forecrown, short, narrow lateral crownstripe and lores black, short, broad supercilium and spot below eye bright yellow; rest of head and upperparts clean bluish-grey, upperwing darker, white tips on greater and median upperwing-coverts (two white wingbars), extensive white in outer three rectrices; throat and underparts bright yellow, becoming white on lower belly and undertail-coverts; iris dark; bill blackish; legs dark greyish-flesh. Differs from *D. adelaidae* in having brighter plumage, with bluer upperparts, brighter yellow underparts and pure yellow on face. Sexes similar. Juvenile apparently undescribed, presumably similar to juvenile of *D. adelaidae*. Voice. Little information. Song similar to that of *D. adelaidae*, but more musical. Call presumably similar to that of *D. adelaidae*.
Habitat. Montane rainforest.
Food and Feeding. Feeds mainly on insects and other arthropods. Forages by gleaning; mainly at lower levels than those preferred by *D. adelaidae*, and often in undergrowth. Pair-members apparently remain together on territory throughout year.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Lesser Antilles EBA. Moderately common, but with noticeable population fluctuations during the last century. Population thought to number more than 10,000 individuals, but has not been quantified.
Bibliography. Anon. (2000), Cruz & Delannoy (1984b), Evans (1990), Keith (1997), Lovette *et al.* (1998), Pashley & Hamilton (1990), Raffaele *et al.* (1998), Staicer (1996a, 1996b), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

30. Olive-capped Warbler

Dendroica pityophila

French: Paruline à calotte verte **German**: Kubawaldsänger **Spanish**: Reinita Coroniverde

Taxonomy. *Sylvia pityophila* Gundlach, 1855, Cuba.
Closely related to the *D. dominica* superspecies group, but generally not included within it as it is sympatric with *D. dominica* in Bahama Is. One study of mitochondrial DNA indicated that this species and *D. pinus* may be sister-taxa. Birds from Bahamas described as a geographical race, *bahamensis*, on basis of longer tail and other differences in morphology, and tend also to be darker, more plumbeous grey on upperparts, yellower on forecrown, less heavily marked with black around yellow throat and breast, and greyer on flanks; possibly worthy of recognition, but further study required; recent study found relatively little genetic variation among populations. Treated as monotypic.
Distribution. N Bahama Is (Grand Bahama, Little Abaco and Great Abaco) and W & E Cuba (Pinar del Río; Holguín, Santiago de Cuba and Guantánamo).



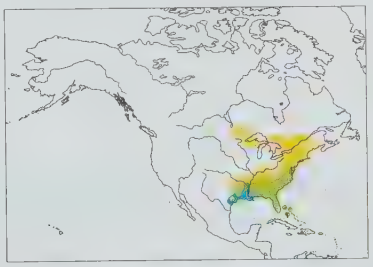
Descriptive notes. 13 cm; 7·2–8·7 g. Most of crown yellowish-olive, narrow yellow supraloral line joins to upper part of eyering, rest of upperparts slate-grey to plumbeous; white tips on greater and median upperwing-coverts (two white wingbars), white in outer two rectrices; throat and breast yellow, irregularly bordered with blotchy black streaks, lower underparts whitish, flanks with brownish-olive to greyish tinge; iris dark; bill blackish; legs blackish-brown. Sexes similar, male on average brighter than female. Juvenile has brownish head and upperparts, indistinct whitish wingbars, paler underparts; first-year, especially female, often duller than adult. Voice. Song a variable series of rather shrill whistled notes, usually 7–9 in number (Cuba, at least), descending in pitch and delivered fairly slowly, has been transcribed as "wisi-wisi-wisi-wiseu-wiseu" and is somewhat reminiscent of a slow *D. petechia* song; not clear whether individual variations correspond to Type 1 and Type 2 songs. Call "tsip-tsip-tsip", repeated frequently.
Habitat. Open pine (*Pinus*) forests and pine barrens; in highlands in Cuba.
Food and Feeding. Little information. Probably feeds mainly on insects and other arthropods; in Bahamas regularly visits flowering heads of century plants (*Agave braceana*), either for nectar or for the insects attracted to the plants.
Breeding. Season Mar–Jun. Nest a cup with some feathers in lining, placed 2–15 m up in pine tree, usually close to trunk; clutch 2 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cuba EBA and Bahamas EBA. No population estimates available; described as fairly common to common within its limited range.
Bibliography. Emlen (1973), Garrido (2000a), Garrido & Kirkconnell (2000), Lovette *et al.* (1998), Raffaele *et al.* (1998), Stattersfield *et al.* (1998).

31. Pine Warbler

Dendroica pinus

French: Paruline des pins **German**: Kiefernwaldsänger **Spanish**: Reinita del Pinar

Taxonomy. *Certhia pinus* Linnaeus, 1766, Charleston, South Carolina, USA.
Affinities within genus uncertain. One study of mitochondrial DNA indicated that this species and *D. pityophila* may be sister-taxa, while another suggests that *D. palmarum* may be the sister of present species. Has hybridized with nominate race of *D. coronata*. Some confusion regarding species name (see page 675). Four subspecies recognized.
Subspecies and Distribution.
D. p. pinus (Linnaeus, 1766) – breeds SE Canada (from extreme SE Manitoba E to S Quebec and S New Brunswick) and E USA (E from Minnesota, Missouri and E Texas, excluding prairie regions of Midwest); winters in S part of breeding range and S to S Florida.
D. p. florida (Maynard, 1906) – S Florida.
D. p. achrustera Bangs, 1900 – NW Bahamas (Grand Bahama, Abaco, New Providence and Andros).
D. p. chrysoleuca Griscom, 1923 – Hispaniola.



Descriptive notes. 14 cm; 7–17 g. Male nominate race is olive-green on head and upperparts (upperparts faintly washed brownish in fresh autumn plumage), with yellow supraloral and upper and lower eye-crescents; upperwing and tail grey, white tips on greater and median coverts (two white wingbars), tail with extensive white in outer two rectrices; yellow below, becoming white on belly and undertail-coverts, with dusky streaks on side of breast; iris dark; bill mostly blackish; legs dull brown to blackish. Female similar in pattern but duller, head and upperparts grey-green, throat and breast pale greenish-yellow, streaking on breast sides indistinct, has on average less white in tail. Juvenile very drab, with grey-brown head and upperparts, washed greyer on nape, buff-washed wingbars, and pale buffish-white underparts with faint olive mottling on breast; first-year duller than adult, especially in autumn/winter; first-winter female typically very drab, resembles juvenile but without mottling on breast. Race *florida* has slightly paler and yellower upperparts than nominate, also brighter underparts with less distinct streaking, and slightly longer bill; *achrustera* is like nominate, but on average slightly duller; *chrysoleuca* is brightest race, female in particular being noticeably brighter than nominate female. Voice. Unusually for a temperate-region parulid, sings throughout year. Song a rapid, musical trill on even pitch; two variations described, a faster trill and a slower one with more inflected notes, but not clear whether these correspond to Type 1 and Type 2 songs. Usual call a sweet, sharp "chip"; flight call a slightly buzzy "zeet".
Habitat. Breeds almost exclusively in pine (*Pinus*) forests, usually in lowlands, especially where relatively sparse understorey. Loblolly pine (*Pinus echinata*), longleaf pine (*Pinus palustris*) and shortleaf pine (*Pinus taeda*) preferred in S of range, where commonly occurs in open pine savanna with mature trees. Red pine (*Pinus resinosa*), white pine (*Pinus strobus*), jack pine (*Pinus banksiana*) and pitch pine (*Pinus rigida*) preferred in N, where may occur also in mixed pine–deciduous forest. Pitch pines favoured on coast from New England S to New Jersey. In winter and on migration still shows strong preference for pines, but found also in mixed and deciduous forests, cypress (*Taxodium*) swamps and thickets. Hispaniolan race (*chrysoleuca*) occurs in high-elevation West Indian pine (*Pinus occidentalis*) forest with broadleaf shrub understorey, and in Bahamas *achrustera* occurs in Caribbean pine (*Pinus caribea*) forest with low broadleaf shrub understorey.
Food and Feeding. Feeds mainly on insects and other arthropods; also takes pine seeds, fruit and berries in winter. Recorded as ingesting grit, possibly as an aid to digestion. Forages at all levels, including ground. Typically creeps along trunks and branches, probing bark crevices and pine cones; also flycatches, and hangs upside-down to investigate clumps of pine needles. Frequently visits feeders in winter. Groups often join mixed-species foraging flocks in winter.
Breeding. Season Mar–Jul, egg-laying Apr–Jun (exceptionally Mar and Jul); extended nesting season suggests possibility of two or even three broods, but as yet no evidence for this. Nest a cup of weed stalks, bark shreds and pine needles, lined with hair, feathers and pine needles, placed 3 m or more up in pine tree. Clutch 3–5 eggs, usually 4; estimated incubation period 10 days or 12–13 days; estimated nestling period 10 days. Nests infrequently parasitized by Brown-headed Cowbird (*Molothrus ater*); of eight nests in a S Ontario (Canada) study, four were parasitized.
Movements. Resident and short-distance migrant. N breeders of nominate race move S to SE USA in winter; moves S from late Aug, but mainly during Sept and Oct, arriving back on breeding grounds from late Feb/Mar (Missouri) and late Apr (S Quebec). Casual in North Dakota and South Dakota on migration, and in NE Mexico, Bermuda and Cuba in winter. Vagrant to N & W North America, Greenland, S Mexico, Cuba, Costa Rica and Colombia.
Status and Conservation. Not globally threatened. Generally common and increasing throughout most of range; prone to population declines following particularly hard winters. Estimated breeding densities of nominate race include 40 pairs/km² in 25-year-old pine forest, ranging up to 136 pairs/km² in 100-year-old forest (in piedmont region of Georgia); mean of 27·7 pairs/km² in loblolly–shortleaf pine–hardwood forest in Okefenokee Swamp (Georgia); 20 territorial males/km² in pine–hardwood sapling stands and mature pine hardwood, ranging up to 55 males/km² in pine pole stands, in Texas; and up to 254 birds/km² in pine–hardwood forests where management for Red-cockaded Woodpecker (*Picoides borealis*) in form of thinning of midstorey by burning was carried out. Race *chryoleuca* may be threatened on Haiti owing to destruction of highland pine forest, but still common where such habitat persists; more widespread in Dominican Republic, with mean of 226 birds/km² estimated in Cordillera Central and 316 birds/km² in Sierra de Bahoruco. Race *achrustera* considered abundant on Abaco I, where estimated winter density c. 104 birds/km², and on Grand Bahama.
Bibliography. Dickson & Segelquist (1979), Emlen & DeJong (1981), Ficken *et al.* (1968), González-García (1993), Hough (1996), Hubbard (1977), James *et al.* (1990), Johnston & Odum (1956), Latta & Sondreal (1999), Latta & Wunderle (1996), Lee (1996), McCarthy (2006), Meyers & Odum (1991), Morse (1967c, 1974), Nesbitt & Hetrick (1976), Norris (1952), Potter (1983), Rodewald *et al.* (1999), Strewe & Navarro (2004a), Whitney (1983), Wilson *et al.* (1995).



PLATE 54

inches 3
cm 8

32. Kirtland's Warbler

Dendroica kirtlandii

French: Paruline de Kirtland **German**: Michiganwaldsänger **Spanish**: Reinita de Kirtland

Taxonomy. *Sylvicola kirtlandii* S. F. Baird, 1852, near Cleveland, Ohio, USA.
Relationships within genus unclear. Possible hybrid between this species and *D. fusca* reported from Hispaniola. Monotypic.
Distribution. Breeds in NC Michigan, in N USA; migrates to Bahamas and Turks and Caicos Is.



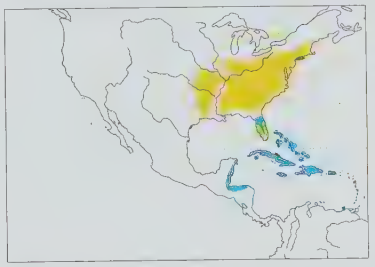
Descriptive notes. 15 cm; 12·2–16 g. Male has grey head, with black lores and white eye-crescents; upperparts grey, streaked black, two indistinct white bars on greater and median upperwing-coverts, white spots at tips of outer two rectrices; throat and underparts yellow, fading to white on undertail-coverts, black streaks on side of breast and flanks; plumage may be marginally duller in autumn/winter; iris dark; bill and legs blackish. Female similar but duller, black of facial markings replaced with grey, upperparts washed brownish, underparts paler yellow, tail with less white. Juvenile has brownish head and upperparts, wingbars pale buff, pale buff below, tinged yellowish on belly, and with fine blackish speckling on throat and breast, flesh-coloured bill and legs; first-year slightly duller than adult, especially in autumn/winter; first-winter female relatively dull, with brownish head and upperparts, pale buffy-yellow throat and underparts, streaking on sides less distinct, and often some indistinct dark streaking on throat and breast. Voice. Song loud, lively and relatively low-pitched, and rises in pitch, volume and tempo; may be transcribed as "chip chip chip-chip-chip tew tew weet weet". A simpler chattering "chu-chu-chu-chu" song often given in late summer, and soft, bubbly "whisper song" given during interactions between males, but not clear whether this corresponds to Type 2 song. Usual call a loud, smacking, relatively low-pitched "tchip"; flight call a thin, high-pitched "zeet".
Habitat. Breeds in dense stands of young jack pine (*Pinus banksiana*) 2–7 m high, with ground cover of blueberry (*Vaccinium*), grasses, sedges and ferns; such stands typically grow following a forest fire, and ideal stands are 80 ha or more in extent. When pines reach more than 7 m in height the species moves out, as thick ground cover required for nesting is shaded out. Some colonies now breeding in young artificial plantations of jack pine and red pine (*Pinus resinosa*). Winters primarily in low, dense scrub with scattered taller trees, possibly also in open Caribbean pine (*Pinus caribaea*) woodland; one recent study suggested that this species may be more reliant on pine woodland in winter than was previously thought, whereas another maintains that scrub is the primary habitat used on wintering grounds.
Food and Feeding. Feeds mainly on insects and other arthropods; also takes blueberries in middle to late summer on breeding grounds, and other small fruits in winter. Has been seen to ingest the pitch that exudes from pine trees, and also pine needles and grass. Forages mainly by gleaning at low to middle levels, mainly in lower branches of pine trees but also on ground. Investigates terminal clusters of pine branches for insects; occasionally hover-gleans.
Breeding. Season May–Jul, egg-laying May–Jun, occasionally into early Jul. Polygyny recorded, up to 15% of males polygynous in some years; reasons for this unclear, but possibly linked with site-fidelity of females (producing unequal sex ratio). Nest a cup of grasses and roots, lined with moss, grass and hair, hidden on ground in tangle of ferns or blueberry under jack pine trees. Clutch 4–5 eggs; occasional replacement laid if first nest destroyed or deserted; incubation period 14–15 days; nestling period 9–10 days, but young may leave nest after 8 days if disturbed; both sexes will feign injury to distract attention from nest. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); in one study of 29 nests, 70% were parasitized and only two warbler chicks fledged; estimated that breeding success reduced by 40% when 55% of nests parasitized.
Movements. Long-distance migrant. Young leave breeding grounds mainly in Aug, adults may linger into early Oct, and they seem to head directly from Michigan to Florida and then across to Bahamas, arriving there from early Sept; return probably along same route but in reverse direction, leaving Bahamas during Apr and arriving on breeding grounds from mid-May. Seldom seen on migration, but passage migrants recorded in many states E of Mississippi R and especially in Florida, Georgia and South Carolina. Has been suggested that most make the journey in one flight; nesting habitat (jack pine) thought to have spread N & W since end of last glaciation, which may explain how the "one-hop" migration evolved (when breeding and wintering grounds were closer together). Vagrants recorded recently in Cuba (Nov 2004) and Bermuda (Dec 2004); recent sight records also from Hispaniola and E Mexico (Veracruz).
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Michigan Jack Pine Savanna Secondary Area, and wintering in Bahamas EBA. Formerly rated as Vulnerable, but recent conservation measures have resulted in significant population increase and IUCN status has been altered accordingly. In first population census, made in 1951, 432 singing males found. Annual counts undertaken since 1971, and in 1970s and 1980s population recorded as stable at 200–250 pairs, but not increasing, despite good nesting success and habitat management. Since 1990, population has increased dramatically, reaching 904 singing males in 1999 and 1826 in 2009; current global population estimated at c. 4000 individuals. Increase thought to have been the result of better habitat management, through planting, as well as burning, and persistent removal of cowbirds from breeding areas. Nesting area is so small that inexperienced first-year individuals on first spring migration may well miss it, and these may account, at least partially, for the singing birds occasionally recorded elsewhere in Great Lakes area; singing males seen in recent years in other parts of N Michigan, in neighbouring Ontario and in S Quebec, and in 2007 nesting recorded in Wisconsin and in E Ontario, latter the first breeding record for Canada since 1945; census of 2009 yielded 11 singing males in Wisconsin and 2 in Canada. Required habitat is so specialized that a large area of jack pines in breeding area is continually managed (by burning) so that there are always sufficient trees of appropriate height and in large enough stands to provide adequate nesting habitat; planting can also produce required habitat, and colonies now breeding in young plantations of jack pine and red pine. Brood parasitism by cowbirds is a serious threat to the species' survival, and cowbirds now controlled by trapping on main nesting grounds; up to 4000 cowbirds now removed annually, and this has reduced parasitism rates from 70% down to 3% and doubled or tripled this parulid's productivity. Despite these successes, this species remains potentially under threat from habitat fragmentation and degradation, and from predation by domestic cats.
Bibliography. Amos (2005), Anon. (2009f, 2010a, 2010c), Austen *et al.* (1994), Butchart & Stattersfield (2004), Collar *et al.* (1992), Clench (1973), Faanes & Haney (1989), Goodman (1982), Haney *et al.* (1998), Hayes *et al.* (1986), Isada (2006), Latta & Parkes (2001), Mayfield (1953, 1960, 1961, 1972, 1983, 1988a, 1988b, 1992), McCarthy (2006), Mountfort & Arlott (1988), Nelson & Buech (1996), Probst (1985, 1986), Radabaugh (1972a, 1972b), Richter (1996), Rossignal (2010), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Sykes (1997), Sykes & Clench (1998), Sykes & Munson (1989), Sykes *et al.* (1989), Walkinshaw (1976, 1983).

33. Prairie Warbler

Dendroica discolor

French: Paruline des prés **German**: Rostscheitel-Waldsänger **Spanish**: Reinita Galana

Taxonomy. *Sylvia discolor* Vieillot, 1809, "the Antilles", in Caribbean.
Forms a superspecies with *D. vitellina*; sometimes regarded as conspecific, although such treatment not supported by recent phylogenetic study. Two subspecies recognized.
Subspecies and Distribution.
D. d. discolor (Vieillot, 1809) – breeds SE Canada (SE Ontario) and E USA E from SE Iowa, E Kansas and E Texas and S from extreme S Maine (but excluding S coastal areas and most of Florida and Mississippi Valley; isolated population in NW Michigan); migrates to peninsular Florida, Caribbean and islands off coast (also small numbers on adjacent mainland) of C Middle America.
D. d. paludicola A. H. Howell, 1930 – coastal S Florida.



Descriptive notes. 12 cm; 5·7–10·8 g. Male nominate race breeding has olive-green crown and nape, yellow supercilium and large yellow patch below eye, black eyestripe and lower border of ear-coverts; upperparts olive-green, mantle streaked chestnut, greyer upperwing with two narrow yellowish bars on greater and median coverts, tail with extensive white in three outer feather pairs; yellow below, streaked black on flanks; iris dark; bill blackish; legs deep brown to dark grey or blackish. Non-breeding male is duller, with head pattern less striking, streaking on mantle and flanks less distinct. Female is similar to non-breeding male, tail with less white on average. Juvenile has plain olive-grey head and upperparts, pale buff lores and wingbars, whitish eye-crescents, buffy-white throat and underparts, with bill and legs paler than those of adult; first-year on average duller than adult; first-winter female often very dull, with greyish-olive head and upperparts, lacking chestnut streaks, whitish in place of yellow on face, and indistinct olive flank streaks. Race *paludicola* is slightly duller in all plumages than nominate, adult male olive-grey on upperparts, with less distinct chestnut streaking, paler yellow below, with less distinct flank streaking. Dull individuals differ from *D. vitellina* in having more distinct face pattern, streaked mantle, and more distinct streaks on flanks. Voice. Two song types. Type 1 song a series of rapid buzzy notes, accelerating and rising in pitch towards end. Type 2 song quieter and more variable, typically a series of long notes followed by a series of shorter notes. Usual call a low, smacking "tcheck"; dry "tsip" used as alarm call in breeding season; flight call a thin "seep".
Habitat. Nominate race breeds in dry, scrubby and shrubby areas lacking closed canopy but often with scattered taller trees, such as abandoned fields and orchards, brushy second growth, young pine (*Pinus*) plantations and open pine forests having well-developed shrub layer (no closed canopy). Uses all kinds of scrub and lightly wooded habitats on migration. Winters in pine forest, dry scrub, woodland edges and clearings, open second-growth forest with well-developed understorey and gardens, mainly in lowlands; also in mangroves. Race *paludicola* resident in coastal mangrove swamps.
Food and Feeding. Feeds mainly on insects and other arthropods, especially spiders (Araneae); occasionally takes fruit and nectar in winter. Forages mainly at low to middle levels in shrub layer, but males will interrupt singing to feed quite high in trees; feeds also on ground, especially before leaves of trees are open. Forages mostly by gleaning, but also flycatches, hover-gleans, and hangs upside-down to feed on pupae. Regularly visits flowering heads of century plant (*Agave braceana*) in Bahamas; race *paludicola* will visit mangrove flowers for nectar. Individuals sometimes join mixed-species foraging flocks in winter, but more often solitary.
Breeding. Season May–Jul; S populations (including *paludicola*) often double-brooded. Polygyny regular, but relatively infrequent. Nest a cup of plant down, grass and leaves, lined with rootlets, hair and feathers, placed 0·7–1·7 m (occasionally higher) above ground in bush or sapling, or (race *paludicola*) in mangrove tree over water. Several nests may be partly constructed by female before one is selected for completion. Clutch 3–5 eggs, usually 4; incubation period 10·5–14·5 days; nestling period 8–11 days. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); in long-term study in Indiana, 35% of May nests were parasitized, compared with 18% of Jun nests and none of Jul nests, and parasitism estimated to have caused 73% reduction in breeding success, with mean of 0·78 warbler chicks fledged from nests containing cowbird chicks (compared with mean of 3·36 for those containing only host's chicks).
Movements. Resident and medium-distance migrant. Nominate race migratory, leaves breeding grounds from late Jul and moves S or SE to Florida, many then crossing to Caribbean, arriving on wintering grounds from mid-Aug but mainly during Sept; spring return begins early Mar, and many cross to S Atlantic coast, arriving on breeding grounds from early Apr in S, late Apr farther N. Casual in Costa Rica in autumn and winter, and in Netherlands Antilles and the US Gulf Coast in winter. Vagrant in Maritime Provinces of Canada, W North America, Trinidad and Colombia.
Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Nominate race generally common throughout range. Like *D. pensylvanica*, has benefited from large-scale clearance of forests in breeding range, but has declined recently in upland areas, probably as a result of regrowth of forest on abandoned farmsteads and through urbanization. Despite these clearances, has shown worrying declines in many areas in recent decades. Estimates of population density vary from 12·5 pairs/40 ha in young jack pines

On following pages: 34. Vitelline Warbler (*Dendroica vitellina*); 35. Palm Warbler (*Dendroica palmarum*); 36. Bay-breasted Warbler (*Dendroica castanea*); 37. Blackpoll Warbler (*Dendroica striata*); 38. Cerulean Warbler (*Dendroica cerulea*); 39. Plumbeous Warbler (*Dendroica plumbea*); 40. Arrow-headed Warbler (*Dendroica pharetra*); 41. Elfin Woods Warbler (*Dendroica angelae*); 42. Whistling Warbler (*Catharopeza bishopi*); 43. Black-and-white Warbler (*Mniotilta varia*); 44. American Redstart (*Setophaga ruticilla*).

(*Pinus banksiana*) in Michigan to 80 pairs/40 ha in developing scrub under power lines in Maryland (seven years after being cut); c. 15–35 pairs/40 ha seems to be density range in most of its typical habitat. Race *paludicola* now rare owing to loss of mangroves, and its status considered to be of special concern, although few details known; it may have been adversely affected also by pesticide use.

Bibliography. Anon. (2002), Buerkle (1997, 2000), Faaborg & Arendt (1992), Heckscher (1998), Jackson *et al.* (1989), James *et al.* (1992), Latta & Faaborg (2001), Nolan (1978), Nolan *et al.* (1999), Prather (1994), Prather & Cruz (1995), Rodgers (1996), Staicer (1992).

34. Vitelline Warbler

Dendroica vitellina

French: Paruline des Caïmans **German**: Dotterwaldsänger **Spanish**: Reinita de las Caimán

Taxonomy. *Dendroica vitellina* Cory, 1886, Grand Cayman Island.
Forms a superspecies with *D. discolor*; sometimes regarded as conspecific, although such treatment not supported by recent phylogenetic study. Three subspecies recognized.
Subspecies and Distribution.
D. v. nelsoni Bangs, 1919 – Swan Is (N of Honduras), in W Caribbean.
D. v. vitellina Cory, 1886 – Grand Cayman I.
D. v. crawfordi Nicoll, 1904 – Little Cayman I and Cayman Brac.



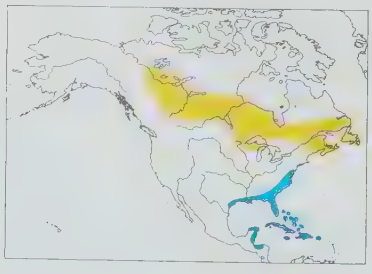
Descriptive notes. 13 cm; 6·2–7·5 g. Male nominate race has olive-green crown and nape, yellow supercilium and large yellow patch below eye, olive-green eyestripe and lower border of ear-coverts; upperparts uniformly bright olive-green, indistinct pale yellowish wingbars on greater and median upperwing-coverts, white tips on outer three rectrices; bright yellow below, olive wash on flanks forming indistinct, blurred streaks; iris dark; bill blackish; legs blackish-brown. Female is slightly duller than male, with more uniformly yellow ear-coverts. Juvenile has pale greyish or greyish-brown head and upperparts, slightly darker on mantle, obscure pale buff wingbars, whitish throat and underparts tinged yellowish on belly and undertail-coverts, greyish-brown wash on side of breast and flanks; first-year probably resembles adult once post-juvenile moult completed. Race *crawfordi* is slightly paler and yellower above than nominate, has less obvious head pattern, lacks faint olive flank streaks; *nelsoni* is intermediate between previous and nominate in head pattern and upperpart colour. Dull *D. discolor* is similar but slightly smaller, and has more distinct olive streaks on flanks and more distinct face pattern. Voice. Song a series of 4–5 wheezy and slightly grating notes which rise in pitch; similar to that of *D. discolor* but delivered more slowly, also reminiscent of song of *D. caerulescens*. Call apparently undescribed, probably similar to that of *D. discolor*.
Habitat. Arid scrubby woodland, coastal scrub and clearings, and logged areas of dry forest; sometimes in urban areas.
Food and Feeding. Little known; probably feeds mostly on insects and other arthropods, by foraging at low to middle levels.
Breeding. Laying recorded in Apr–Jun. Nest a compact cup placed 0·6–2·6 m up in bush; clutch 2 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Cayman Islands Secondary Area and Swan Islands Secondary Area. Confined to four islands in Cayman and Swan groups in Caribbean, but occurs in quite a wide variety of habitats there. Nominate race described as being common on Grand Cayman; *crawfordi* very common on Little Cayman and Cayman Brac; *nelsoni* formerly common on Great Swan I, but no recent population estimates. Total area of suitable habitat has been estimated at c. 135 km², and some of this habitat is under threat of development in Cayman Is.
Bibliography. Anon. (2009f), Bangs (1919), Bradley (1995), Butchart & Stattersfield (2004), Collar *et al.* (1992), Markland & Lovette (2005), Monroe (1968), Nicholl (1904), Nolan *et al.* (1999), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

35. Palm Warbler

Dendroica palmarum

French: Paruline à couronne rousse **German**: Palmenwaldsänger **Spanish**: Reinita Palmera

Taxonomy. *Motacilla palmarum* J. F. Gmelin, 1789, Santo Domingo, Dominican Republic.
Affinities within genus uncertain; has been considered most closely related to *D. discolor* and *D. pinus*. Has hybridized with *D. coronata* (of nominate race). Two subspecies recognized.
Subspecies and Distribution.
D. p. palmarum (J. F. Gmelin, 1789) – breeds C & SC Canada from Northwest Territories and Alberta E to Ontario; migrates to Florida, Caribbean (mainly Bahamas and Greater Antilles) and, in smaller numbers, US Atlantic coast and E coast of C Middle America.
D. p. hypochrysea Ridgway, 1876 – E Ontario (locally) and W Quebec E to Newfoundland and Nova Scotia, and NE United States (N Minnesota, Wisconsin, N Michigan, Maine); migrates to Gulf of Mexico coast from Texas E to W Florida.



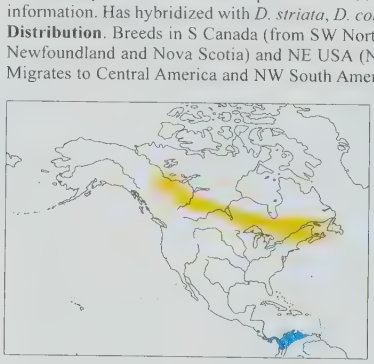
Descriptive notes. 14 cm; 7–12·9 g. Largely terrestrial parulid with tail-wagging habit. Nominate race breeding has rufous crown, pale yellowish supercilium, dark eyestripe; sides of head and neck and upperparts grey-brown with olive tinge, dark streaks on upperparts, rump contrastingly olive-yellow; obscure whitish wingbars on greater and median upperwing-coverts, tail with white spots at tip of outer two feather pairs; throat and undertail-coverts yellow, otherwise whitish below, with darker streaks on breast and flanks; iris dark; bill blackish, paler horn base of lower mandible; legs blackish-brown. Non-breeding plumage is duller, lacking rufous cap and yellow throat, and is less heavily streaked. Sexes similar. Juvenile has grey-brown head and upperparts mottled and streaked darker, hint of pale supercilium and obscure cinnamon-buff wingbars, throat and underparts pale grey-buff, mottled/spotted with dark brown, undertail-coverts unmarked. Race *hypochrysea* is more uniformly yellow below than nominate, and slightly brighter on head and upperparts. Voice. Nominate race, at least, has two song types. Type 1 song a series of (usually) 7–10 buzzy notes on more or less even pitch, rapidly delivered and sounding quite trilling. Type 2 song similar but in two parts, with first notes delivered more slowly and remainder more rapidly. Usual call a sharp "tsik" or "tsup"; call of race *hypochrysea* apparently a little sharper and higher-pitched than that of nominate. Flight call a high-pitched "seet" or "see-seet".
Habitat. Breeds in bogs in open coniferous forest, especially where spruce (*Picea*) and tamarack (*Larix laricina*) dominate (but are thinly scattered) and dense understorey present; also in drier areas with scattered trees and dense scrub. In winter and on migration occurs in open areas with short grass in lowlands, including pastures, weedy fields, lawns, beaches and picked cotton fields; also in mangroves and open pine (*Pinus*) woodlands and scrub.
Food and Feeding. Feeds mainly on insects and other arthropods, but takes some seeds, berries and nectar in winter. Forages mainly on ground and in low shrubs, picking insect prey from ground and performing short flycatching sorties. Has been seen to take insects from frozen surface of lakes in Canada in early spring. Recorded as gleaning insects from cones near top of tamaracks, and on spring migration regularly feeds in trees when they begin to bud and flower. In winter, regularly visits flowering heads of century plant (*Agave braceana*) in Bahamas. Individuals may temporarily defend a flower source on wintering grounds, but otherwise often occurs in loose flocks.
Breeding. Season May–Jul. Nest a cup of weed stalks, grass, bark strips and moss, lined with fine grass and feathers, usually concealed on ground at base of small tree, sometimes low in bush. Clutch 4–5 eggs; incubation period 12 days; nestling period 12 days, but young have been recorded as leaving nest at only 8 days (c. 3 days before able to fly). Nests very infrequently parasitized by Brown-headed Cowbird (*Molothrus ater*).
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from early Sept, arriving in wintering areas from late Sept, mostly during late Oct and Nov; race *hypochrysea* migrates somewhat later than nominate. Nominate race travels mostly SE through E USA to Florida and then across to Caribbean, whereas *hypochrysea* moves S mainly along Atlantic coastal plain as far as N Florida and then across Florida to Gulf coast. Both races basically follow reverse route in spring, but spring migration of nominate more to W than autumn one, most moving NW from Florida to travel up Mississippi Valley and W flank of Appalachians; departure from wintering grounds during Mar and Apr, arrival on breeding grounds from late Apr. Nominate race casual in W North America in autumn and winter (rare in Alaska, and most records from California); *hypochrysea* a rare vagrant there. Also casual on Caribbean coast of N Central America. Vagrant in Netherlands Antilles, Mexico (*hypochrysea*), Panama, Colombia, Venezuela (in Jun) and Britain.
Status and Conservation. Not globally threatened. Generally fairly common to common throughout range. Breeding Bird Surveys revealed significant increase from 1966 to 1994. Population estimates include 93,000 individuals in Maritime Provinces in early 1990s, with most in Nova Scotia. Estimated breeding densities include 3–23 males/km² in bogs and fens, and 1–7 males/km² in spruce stands. On winter grounds in Jamaica, densities include 5 birds/10 ha in mangroves, 3 birds/10 ha in lowland/mid-level gardens and parkland, 1 bird/10 ha in montane gardens and parkland, 3 birds/10 ha in uncut lowland dry forest and 12 birds/10 ha in cutover dry forest; in Puerto Rico, 3·9 birds/10 ha in dry forest.
Bibliography. Austin (1971), Erskine (1978, 1992), Harris (1990), Hicks *et al.* (1967), Johnston (1968, 1976), Lewington *et al.* (1991), McCarthy (2006), McNicholl & Goossen (1980), Pearman (1993), Pittaway (1995), Post (1978), Rodriguez & Lentino (1997), Stewart & Connor (1980), Taylor (1969), Welsh (1971), Wilson (1996), Wunderle (1978a).

36. Bay-breasted Warbler

Dendroica castanea

French: Paruline à poitrine baie **German**: Braunbrust-Waldsänger **Spanish**: Reinita Castaña

Taxonomy. *Sylvia castanea* A. Wilson, 1810, Pennsylvania, USA.
Relationships unclear; *D. striata* presumed to be the closest relative of present species, but little information. Has hybridized with *D. striata*, *D. coronata* (nominate race) and *D. fusca*. Monotypic.
Distribution. Breeds in S Canada (from SW Northwest Territories and NE British Columbia E to Newfoundland and Nova Scotia) and NE USA (NE Minnesota E to Maine and New Hampshire). Migrates to Central America and NW South America.



Descriptive notes. 14 cm; 10·2–15·1 g. Male breeding has black forecrown and face, chestnut cap, large creamy-yellow patch on side of neck; upperparts grey with black streaks, greater and median upperwing-coverts broadly tipped white (two white wingbars), large white tips on outer three rectrices; chestnut on throat and upper breast, extending as broad stripe along flanks; rest of underparts whitish; iris dark; bill blackish; legs dusky greyish-flesh. Non-breeding male is quite different, head and upperparts yellowish olive-green, obscure pale yellowish supercilium, heavy black streaking on crown and upperparts; wing and tail much as when breeding; throat and underparts pale buffy white, extensive chestnut on breast side and flanks. Female breeding is considerably duller than male, especially on head, which has only suggestion of male's pattern; crown and ear-coverts grey, streaked black, hint of chestnut on crown, faint whitish supercilium, chestnut on underparts restricted to side of breast; non-breeding plumage like non-breeding male but duller, crown and upperparts only faintly streaked, flanks warm buff, sometimes with a few chestnut feathers. Juvenile has head and upperparts pale grey-buff, heavily streaked blackish, pale buff below, dark spotting/mottling on throat, breast and flanks, bill and legs pinkish-buff; first-winter duller than adult, first-winter female dullest, with only faint streaking above and uniformly off-white underparts lacking any chestnut, first-summer, especially male, on average slightly duller than adult. Dullest individuals best distinguished from similar first-winter *D. striata* by darker legs, undertail-coverts not noticeably whiter than rest of underparts, essentially unstreaked breast, and slightly less distinct eyestripe and supercilium. Voice. Two song types. Songs very high-pitched (but not so high as that of *D. striata*) and somewhat lisping; a short series of rather flat "see" notes, usually on one pitch, sometimes falling slightly in pitch at end. Usual calls a loud sweet "chip", very similar to that of *D. striata*, and a thin, high-pitched "see" or "tseet"; flight call a buzzy "zeet", also very like that of latter species.

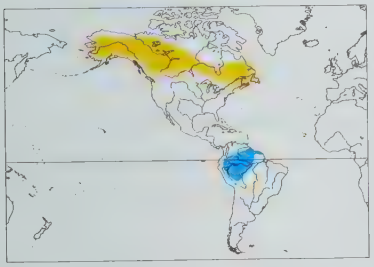
Habitat. Breeds in open coniferous forests, especially those dominated by spruce (*Picea*) and balsam fir (*Abies balsamea*), and also in mixed forest containing pine (*Pinus*), hemlock (*Tsuga*), birch (*Betula*) and maple (*Acer*); often in swampy areas and clearings. Uses wide variety of wooded habitats on migration. In winter mainly in forest edges and large clearings and second growth, also more open areas with scattered tall trees, mangroves, cloudforest and other forest types; mainly below 1000 m, but often at higher altitudes during migration (and sometimes in winter).
Food and Feeding. Feeds mainly on insects and spiders (Araneae) in summer, specializing in taking spruce budworm (*Choristoneura fumiferana*) larvae; much less often black-headed budworm (*Alceris variana*), forest tent caterpillars (*Malacosoma disstria*) and other Lepidopteran larvae, beetles, flies, grasshoppers, dragonflies and ants; much fruit and some nectar taken during migration and in winter. Consumes huge numbers of budworms during outbreaks, when it has been estimated to be capable of eliminating 13,570 budworms/ha. Forages primarily at middle to high levels. Feeds mainly by gleaning, concentrating on needle clusters; occasionally flycatches or hover-gleans. Frequently joins mixed-species foraging flocks in winter.
Breeding. Season late May to late Jul, egg-laying late May to early Jul. Nest a cup of fine twigs and grass, lined with rootlets and hair, placed 2–7 m (occasionally higher) above ground on horizontal branch of conifer. Clutch 4–5 eggs (up to 7 in "spruce budworm years"); incubation period 12–13 days; nestling period 10–12 days; female may feign injury to distract attention from nest. Nests parasitized only rarely by Brown-headed Cowbird (*Molothrus ater*); cowbirds rare or absent over much of this species' breeding range, but parasitism regular in area of distributional overlap.
Movements. Long-distance migrant. Leaves breeding grounds from mid-Aug and moves mostly S through Mississippi Valley and Appalachians to Gulf of Mexico coast, then across Gulf to Yucatán and through E Central America to arrive on wintering grounds from late Sept; some follow Gulf coast, rather than crossing it, and some follow Atlantic coast to Florida, reaching South America via Caribbean; first years may have more E component than adults to autumn migration. Spring migration begins in Mar and is basically in reverse direction along same route, but more W through North America, most moving W of Appalachians; arrival on breeding grounds from mid-May. Casual in Ecuador in winter. Vagrant in much of W North America, including Alaska, and in Trinidad, Tobago, Greenland and Britain.
Status and Conservation. Not globally threatened. Fairly common, but numbers fluctuate in response to periodic outbreaks of spruce budworm. Longer-term declines may have occurred as a result of annual spraying of budworms in E Canada and replacement of mature forests with second-growth plantations that are resistant to budworm infestations. During budworm outbreaks breeding densities can reach 1543 birds/km² in Ontario; other breeding densities during outbreaks include 4 males/ha in New Brunswick and 2 males/ha in N Maine; in White Mts (New Hampshire) when budworms were absent, density estimated at 2 pairs/km². May be at risk on its wintering grounds from habitat disturbance, this due mainly to relatively small extent of wintering area and this species' preference for foraging high in forest canopy.
Bibliography. Banks & Baird (1978), Brodkorb (1934), Crawford *et al.* (1983), Ellison *et al.* (2002), Graves (1996b), Greenberg (1984), Hough (1996), Howard (1968), Hurley & Jones (1983), McMartin *et al.* (2002), Mendall (1937), Morse (1978), Morton (1980), Mueller & Mueller (1976), Ruos (1984), Sealy (1979), Whitney (1983), Williams (1996b).

37. Blackpoll Warbler

Dendroica striata

French: Paruline rayée **German**: Streifenwaldsänger **Spanish**: Reinita Estriada

Taxonomy. *Muscicapa striata* J. R. Forster, 1772, Fort Severn, west coast of Hudson Bay, Canada.
Precise relationships unclear; *D. castanea* presumed to be closest relative of present species, but little information. Has hybridized with *D. castanea*; another hybrid involved *Seiurus noveboracensis* and either present species or, more probably, *D. tigrina*. Birds from Alaska described as a geographical race, *lurida*, but appear little different from those in rest of species' range. Monotypic.
Distribution. Breeds in Alaska and Canada (E to Newfoundland and Nova Scotia, and S to C British Columbia) and extreme NE United States (S to New York). Migrates to NE South America S to N Bolivia and W Brazil, mainly in W Amazonian region; smaller numbers may winter S to NE Argentina and coastal SE Brazil.



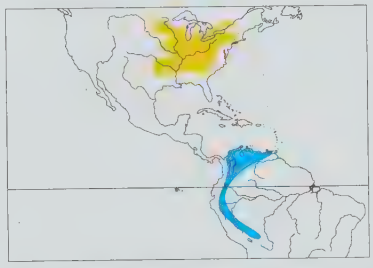
Descriptive notes. 14 cm; 9·7–20·9 g. Male breeding has black cap, streaky black chin and malar stripe, contrasting white face; upperparts grey, tinged olive and heavily streaked black; greater and median upperwing-coverts broadly tipped white (two white wingbars), tail with large white tips on outer two pairs of rectrices; white below, bold black streaks on side of breast and flanks; iris dark; bill blackish, dark fleshy-coloured lower mandible; legs pale orange-yellow. Non-breeding male is quite different, has crown, nape and upperparts olive-green with heavy black streaking, yellowish supercilium and dusky eyestripe; wing and tail much as when breeding; throat and breast lemon-yellow, becoming whitish on belly and white on undertail-coverts, with bold blackish or dusky streaking on breast side and flanks. Female breeding is considerably duller than breeding male, but with faint suggestion of latter's head pattern, has crown, nape and upperparts grey, tinged olive and heavily streaked black, short, faint whitish supercilium, whitish face faintly mottled darker, streaks on side dusky and less bold than male's, on average less white in tail; non-breeding female similar to non-breeding male, but less prominent streaking above and on flanks. Juvenile has head and upperparts mottled olive-grey and blackish, blackish lores and buffier ear-coverts, whitish wingbars, greyish-white below with heavy blackish-brown mottling throughout (mottling heavier and more extensive than on *D. castanea*), bill flesh-coloured, legs paler than those of adult; first-winter generally duller than adult, with relatively indistinct dark streaking on upperparts and indistinct, blurred olive streaks on side of breast. Dull individuals best distinguished from similar *D. castanea* by paler legs, contrasting white undertail-coverts, lemon-yellow breast with more distinct streaks on side, and slightly bolder eyestripe and supercilium. Voice. Song very high-pitched and often more emphatic in middle, a series of up to 20 single or double "si" notes, delivered at rate of 5–12 notes per second; alternative song reported, similar but delivered more quickly and sounding like very high-pitched trill. These songs may correspond to Type 1 and Type 2 songs, respectively, but no detailed analysis has been done. Usual call a loud "chip", and flight call a buzzy "zeet"; all calls very similar to those of *D. castanea* and probably not distinguishable in field.
Habitat. Breeds mainly in spruce (*Picea*) forests, especially those of black spruce (*Picea mariana*), including stunted forests at N limit of tree growth; found also in spruce–alder–willow (*Picea–Alnus–Salix*) thickets in riparian areas in W of range, in coastal/subalpine forests of white spruce (*Picea glauca*), red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*) in E, and in mixed spruce–birch (*Picea–Betula*)/aspen (*Populus tremuloides*) forests. Occurs in wide variety of woodlands on migration. In winter in lowland tropical forest, cloudforest and mangroves, as well as second-growth forest and coffee plantations. Usually below 1000 m on wintering grounds, but often higher on migration, and occasionally to 1600 m in winter in Venezuela, 2600 m in Colombia and 2800 m in Ecuador.
Food and Feeding. Feeds mainly on insects and other arthropods, especially spiders (Araneae) and their eggs; also a few seeds and berries taken in autumn and winter, when may take pollen and nectar, too. Forages mainly by gleaning at middle to high levels; occasionally flycatches. Has been recorded as feeding on the ground in Bahamas. Small groups may join mixed-species foraging flocks in winter.
Breeding. Season May–Jul, fledging occasionally to early Aug; egg-laying Jun–Jul, exceptionally late May; regularly double-brooded. Occasionally polygynous. Nest a cup of grasses, mosses, lichens and some twigs, lined with fine grasses, feathers and hair, usually placed 0·3–2·3 m up in spruce tree, sometimes on ground. Clutch 4–5 eggs, occasionally 3; incubation period 11·5–12 days; nestling period 8–10 days. Nests very rarely parasitized by Brown-headed Cowbird (*Molothrus ater*), which is rare in this species' remote dense-forest breeding habitat.
Movements. Long-distance migrant; undertakes longest migration of any parulid. Leaves breeding grounds mainly late Aug and Sept; most move SE to N Atlantic coast and then follow coast to Florida and pass through Caribbean to reach wintering grounds from late Oct, but some head out from Atlantic coast to fly non-stop to Caribbean or perhaps even N South America (it is disputed whether this oceanic route, although well documented, forms part of regular migration of this species); common in Bermuda on autumn passage; a few move S down W coast of North America and possibly reach South America by this route, although this species is very rare in W Mexico. Return migration begins in Apr and is basically along same route but in reverse direction, though oceanic route is not followed in spring, birds taking a more W route, arriving on Gulf or Atlantic US coast via Caribbean and then moving N over land to reach breeding grounds from late May. Casual on W coast of North America in autumn, in Mexico and Belize in spring and autumn, in Costa Rica in autumn and winter, and in SE Brazil and Bermuda in winter. Vagrant in S Chile, S Argentina, Greenland, Iceland, Britain, Ireland, France and Galapagos Is.
Status and Conservation. Not globally threatened. Generally common throughout range; often one of the most common birds in its breeding habitat. Population density estimates range from 1·5 pairs/10 ha at altitude of 750 m to more than 40 pairs/10 ha in subalpine valleys in NE USA; from 0·1 pairs/10 ha in young spruce plantation to 9·8 pairs/ha in more mature forest in New Brunswick; and from 0·8–2 territories/10 ha in spruce forest to 2·5–4·4 territories/10 ha in cottonwood–birch (*Populus–Betula*) forest in Alaska. Overall, population is stable, but some significant declines recorded in recent years in Newfoundland and elsewhere in E part of breeding range. Most of the boreal breeding habitat is not threatened, and broad range of winter habitats used should largely safeguard this species from effects of tropical-forest degradation.
Bibliography. Able & Noon (1976), Amos (1991), Boag & Ratcliffe (1979), Brady (1992, 1994), Burleigh & Peters (1948), Eliason (1986a, 1986b), Graves (1996b), Gross (1994), Hill & Hagan (1991), Hough (1996), Hunt & Eliason (1999), Jones, H.L. *et al.* (2000), Kessel (1998), Lehman (2005), Lewington *et al.* (1991), McCarthy (2006), McNair & Post (1993), McNair *et al.* (1996), Morse (1979), Murray (1965, 1976, 1979, 1989), Nisbet (1970), Nisbet, Drury & Baird (1963), Nisbet, McNair *et al.* (1995), Parker *et al.* (1994), Parkes (1995), Paynter (1995), Roberts & Tamborski (1993), Sabo (1980), Short & Robbins (1967), Sick (1971, 1993), Stiles & Campos (1983), Walkinshaw (1976), Whitney (1983), Williams (1985).

38. Cerulean Warbler

Dendroica cerulea

French: Paruline azurée **German**: Pappelwaldsänger **Spanish**: Reinita Cerúlea

Taxonomy. *Sylvia cerulea* A. Wilson, 1810, Philadelphia, Pennsylvania, USA.
Affinities within genus uncertain; has been suggested that *D. fusca* is its closest relative, on basis mainly of similarities in vocalizations. Has hybridized with *Mniotilta varia*. Monotypic.
Distribution. Breeds locally in SE Canada (SE Ontario, extreme S Quebec) S in E USA to N Alabama and Virginia (absent coastal Atlantic and Gulf lowlands). Migrates to W South America from N Colombia and Venezuela S to S Peru and W Bolivia.



Descriptive notes. 12 cm; 8·4–10·3 g. Rather short-tailed and plump-looking parulid. Male breeding has head and upperparts deep cerulean-blue with black streaks, broad white tips on greater and median upperwing-coverts (two white wingbars), tail with white tips on all except central rectrices; white below, narrow breastband and streaks on flanks black mixed with blue; iris dark; bill blackish; legs grey to blackish. Non-breeding male is similar, but marginally duller, with variable white supercilium, and breastband often broken in centre. Female breeding has head and upperparts turquoise-blue, pale yellowish-white supercilium and white wingbars, tail generally with slightly less white than male's, whitish below with yellow tinge on throat and breast, faint greyish flank streaks; non-breeding plumage greener above and yellower below. Juvenile has head and upperparts brownish-grey, faintly streaked darker, with pale yellow supercilium, whitish throat and underparts, tinged yellowish on side of throat, breast and flanks, faint narrow rufous-brown crescents on throat and breast, pinkish-flesh bill and legs; first-winter male resembles adult female, but bluer above, especially on rump, more heavily streaked on mantle, and whiter below, first-winter female considerably greener above and yellower below than adult; first-summer resembles adult of respective sex, but remiges, primary coverts, alula and rectrices have greenish (not blue) edges. Voice. Sings Type 1 and Type 2 songs, but these very similar and differ mainly in rate of delivery and pitch, Type 2 songs lower-pitched and delivered at faster rate. Songs a series of (usually 4) buzzy "swee" notes, followed by a short series of rising and accelerating notes, and ending with higher-pitched buzzy trill; some songs simpler and lack terminal trill. Usual call a sharp, emphatic and quite musical "chip"; flight call a loud, buzzy "zzee".
Habitat. Breeds in open, mature, old-growth deciduous (occasionally mixed) forest with tall trees and relatively sparse undergrowth, often in swampy areas and along rivers and streams, preferring territories having large selection of nest-sites. In study in Indiana in 2008, territories concentrated in forests with canopy height of more than 28 m and cover exceeding 84%, and with relatively widely spaced large trees on steep slopes (reaffirming this species' reliance on mature old-growth forest). In NE of breeding range frequently uses second-growth forests that have grown up following abandonment of agriculture. Uses any wooded areas on migration, but maintains preference for tall trees. In winter found mainly in submontane forest on E slope of Andes, at 500–2000 m (mainly

500–1400 m in Ecuador), sometimes also in adjoining lowlands; also in second-growth forest and coffee plantations at similar elevations; coffee plantations may now be an important habitat in view of continued loss of primary forest on wintering grounds, but more study needed.
Food and Feeding. Feeds almost entirely on insects and other invertebrates, mainly spiders (Araneae); may take small fatty masses attached to fruits of tropical trees in winter. Has been observed to visit flowers in canopy trees, presumably for nectar, on Venezuelan wintering grounds. Forages mainly high in canopy; occasionally at lower levels, especially during migration. Forages mainly by gleaning, but also makes short flycatching sallies and occasionally hover-gleans. Single individuals or pairs join mixed-species foraging flocks in winter; it has been suggested that this species may be an obligate flock-follower in winter quarters, with more than 90% of individuals associated with foraging flocks in Venezuela.
Breeding. Season late Apr–Jul, egg-laying May–Jun. Nest a shallow cup of bark strips, grass and weed stalks, lined with hair and rootlets, placed 4–20 m up on branch of tree. Clutch 2–5 eggs, usually 4; incubation period 11–12 days; nestling period 10–11 days. Nests regularly parasitized by Brown-headed Cowbird (*Molothrus ater*); in Ontario, seven of 39 nests (18%) were parasitized in one study, but at another site, of over 200 nests studied only two were parasitized; in Tennessee one out of 52 nests was parasitized, and rate in Mississippi Alluvial Valley was nine out of 66 nests (13·6%).
Movements. Long-distance migrant. Leaves breeding grounds from late Jul (some not until early Sept), moving mostly S to Gulf of Mexico coast and across Gulf to Yucatán, thence through Central America to wintering grounds; a few reach South America via Florida and W Caribbean; arrival in winter quarters from as early as late Aug. Spring migration begins in early Mar, basically along same path in reverse direction, but follows a rather more W route through North America, most crossing the Gulf and then moving N through Mississippi Valley and Appalachians; arrival on breeding grounds from mid-Apr in S, early May farther N. Casual on Atlantic coast, N of breeding range and in Bermuda in autumn. Vagrant in W North America (where one of the rarest eastern parulids), New Brunswick and Nova Scotia, mainly in autumn, and in Trinidad, E Venezuela and SE Brazil in winter.
Status and Conservation. VULNERABLE. Listed as a species of conservation concern by US Fish & Wildlife Service. Locally common. Has declined sharply, despite a range expansion in NE of breeding range in recent decades. Breeding Bird Census data for 133 plots gave mean density of 43 pairs/km², with maximum of 290 pairs/km². Breeding Bird Survey data during 1966–1987 indicated annual decline of 3·4%, the steepest decline of any North American parulid warbler, and estimated 80% decline across breeding range between 1966 and 2003. This species is largely dependent on primary old-growth forests in both breeding and wintering areas, and loss of large tracts of these habitats to agriculture (and on breeding grounds also to short-rotation, even-aged managed forests) probably one of primary causes of decline. Other contributory factors on breeding grounds include habitat fragmentation and resultant brood parasitism by Brown-headed Cowbirds, and loss of key tree species such as oaks (*Quercus*), elms (*Ulmus*), sycamores (*Platanus*) and American chestnut (*Castanea dentata*) through disease. A recent study has suggested that the population in S Ontario may not be reproducing at a sufficiently high rate to accommodate adult mortality. As this warbler requires comparatively large territories, relatively large areas of intact forest are necessary for survival of a population.
Bibliography. Ambuel & Temple (1982), Anon. (2002, 2009f), Austen *et al.* (1994), Barker & Rosenberg (1997), Butchart & Stattersfield (2004), Hamel (1992, 2000a, 2000b), Jones & Robertson (1998, 2001), Jones, Barg *et al.* (2004), Jones, Ramoni *et al.* (2000), Kahl *et al.* (1985), Lehman (1987), Lynch (1981), Oliarnyk & Robertson (1996), Ouellet (1967), Parker, T.A. (1994), Parkes (1978), Robbins, Fitzpatrick & Hamel (1992), Robbins, Sauer *et al.* (1989), Rosenberg *et al.* (2000), Roth & Islam (2008), Vanderah (1993), Woodward (1997).

39. Plumbeous Warbler
Dendroica plumbea

French: Paruline caféiette **German**: Grauwaldsänger **Spanish**: Reinita Plúmbea

Taxonomy. *Dendroeca* [sic] *plumbea* Lawrence, 1877, Dominica.
Forms a superspecies with *D. pharetra* and *D. angelae*. Birds from Guadeloupe, supposedly on average darker above and sometimes faintly mottled darker on throat and breast, proposed as a geographical race, *guadeloupensis*, but considered inseparable from birds elsewhere in species' range; recent study found relatively little genetic variation among populations. Monotypic.
Distribution. Guadeloupe, Terre de Haut, Marie-Galante and Dominica, in Lesser Antilles.



Descriptive notes. 14 cm; 8·4–11·3 g. Has head and upperparts grey, white supercilium broken over eye, white spot below eye; broad white tips on greater and median upperwing-coverts (two wingbars), white tips on outer two pairs of rectrices; whitish below, greyer on flanks; iris dark; bill greyish-black, dark horn lower mandible; legs dark flesh-coloured. Sexes similar. Juvenile undescribed; first-year has same pattern as adult, but greyish-olive above, with facial markings buffy white, buffy wingbars, buffy white below. VOICE. Song short and simple but quite melodic, can be transcribed as "pa-pi-a" or "de-de-diu". Usual calls include short "chek" and loud rattle.
Habitat. Dry lowland scrub-forest, montane forest and elfin forest with dense understorey, and rainforest.
Food and Feeding. Feeds mainly on insects; takes some berries. Forages mainly by gleaning at low levels, mostly in understorey.
Breeding. Laying in Mar–Jul. Nest a cup of leaves and rootlets, lined with softer material, placed low in bush or bromeliad. Clutch 2–3 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Lesser Antilles EBA. Generally common throughout its limited range. No population estimates available.
Bibliography. Bond (1985), Brodkorb (1931), Curson *et al.* (1994), Evans (1990), Kepler & Parkes (1972), Lovette *et al.* (1998), Raffaele *et al.* (1998), Sibley & Monroe (1990), Stattersfield *et al.* (1998).

40. Arrow-headed Warbler
Dendroica pharetra

French: Paruline de Jamaïque **German**: Strichelwaldsänger **Spanish**: Reinita Jamaicana

Taxonomy. *Sylvicola pharetra* Gosse, 1847, Bluefields Peak, Jamaica.
Forms a superspecies with *D. plumbea* and *D. angelae*. Monotypic.
Distribution. Jamaica.

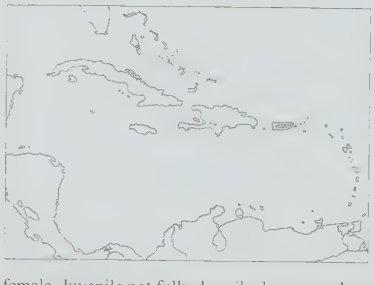


Descriptive notes. 12·5 cm; 9·1–10·5 g. Has head and upperparts streaked black and white, upperwing darker, greater and median coverts tipped white (two white wingbars), tail dark, small white spot at tip of outer two pairs of rectrices; whitish below, black arrowhead streaks on throat, breast and flanks; iris dark; bill blackish; legs blackish-brown. Sexes similar, female very slightly duller than male. Juvenile not fully described, apparently unstreaked on underparts; first-year brownish-olive above, faintly streaked yellowish-buff, wings and tail darker and more like those of adult, underparts pale brownish-yellow, faintly streaked darker, distinguished from non-breeding *D. striata* by fine yellowish-buff streaks on head and upperparts, less distinct wingbars, uniform underparts, and lack of distinct eyestripe and supercilium. VOICE. Song a series of high-pitched and squeaky notes, can be transcribed as "sww-sw-swee-sww-sw-swee-sww-sw-swee-swee-swee". Usual call a high-pitched, metallic "tic", repeated regularly.
Habitat. Breeds in humid montane forest; found also in lowland humid forest outside breeding season.
Food and Feeding. Feeds on insects. Forages by gleaning at all levels on branches, leaves and vines.
Breeding. Laying mainly in Mar–Jun, sometimes in Nov following Oct rains. Nest a compact cup of fine roots, lined with moss and lichen, well hidden in bush, bromeliad, vine or tree. Clutch 2–4 eggs. No other information.
Movements. Sedentary; some limited altitudinal movement, birds descending to lower elevations outside breeding season.
Status and Conservation. Not globally threatened. Restricted-range species: present in Jamaica EBA. Locally common throughout its limited range. No population estimates available.
Bibliography. Bernal (1989), Bond (1985), Curson *et al.* (1994), Downer & Sutton (1990), Kepler & Parkes (1972), Lack (1976), Raffaele *et al.* (1998), Sibley & Monroe (1990), Stattersfield *et al.* (1998).

41. Elfin Woods Warbler
Dendroica angelae

French: Paruline d'Angela **German**: Angelawaldsänger **Spanish**: Reinita de Ángela
Other common names: Puerto Rico Warbler

Taxonomy. *Dendroica angelae* Kepler and Parkes, 1972, Sierra de Luquillo (780 m), Puerto Rico.
Forms a superspecies with *D. plumbea* and *D. pharetra*. Monotypic.
Distribution. Puerto Rico.



Descriptive notes. 13·5 cm; 7·5–8·7 g. Has black head with complex but diagnostic white markings (white supraloral spot, variable narrow white supercilium, broken white eyering, white band around rear ear-coverts, white nuchal line); upperparts black, white wingbars on greater and median upperwing-coverts, white tips on tertials, white patch at base of primaries, small white spot at tip of outer three pairs of rectrices; white below, boldly streaked black on throat, breast and flanks; iris dark; bill black; legs lead-grey to dark bluish-grey. Sexes basically alike, male may have slightly heavier streaking below than female. Juvenile not fully described, apparently unstreaked below; first-year has adult pattern, but head and upperparts greyish-olive, wingbars and tertial spots tinged yellowish, throat and underparts pale olive-yellow with indistinct darker streaks; adult plumage apparently acquired after one year. VOICE. Song a series of short, rapidly delivered unmusical notes on one pitch, increasing in volume and ending with short series of distinct double notes; resembles song of Bananaquit (*Coereba flaveola*). Usual call a short metallic "chip", also similar to that of Bananaquit. Contact call similar to song, but without double-note ending.
Habitat. Mainly undisturbed, humid lower montane, montane and elfin forests having dense canopy with vines, high undercanopy and sparse understorey, at altitudes of 370–1030 m. Also, far less commonly, in disturbed and second-growth montane forest, but probably dependent on undisturbed humid forests.
Food and Feeding. Feeds on insects. Foraging at high levels, mainly high in canopy, by gleaning very actively from leaves, twigs and small branches. May join mixed-species foraging flocks outside breeding season.
Breeding. Season Mar–Jun, egg-laying Apr. Nest a tightly woven cup of black rootlets, tree-fern stems and dried leaves, lined with dried grass and some feathers, placed 1·3–7·6 m up in aerial leaf litter trapped in vegetation or vines (unique nest-site among parulids), larger *Cecropia* leaves forming effective roof over open cup; one nest was in tree cavity. Clutch 2 eggs, occasionally 4; no information on incubation and fledging periods.
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Puerto Rico and the Virgin Islands EBA. Listed as a species of conservation concern by US Fish & Wildlife Service. Generally uncommon to locally common. Remaining habitat quite restricted, and global population was believed no more than 300 pairs in two main populations, at El Yunque and in Maricao State Forest; recent more accurate counts suggest population of 1830 individuals. Some habitat degradation has occurred as a result of building of roads and communication structures in mountain forests, and the two main populations are now quite isolated from each other. At present, enough protected undisturbed habitat survives to prevent this species from being in immediate danger; its small population size and very small range, however, mean that it is vulnerable to natural disasters (e.g. hurricanes) and any future habitat modification.
Bibliography. Anadón-Irizarry (2006), Anon. (1989, 2002, 2009f), Arroyo-Vazquez (1992), Butchart & Stattersfield (2004), Collar *et al.* (1992), Cruz & Delannoy (1984a, 1984b), Curson *et al.* (1994), Gochfield *et al.* (1973), Kepler & Parkes (1972), Raffaele (1989), Raffaele *et al.* (1998), Rodríguez-Mojica (2004b), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Willis (1972b).

Genus *CATHAROPEZA* P. L. Sclater, 1880

42. Whistling Warbler

Catharopeza bishopi

French: Paruline de Saint-Vincent **German**: Pfeifwaldsänger **Spanish**: Reinita de San Vicente

Taxonomy. *Leucopeza bishopi* Lawrence, 1878, St Vincent.
Appears to be closely related to, and sometimes regarded as an aberrant member of genus *Dendroica*, from which it differs in having characteristic tail-cocking habit; perhaps closest to *Dendroica plumbea*, *Dendroica pharetra* and *Dendroica angelae*, which it resembles in retaining distinctive immature plumage throughout first year until first complete moult. Monotypic.
Distribution. St Vincent, in S Lesser Antilles.



Descriptive notes. 14·5 cm; 13·5–19 g. Relatively long-tailed parulid, tail frequently held cocked. Has blackish-grey head, upper throat and upperparts, bold white eyering, whitish loral spot, small white spots at tip of outer two or three rectrices; whitish below, blackish-grey breastband and dark grey flanks; iris dark; bill blackish; legs pinkish-flesh. Sexes similar. Juvenile has head and body mostly dusky brown, with little contrast between upperparts and underparts, lacks eyering and breastband; first-year head and upperparts dark olive-brown, narrower and buffier eyering, cinnamon-buff below, indistinct olive-brown breastband. VOICE. Song a series of short, rich, whistled notes, starting soft and relatively low-pitched, then rising rapidly in pitch with crescendo effect, and ending with 2 or 3 emphatic notes; also a less common and shorter three-part song, consisting of a series of double notes followed by a series of short, downslurred notes on even pitch and ending with crescendo. These two songs may correspond respectively to Type 1 and Type 2 songs of many *Dendroica* species, but no detailed analysis yet done. Usual call a soft, low-pitched "tuk" or "tchuk"; also a harsher "tuk", given in agitation.
Habitat. Occurs mainly in primary rainforest and palm brakes, at 300–600 m; less commonly to 1100 m in elfin forest, and in humid secondary forest and forest edges.
Food and Feeding. Feeds mainly on insects and other arthropods; at least one record of a lizard being eaten. Forages mainly by hopping slowly through understorey and lower canopy, gleaning from leaves and picking prey from crevices in branches and tree trunks; also hangs acrobatically to search undersides of leaves and buds. Generally singly and in pairs.
Breeding. Season Apr–Aug, egg-laying usually Apr–Jul; begging juveniles seen Jun to early Aug. Nest a cup, placed low in sapling; clutch 2 eggs. No other information.
Movements. Sedentary.
Status and Conservation. ENDANGERED. Restricted-range species: present in Lesser Antilles EBA. Locally fairly common. Total population in 1986 estimated at 1500–2500 singing males. Primary forest on which this species largely depends has been extensively cleared, and estimated that as little as c. 80 km² of preferred habitat remains; this is little more than half of estimated available habitat in early years of 20th century. Its tolerance of suboptimal secondary forest will probably help it to survive, at least in short term. As well as clearance of forest, has suffered habitat loss caused by volcanic eruptions; at least two eruptions of volcano Soufrière occurred in 20th century, destroying large tracts of rainforest in N mountains, but the warblers returned as soon as regeneration of vegetation took place.
Bibliography. Andrle & Andrle (1976), Anon. (2009f), Butchart & Stattersfield (2004), Carr *et al.* (1990), Collar *et al.* (1992), Curson *et al.* (1994), Evans (1990), Kepler & Parkes (1972), Mountfort & Arlott (1988), Raffaele *et al.* (1998), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

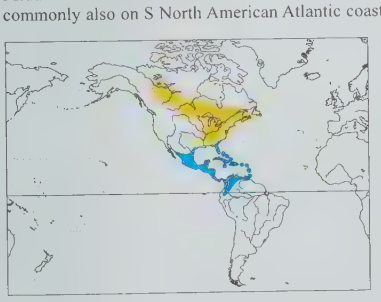
Genus *MNIOTILTA* Vieillot, 1816

43. Black-and-white Warbler

Mniotilta varia

French: Paruline noir et blanc **German**: Kletterwaldsänger **Spanish**: Reinita Trepadora

Taxonomy. *Motacilla varia* Linnaeus, 1766, Santo Domingo, Dominican Republic.
Closely related to *Dendroica* and has sometimes been placed in that genus. Has hybridized with *Dendroica cerulea* and *Dendroica fusca*. Monotypic.
Distribution. Breeds in C & S Canada (from NE British Columbia, extreme SE Yukon and SW Northwest Territories E to Newfoundland and Nova Scotia) and S in E USA to Gulf states (excluding Gulf coastal region). Migrates to region from Gulf of Mexico coast and Florida S throughout Middle America and Caribbean to NW South America (mainly in Andes S to Peru), wintering less commonly also on S North American Atlantic coast and in Baja California.



Descriptive notes. 13 cm; 8·8–15·2 g. Unmistakable, fairly stocky and relatively short-tailed parulid with boldly striped black-and-white plumage and distinctive tree-climbing behaviour. Male breeding is brightest and purest black and white, and has black throat and ear-coverts; tail has white spots near tip of outer two rectrices; iris dark; bill blackish, paler base of lower mandible; legs dark greyish. Non-breeding male is marginally duller, with throat mottled whitish. Female is duller overall than male, with white of underparts less pure (especially in non-breeding plumage), grey ear-coverts, whitish throat, and flank streaks greyer and less bold. Juvenile has upperparts mottled blackish-brown and buffy white, underparts pale buffy-brown with diffuse brownish streaks, becoming paler on belly and undertail-coverts; first-year male in autumn like adult female but on average brighter, with flank streaks bolder and blacker, by spring resembles adult male but slightly duller and remiges, rectrices, primary coverts and alula noticeably worn and brown; first-year female in autumn relatively dull, with pale buff wash on lores, ear-coverts and underparts, and flank streaks greyer and less distinct than on adult. VOICE. Two song types. Type 1 song a fairly long series of very high-pitched, thin, squeaky double notes, often preceded by single note. Type 2 song similar but faster, longer in duration and more varied in pitch. Usual call a sharp, hard "tick", accelerated into chatter in alarm; flight call a soft, thin "seet" or "seet-seet", often given also during foraging.
Habitat. Breeds in variety of deciduous and mixed forests and woodlands, especially in damp areas, favouring mature forest over earlier successional stages. Uses all kinds of woodland and scrub on migration. In winter found in similarly wide variety of woodland and scrub habitats, including plantations, mangroves and open areas with scattered trees, such as parks and gardens; mostly at 500–2000 m, but ranges down to sea-level and up to 3000 m.
Food and Feeding. Feeds on insects and other arthropods; takes fruit occasionally in winter. Forages at all levels, by climbing up and down trunks and main branches of trees in manner of a nuthatch (Sittidae), while probing bark crevices for prey. Will also glean from outer branches of trees; sometimes hover-gleans. Has been observed to attend an army-ant (Ectoninae) swarm and to follow termite (Isoptera) trails. When on the non-breeding grounds, individuals will join mixed-species foraging flocks.
Breeding. Season late Apr to early Aug (mainly May–Jul), egg-laying mainly Apr–Jun. Nest a cup of grass, leaves, bark strips, moss and rootlets, lined with hair, placed on ground, often under fallen log or at base of tree, sometimes in roots of fallen tree. Clutch 4–5 eggs, occasionally 6; incubation period 10–12 days; nestling period 8–12 days; adults will feign injury to distract attention from nest. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*), rate of parasitism increasing in recent decades: studies of nest records from late 19th century to early 20th indicated that 12 out of 120 nests (10%) were parasitized, but in 1970s in Ontario 9 out of 43 nests (20·9%) parasitized.
Movements. Short-distance to long-distance migrant. Leaves breeding grounds during Jul and early Aug, N birds moving S on broad front through E North America, then following Gulf coast, or crossing Gulf, or moving through Florida and Caribbean to reach wintering grounds; autumn migration appears to be quite protracted, some reaching South America by early Sept (exceptionally in late Aug), others lingering in North America until Oct or later. Spring migration begins in Mar, and birds follow same basic routes to reach breeding grounds from late Mar in S, early May in N. Common in Bermuda in autumn and winter; casual throughout much of W North America, mainly in autumn but with many Californian spring records, and on W North American coast, E USA and Ontario in winter. Vagrant in Alaska, Britain, Ireland, Iceland and Faeroes.
Status and Conservation. Not globally threatened. Generally common throughout range. No evidence of overall change in status, although local increases recorded, and also declines in areas suffering severe forest fragmentation. Studies of Breeding Bird Survey routes showed 58% decline on routes that were sprayed with pesticides and 39% increase on unsprayed routes, indicating that pesticide use, as well as habitat fragmentation, may cause local declines.
Bibliography. Arendt (1992), Askins *et al.* (1992), Blake & Loiselle (1992), Burtt (1980), Davis (1989), Hardy (1974), Hill & Hagan (1991), Howell & Webb (1995), Kricher (1995), Kricher & Davis (1992), Lack (1976), Lewington *et al.* (1991), McCarthy (2006), Ornat & Greenberg (1990), Osterhaus (1962), Parkes (1978), Pomara *et al.* (2003), Robbins, Dowell *et al.* (1992).

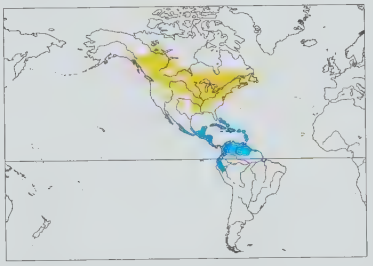
Genus *SETOPHAGA* Swainson, 1827

44. American Redstart

Setophaga ruticilla

French: Paruline flamboyante **German**: Schnäpperwaldsänger **Spanish**: Candelita Norteña

Taxonomy. *Motacilla ruticilla* Linnaeus, 1758, Virginia, USA.
Genus considered closest to *Dendroica*, and some authors have suggested that it be subsumed in latter; probably close also to *Mniotilta*. Has hybridized with *Parula americana* and probably also with *Vermivora ruficapilla*. W breeding birds described as a geographical race, *tricolor*, but generally considered inseparable from those elsewhere in species' range. Monotypic.
Distribution. Breeds from C & S Canada (NW British Columbia, extreme S Yukon and SW Northwest Territories E to Newfoundland and Nova Scotia) S through much of C & E USA (but excluding most of SW & SE). Migrates to Middle America (S from NW & C Mexico), Caribbean and NW South America (excluding Amazon Basin); small numbers winter on coast of SE USA (S Florida), and also rarely in SW USA (S California).



Descriptive notes. 13 cm; 6·5–12 g. Highly distinctive parulid; elongated rictal bristles and broad-based bill are adaptations for flycatching behaviour. Male is mostly glossy black, with white lower underparts, and bright orange patches on wing, base of tail (except central feather pair) and side of breast; iris dark; bill and legs blackish. Female has grey head, olive upperparts and whitish underparts, orange patches of male replaced with yellow, patch on wing also smaller in extent. Juvenile has greyish olive-brown head and upperparts, narrow pale buff wingbars on greater and median upperwing-coverts, pale yellow bases on outer four rectrices, whitish throat, dusky breastband, off-white lower underparts; first-year male in autumn resembles adult female but breast side more orange-yellow, by spring generally scattered black feathers in plumage; first-year female duller than adult, has very little yellow (sometimes none) in wing, paler yellow patches on breast side and more uniform greyish-olive head and upperparts. VOICE. Two song types. Type 1 song more commonly given, a short but variable series of high-pitched buzzy notes ending with lower (occasionally higher) note. Less common Type 2 song similar but more variable, lacks accented terminal note. Usual call a sharp, sweet "chip" or "tsip", similar to that of *Dendroica petechia* but thinner in quality; flight call a clear, penetrating and rising "sweet", given also as contact call when on ground.

Habitat. Breeds in open deciduous and mixed woodlands, forest clearings and tall scrub. Adult males tend to occupy territories in earlier-successional forest with dense shrub layer, and first-year males more often found in later-successional forests with more sparse shrub layer, at least in parts of breeding range. In W breeding range favours moist woodland areas such as willow (*Salix*) and alder (*Alnus*) thickets, and riparian woodland; early-successional forest containing more willows and less aspen (*Populus tremuloides*) preferred in aspen-dominated forest in Alberta (Canada). Deciduous forest preferred over coniferous. Found in all kinds of woodland and scrub during migration. In winter uses variety of woodland and scrub habitats, including parks and areas with tall trees in towns (especially in Caribbean) and mangroves, from sea-level to 1300 m, in Ecuador occasionally to 2800 m. In studies in Venezuela and Puerto Rico, adult males tended to occur in forest habitats, females and first-years tending to occupy "suboptimal" habitats, e.g. scrub, mangroves and dry scrubby woodland (it has been suggested that they may be in poor condition during breeding season as a result). In coastal Jamaica adult males tend to winter in mangroves, which have higher canopy, more open understorey, higher relative humidity and higher insect biomass than does the contiguous scrub where females tend to winter.

Food and Feeding. Feeds almost entirely on insects; occasionally takes seeds and berries in late summer, on migration, and in winter. Forages at all levels, but mainly in subcanopy. Forages principally by aerial flycatching (long toes and relatively weak legs, but well-developed thigh muscles, possible adaptations for rapid jumping take-off to catch prey); also perch-gleans and hover-gleans. Tends to perch-glean for energy-rich food such as lepidopteran larvae in summer, and to use flycatching more in winter. Spends more time in foraging, and at faster rate, but with lower success rate, in winter months. Occasionally gleans from tree trunks and even from ground.

Breeding. Season late May to Jul. Poly-territorial polygyny recorded, perhaps a result of locally low proportion of males. Nest a neat cup of grass, bark strips and spider webs, lined with feathers, hair and rootlets, placed 2–8 m up in tree or bush; sometimes uses open cup-nest of other species, such as *Dendroica petechia* or Red-eyed Vireo (*Vireo olivaceus*). Clutch 2–5 eggs, usually 4; incubation period 10–13 days; nestling period 8–9 days, but chicks may leave nest after 7 days if disturbed. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); rate of parasitism 6–74% in three studies in New York, 15·8% in Quebec, 20% in Ontario, and 64% in British Columbia; in studies in Illinois, 2 of 27 nests (7%) parasitized before 1900 and 15 of 41 nests (37%) after 1900, suggesting increase in parasitism over last 100 years or so; in W Canada, females respond to presence of cowbirds more in fragmented forest than in contiguous forest, presumably because, in former habitat, cowbirds more common and the birds more familiar with them.

Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from Jul, mainly in Aug and Sept, moving S and leaving North America on broad front, birds following Gulf of Mexico coast, crossing Gulf to Yucatán and moving through Caribbean via Florida; most arrive in South America during Oct. Spring migration begins in late Mar and follows much the same routes, although majority move N through Central America and across Gulf coast, arriving on breeding grounds from mid-Apr in S, late May in far NW. Studies of fat load suggest that this species is not capable of single long-distance flights such as those regularly undertaken by e.g. *Dendroica striata*. Common in Bermuda in autumn and winter. Casual but regular in some numbers on W coast of USA in autumn and winter (S California). Vagrant to W Alaska, Iceland, Britain, Ireland, France, Azores, N Brazil and Chile, Revillagigedo and Clipperton Is (off W coast of Mexico) and Cocos Is (off Pacific coast of Costa Rica).

Status and Conservation. Not globally threatened. Generally common throughout range. Has declined since middle of 20th century, mainly as a result of loss of its preferred forest habitat; at present, this decline not significant over breeding range as a whole, but significant recent declines have occurred in N New England, Ohio, Nova Scotia and New Brunswick. In contrast, recent increases in Connecticut and Wisconsin, also in Quebec (where thought to be in response to forest regeneration after logging). Estimated breeding densities include 15–21·3 birds/10 ha in N New York, 5–15/10 ha in Quebec, 13/10 ha in Tennessee, 21/10 ha in Maryland and 29/10 ha in Washington, deciduous forests generally holding highest densities. Density estimates on wintering grounds include 3·8 and 7·5/10 ha on Grand Cayman Is (Caribbean), 14– 56/10 ha in Jamaica, 10/10 ha in Mexico, 17·5/10 ha in Puerto Rico and 20–52/10 ha in Belize; numbers thought to be related to prey availability in tree foliage, and possibly to influence of competition for prey from other birds.

Bibliography. Ambuel & Temple (1983), Bennett (1980), Boxall (1983), Burleigh (1944), Commisso (1988), Ficken (1961, 1962a, 1962b, 1963, 1964), Ficken & Ficken (1965, 1967), Hill & Hagan (1991), Hobson & Villard (1998), Holmes (1986), Holmes & Sherry (1988), Holmes, Sherry & Bennett (1978), Holmes, Sherry & Reitsma (1989), Holmes, Sherry & Sturges (1986), Howe (1974), Howell & Webb (1995), Hunt (1996), Keast *et al.* (1995), Lefebvre *et al.* (1992), Lemon, Cotter *et al.* (1985), Lemon, Dobson & Clifton (1993), Lemon, Monette & Roff (1987), Lemon, Perreault & Lozano (1996), Lemon, Perreault & Weary (1994), Lemon, Weary & Norris (1992), Lewington *et al.* (1991), Lovette & Holmes (1995), Lozano *et al.* (1996), Mannan (1979), Marra & Holmes (2001), Marra *et al.* (1993), McNally & Lemon (1985), Morse (1973), Omland & Sherry (1994), Osterhaus (1962), Parkes (1961), Parrish & Sherry (1994), Procter-Gray (1991), Procter-Gray & Holmes (1981), Robbins, Dawson & Dowell (1989), Robinson & Holmes (1994), Rohwer *et al.* (1983), Salaberry *et al.* (1992), Sallabanks (1993), Secunda & Sherry (1991), Shackell *et al.* (1988), Sherry (1979), Sherry & Holmes (1989, 1992, 1996, 1997), Sibley (1994), Sodhi *et al.* (1999), Spellman *et al.* (1987), Stoltz *et al.* (1992), Weary *et al.* (1994b), Wetmore (1949), Whitcomb *et al.* (1981), Yezerinac (1993).

PLATE 55 ➤



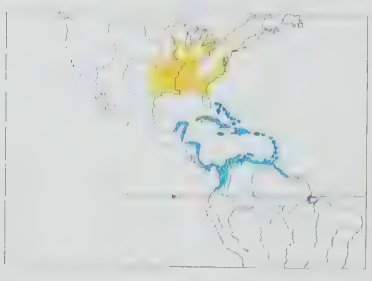
Genus *PROTONOTARIA* S. F. Baird, 1858

45. **Prothonotary Warbler**

Protonotaria citrea

French: Paruline orangée **German**: Zitronenwaldsänger **Spanish**: Reinita Protonotaria
Other common names: Golden Swamp Warbler

Taxonomy. *Motacilla citrea* Boddaert, 1783, Louisiana, USA.
Affinities uncertain: a recent study indicates close genetic relationship with *Vermivora cyanoptera* and *V. chrysoptera* and with *Limnothlypis swainsonii*. Has hybridized with *Dendroica petechia*. Monotypic.
Distribution. Breeds in SE Canada (extreme SE Ontario) and E USA from Great Lakes area S locally (excluding Appalachians) to W Texas and N & C Florida. Migrates to area from SE Mexico S to extreme NW South America, and Caribbean.



Descriptive notes. 14 cm; 13·6–20 g. Male has brilliant golden-yellow head, throat and breast, prominent black eye; upperparts green, wing and tail blue-grey, tail with extensive white on inner webs of all except central rectrices; belly slightly paler than breast, undertail-coverts white; fresh autumn plumage marginally duller; iris dark; bill black, in autumn and winter with flesh-coloured base; legs blackish-grey. Female is similar to male in pattern, but considerably duller, especially on head, with crown and nape heavily washed olive and not contrasting with mantle, duller yellow on throat and breast, less white in tail. Juvenile is mostly dull brownish-olive on head and body, with side of head washed yellowish and lower underparts yellowish-white, washed greyish-olive on flanks; first-year male duller than adult, especially in autumn, when more like adult female but on average brighter and has more white in tail; first-year female rather duller than adult, with heavier olive wash on head and breast, and less white in tail. Voice. Song a series of 5–12 loud, clear ringing "sweee" notes on one pitch, each note slightly upslurred, somewhat reminiscent of call of Solitary Sandpiper (*Tringa solitaria*). Alternative song, given only rarely and often in aerial display during interactions with female; similar to typical song, but longer and more complex, ending with warble. Usual call a loud ringing "tsip" or "chip", rather similar to that of *Limnothlypis swainsonii*, also a softer and more sibilant "psit"; flight call a long, thin, clear "seeep", also sometimes given by perched individual.
Habitat. Breeds in flooded or swampy forest, riparian corridors, and mature woodland where there are dead trees surrounded by standing or slow-moving water and with cavities for nesting. Preference for wet woodland maintained on migration, when occurs also in dry woodland, sometimes in highland areas. In winter primarily in mangroves, but also in swampy lowland forests and occasionally drier woodland and scrub, mostly below 1300 m.
Food and Feeding. Feeds mainly on insects and other arthropods, including crustaceans and molluscs on occasion; also takes fruits, seeds and nectar, especially in winter, when it may visit artificial feeders for hummingbirds (Trochilidae); one record of a lizard being eaten. Forages at low to middle levels; most frequently explores crevices in bark of tree trunks and logs, in manner reminiscent of that of *Mniotilta varia* or *Dendroica dominica*. Singles or pairs may join mixed-species foraging flocks on winter grounds and on migration.
Breeding. Season Apr–Jul; regularly double-brooded in S of breeding range. Nest a cup of mosses, feathers and roots, placed in natural cavity in dead tree in standing water, usually 1·5–3 m above water level; will also use old nest of woodpecker (Picidae) or old excavation of chickadee (Paridae), and one record of old nest of Red-winged Blackbird (*Agelaius phoeniceus*) being used; in some areas makes use of nestboxes (apparently preferring those made from cardboard milk cartons); male may partially construct "dummy" nests early in season. Clutch 3–7 eggs, usually 4–6; incubation period 12–14 days; nestling period 10–11 days, but young near fledging age can swim if forced to leave nest prematurely. Despite being a cavity-nester, suffers quite frequent brood parasitism by Brown-headed Cowbird (*Molothrus ater*); recorded rates of parasitism between 10·7% and 26·9%. Nesting success frequently adversely affected by severe flooding during breeding season, e.g. in Wisconsin study success during a flood year was only a third of that in normal year; in study in Virginia first-year females found to lay fewer eggs, and to have lower hatching success, than older females; nest contents preyed on by Northern House Wrens (*Troglodytes aedon*) and deer mice (*Peromyscus*).
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds mainly in late Jul and early Aug, those breeding W of Appalachians moving S through Mississippi Valley, across Gulf of Mexico (some probably following Gulf coast, instead) and through E Central America to

wintering grounds; those breeding E of Appalachians follow Atlantic coast and lowlands to Florida, some then turning W and crossing Gulf, others moving S through Florida and Caribbean; arrive on wintering grounds from Sept. Spring migration begins in Feb and follows much the same route, with arrival on breeding grounds from late Mar in S, early May in N. At least one record from Costa Rica in Jun. Common in Bermuda in autumn and occasionally overwinters there. Several winter records from S USA; casual in Ecuador in winter. Vagrant throughout much of W North America in autumn, in NE North America (N to James Bay, Ontario, Labrador, Newfoundland and Quebec), NW Mexico (Baja California), Clipperton Is (off Pacific coast of Mexico), and Galapagos Is and Brazil in winter.
Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Locally common throughout most of range; considered endangered in Canada, where now very rare (S Ontario) following recent declines. Population limited by available habitat. Highest densities in lower Mississippi alluvial plain, C Panhandle of Florida and E North Carolina, with up to 50 or more birds per Breeding Bird Survey route recorded in these areas; elsewhere, density estimates include 0·6 pairs/ha in S Illinois and 1·2/ha in W Tennessee. Provision of nestboxes can increase breeding density significantly, to as many as 8 pairs/ha in riverine habitat. In USA, declines in recent decades noted in Mississippi Valley and locally in SE, these probably due to destruction of floodplain-forest and drainage of wetlands, but wetland creation through building of reservoirs may have led to increase in this species' numbers in other areas. Suffers locally from competition for nest-sites by Northern House Wren, which usurps this species' nest-sites and often destroys its eggs; S spread of this wren into core breeding range may also have adverse effect on populations locally.
Bibliography. Anon. (2002), Austen *et al.* (1994), Blem & Blem (1991, 1992), Blem *et al.* (1999), Brush (1994), Bryan *et al.* (1987), Davies & Komar (2003), Dietz (1990), Flaspohler (1996), Guillory (1987), Klein *et al.* (2004), Kowalski (1986), Lefebvre *et al.* (1992), Moore (1990), Petit, D.R. & Petit (1987), Petit, K.E. & Tarvin (1990), Petit, L.J. (1989, 1991a, 1991b, 1999), Petit, L.J. & Petit (1988), Petit, L.J., Fleming *et al.* (1987), Petit, L.J., Petit *et al.* (1990a, 1990b), Walkinshaw (1953), Warkentin & Morton (1995).

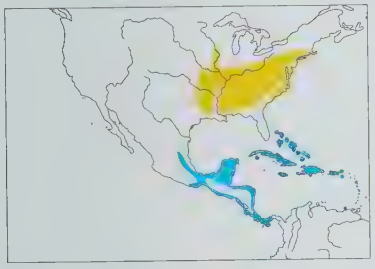
Genus *HELMITHEROS* Rafinesque, 1819

46. **Worm-eating Warbler**

Helmitheros vermivorum

French: Paruline vermivore **German**: Haldenwaldsänger **Spanish**: Reinita Gusanera

Taxonomy. *Motacilla vermivora* J. F. Gmelin, 1789, Philadelphia, Pennsylvania, USA.
Genus sometimes merged with *Lymnothlypis* but, despite superficial similarities, the two are apparently not closely related; has been suggested that genus may be closest to *Vermivora*. Monotypic.
Distribution. Breeds over much of E USA S of Great Lakes (excluding Florida Peninsula and much of S Atlantic coastal plain); distribution centred around Appalachians and adjacent areas. Migrates to lowlands of Middle America from S & E Mexico S to W Panama, and Caribbean.



Descriptive notes. 13 cm; 11·8–17·4 g. Head is rich buff, with broad blackish lateral crown-stripe and narrower blackish eyestripe; upperparts uniformly olive-brown; throat and breast rich buff, becoming paler and duller on lower underparts; iris dark; bill pale horn, darker culmen; legs pale flesh-coloured. Differs from superficially similar *Basileuterus tristriatus* in having richer buff head lacking blackish ear-coverts, longer and more pointed bill, no whitish patch below eye, no yellowish tone on lower underparts. Sexes similar. Juvenile is buffish overall, with rather indistinct dusky head stripes, pale cinnamon wingbars on greater and median upperwing-coverts; first-year similar to adult, but rusty fringes on tertials in fresh autumn plumage. Voice. Song a monotonous loud dry trill on even pitch similar to that of Chipping Sparrow (*Spizella passerina*), consisting of up to 27 notes per second. Also a flight song, given more rarely, similar but softer and with varied pitch. Usual call "zeep-zeep", often given several times in succession, by perched bird, and used also as flight call; sharp, sweet "chip" similar to that of *Limnothlypis swainsonii* but softer, is rarely heard away from breeding grounds.
Habitat. Breeds on wooded ravines and hillsides in deciduous and mixed woodlands with dense undergrowth, often near streams; appears to be reliant on large stands of primary forest or well-developed woodland with intact dense understorey. During migration uses all kinds of woodland, but maintains preference for those with dense understorey. In winter found in lowland tropical rainforest, and other deciduous and evergreen forests, usually below 1500 m, occasionally ranging up to 2000 m; in pine (*Pinus*) forests on Grand Bahama and in Cuba.
Food and Feeding. Feeds on insects, especially caterpillars, and other arthropods, especially spiders (Araneae). Forages primarily by gleaning in understorey, where it specializes in probing clusters of dead leaves, often hanging acrobatically to do so; this behaviour especially noticeable on wintering grounds, but performed throughout year. Sometimes forages on ground, turning over dead leaves, and creeps along branches of trees in manner of *Mniotilta varia*. In E Mexico (in Veracruz), has been recorded as attending swarms of army ants (Ecitoninae) to feed on insects disturbed by the ants. Tends to be solitary and territorial on wintering grounds, but may temporarily join mixed-species foraging flocks which pass through territory.
Breeding. Season May–Jul, egg-laying May–Jun. Nest a cup of dead leaves, lined with hair, moss and stems of maple (*Acer*) leaves, well hidden on ground, often under bush. Clutch 3–6 eggs, usually 4–5; incubation period generally 13 days, but extremes of 11 and 17 days recorded; nestling period 10 days; female may feign injury to distract attention from nest. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); recorded rates of parasitism include 4·8–28·6% in Connecticut, 9 of 12 nests (75%) at fragmented-forest site in Missouri (compared with none of 27 nests in nearby unfragmented forest), and 40 of 106 nests (38%) in Illinois.
Movements. Short-distance to medium-distance migrant. Leaves breeding grounds mainly from late Jul, those in E breeding range moving S along Atlantic coast to Florida and then across to Caribbean; W breeders head S through Mississippi Valley to Gulf of Mexico coast, where most fly across to Yucatán, although some follow Gulf coast to wintering grounds; arrival in winter quarters from Sept, most arriving after mid-month. Spring migration basically the reverse along same route, although a slightly more W bias, arriving on Gulf coast of Texas from mid-Mar (most during early Apr); arrival on breeding grounds from mid-Apr in S, mid-May in N. Regular in Bermuda in autumn, a few overwintering in most years. Casual in Midwest, Great Lakes region and Nova Scotia in spring. Vagrant in W North America, S Canada (Quebec, New Brunswick, Newfoundland), NW Mexico (Baja California), Colombia and Venezuela.
Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Generally fairly common throughout range. Discontinuous distribution; has bred in Kansas. Declines noted in many areas as a result of forest fragmentation, which both degrades breeding habitat and allows access by Brown-headed Cowbird. Breeding densities estimated at up to 100–150 pairs/100 acres (c. 40–60 pairs/40 ha) in suitable habitat in Maryland, 4·4 pairs/10 ha in SW Connecticut and up to 9·9 pairs/10 ha in West Virginia; in fragmented forest in Illinois, 3·1 territories/40 ha recorded in 1985, but this declined to 0·6/40 ha by 1989, probably as a result of increasing rates of brood parasitism and nest predation. On wintering grounds, densities of up to 40 birds/km² recorded in primary forest in Tuxtla Mts, in E Mexico (Veracruz).
Bibliography. Anon. (2002), David & Gosselin (2002b), Diamond & Smith (1973), Gale *et al.* (1997), Greenberg (1987a, 1987b), Hanners & Patton (1998), Lack & Lack (1972), Remsen & Parker (1984), Tramer & Kemp (1980), Whitcomb *et al.* (1981).

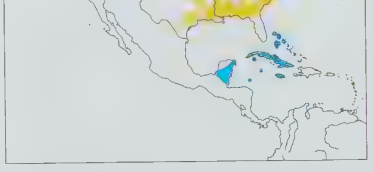
Genus *LIMNOTHLYPIS* Stone, 1914

47. **Swainson's Warbler**

Limnothlypis swainsonii

French: Paruline de Swainson **German**: Swainsonwaldsänger **Spanish**: Reinita de Swainson

Taxonomy. *Sylvia Swainsonii* Audubon, 1834, no locality = Edisto River, near Charleston, South Carolina, USA.
Affinities not known. Genus has been merged with *Helmitheros* but, despite superficial similarities, the two are apparently not closely related; recent studies indicate that it is genetically close to *Vermivora cyanoptera* and *V. chrysoptera* and to *Protonotaria citrea*. Birds breeding in Appalachians described as a geographical race, *alta*, supposedly whiter below and browner (less olive) above in worn spring plumage; in fresh autumn plumage, however, more or less inseparable from lowland birds. Treated as monotypic.
Distribution. Breeds in SE USA S from S Missouri, SC Appalachians (West Virginia) and Virginia, and E from E Texas and SE Oklahoma, but excluding Florida Peninsula. Migrates to W Caribbean (Bahamas, Cuba, Jamaica, Swan Is and Cayman Is) and NE Central America (mainly Yucatán Peninsula and Belize).



Descriptive notes. 14 cm; 14·3–20·4 g. Distinctive parulid with long, deep-based and pointed bill. Has crown warm brown, long whitish supercilium, dark eyestripe; upperparts brownish-olive; throat and underparts whitish (with pale yellowish wash in fresh autumn plumage); iris dark; bill flesh-coloured, darker culmen; legs flesh-coloured. Sexes similar. Juvenile has head and body mostly tawny-brown, cheek slightly paler, narrow pale cinnamon wingbars on greater and median upperwing-coverts, and pale buff lower underparts. Voice. Song loud and distinctive, 2–4 (usually 3) downslurred whistles followed by a series of 3 more rapid, descending notes, often sounding like slow warble; can be transcribed as "wee wee wee wee-tu-weeu". Also a rarely heard "whisper-song". Usual call a loud, sweet "sship", similar to that of *Helmitheros vermivorum* or *Protonotaria citrea*, but louder and more forceful; flight call a high-pitched, thin, slightly buzzy "swees", sometimes doubled.
Habitat. Breeds in two distinct habitats. Lowland populations in swampy woodlands, cane brakes with dense undergrowth, and riparian thickets, also (where cane brakes absent) woods with dense undergrowth of palmetto or sweet pepperbush (*Clethra alnifolia*); in Great Dismal Swamp (SE Virginia–NE North Carolina) prefers well-drained areas of early-successional forest, such as gaps and small clearings which are closing over again; in Georgia and through much of lowland range prefers more open areas of forest with incomplete canopy, more cane brakes, and denser understorey and leaf litter; in E Texas also in early seral pine (*Pinus*) forests with dense understorey. Appalachian populations use rhododendron (*Rhododendron*) and laurel thickets along streams and rivers and in ravines and canyons, up to c. 1000 m. During migration uses wooded areas with dense undergrowth, especially swampy woods. In winter found in tropical and semi-deciduous having dense undergrowth and extensive leaf litter; locally also in wooded gardens and mangroves. Appears to specialize in feeding on invertebrate prey on forest floor, beneath leaf litter, and may be reliant on forest habitat with well-developed canopy and abundant subsurface leaf-litter fauna; has also been suggested as being adapted to drier forest on winter grounds, as invertebrates less prone to desiccation deep within litter.
Food and Feeding. Feeds mainly on insects and other arthropods; recorded also as eating small lizards. Forages on ground in leaf litter, tossing leaves aside and turning them over with its bill; generally picks prey from within litter, rather than from surface. Also gleans low in bushes and on fallen logs, and occasionally performs flycatching sallies. In Cuba regularly seen to follow foraging *Seiurus aurocapilla*, seizing insects disturbed by latter.
Breeding. Season May–Jul, exceptionally to early Aug; at least one recent report of double-brooding. One case of probable polygyny reported. Nest a bulky cup of leaves, moss and pine needles, lined with moss, grass and rootlets, placed 0·7–3 m up in bush, cane or vine. Clutch 3–5 eggs, usually 3; frequently lays replacement clutches if first breeding attempts fail; incubation period 13–15 days; nestling period 10–12 days. Nests parasitized frequently in some areas by Brown-

On following pages: 48. Ovenbird (*Seiurus aurocapilla*); 49. Northern Waterthrush (*Seiurus noveboracensis*); 50. Louisiana Waterthrush (*Seiurus motacilla*); 51. Kentucky Warbler (*Oporornis formosus*); 52. Connecticut Warbler (*Oporornis agilis*); 53. Mourning Warbler (*Oporornis philadelphia*); 54. MacGillivray's Warbler (*Oporornis tolmiei*).

headed Cowbird (*Molothrus ater*), but such parasitism unknown until 1917; has been suggested that, in Virginia, at least, this species may respond to parasitism by laying (or re-laying) late in season, when cowbirds have finished egg-laying.

Movements. Short-distance to medium-distance migrant. Leaves breeding grounds from Aug, arriving in winter quarters from mid-Sept; those wintering in Central America move S to Gulf of Mexico coast, where most probably fly across to Yucatán, although some follow Gulf coast; those wintering in Caribbean move S to Florida and then across. Spring migration begins in Mar and is essentially along same routes but in reverse, with arrival on breeding grounds from mid-Apr. Casual in spring N to Wisconsin and Ontario and W to Nebraska and Kansas, but these spring "overshoots" are far less common than are those of other S-breeding parulids; casual also in Honduras and Puerto Rico and Virgin Is in winter. Recently recorded in winter in Hispaniola, but status there unclear. Vagrant in W Texas, Midwest, SW & NE North America, El Salvador and Bermuda in autumn and winter.

Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Uncommon to locally fairly common. Has declined recently, particularly in NW of breeding range, and now almost extirpated in Illinois. Habitat degradation the main cause of decline, clearing of cane brakes from understorey often causing local extinctions. Fragmentation of habitat also leads to increased brood parasitism by Brown-headed Cowbird, and this is maybe becoming an increasing threat. Estimates of breeding density include 10 males/40 ha in oak–gum (*Quercus–Nyssa*) stands and swamps in Louisiana; 7 birds/40 ha in floodplain-forest and 4/40 ha in broadleaf deciduous forest in South Carolina; and in oak–gum–cypress (*Quercus–Nyssa–Taxodium*) stands in SE, 17/40 ha in those at sapling-poletimber stage but only three/40 ha at sawtimber stage in same area. In winter considered widespread and fairly common in Blue Mts of Jamaica, where densities of 24–32 birds/40 ha reported, and estimated that up to 25,000 winter in the Blue and John Crow Mountains National Park. Recent study indicated that substantial mixing of breeding populations may occur in wintering areas and that conservation of all main breeding populations may be necessary in order to preserve genetic diversity. Has also been suggested that management of forest through thinning and encouraging regeneration of cane brakes may help to maintain populations in some areas.

Bibliography. Anon. (2002), Bond (1985), Brown & Dickson (1994), Carrie (1996), Easterla (1975), Eaton (1953), Eddleman *et al.* (1980), Graves (1992, 1996a, 2001, 2002), Hamel *et al.* (1982), Kirkconnell *et al.* (1996), Klein *et al.* (2004), Meanley (1966, 1968, 1969, 1971a, 1971b, 1982), Meanley & Bond (1950), Miller (2003), Montejo Díaz & McAndrews (2004), Norris (1963), Patterson (1970), Raffaele (1989), Raffaele *et al.* (1998), Rimmer & McFarland (1998b), Simpson & Stephens (1994), Sims & DeGarmo (1948), Somershoe *et al.* (2003), Strong (2000), Strong & Sherry (2001), Thomas *et al.* (1996), Weske & Bridge (1976), Winker & Graves (2008), Wunderle & Waide (1993b).

Genus *SEIURUS* Swainson, 1827

48. Ovenbird

Seiurus aurocapilla

French: Paruline couronnée **German**: Pieperwaldsänger **Spanish**: Reinita Hornera

Taxonomy. *Motacilla aurocapilla* Linnaeus, 1766, "on the coast of Hispaniola, about ten leagues [c. 56 km] from land".

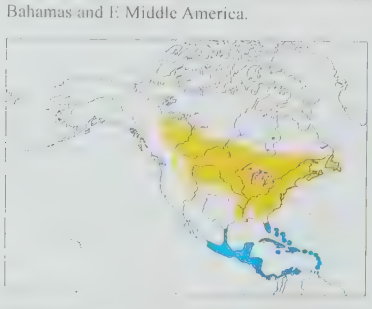
Rather distinct in many ways from the other two members of genus. Recent studies of mitochondrial DNA indicate that this species is sister to all other true parulids, and has been proposed that it be placed in its own monotypic genus, retaining current name of genus (of which it is the original type). Proposed race *canivirens* (described from Georgia, in SE USA) considered indistinguishable from nominate. Three subspecies recognized.

Subspecies and Distribution.

S. a. aurocapilla (Linnaeus, 1766) – breeds S Canada (S Northwest Territories and NE British Columbia E to S Quebec and Nova Scotia) and S in E USA to N Louisiana and N Georgia; migrates to non-breeding grounds in region from S Texas and Florida S through Middle America to Panama and in Caribbean, occasionally S to N Colombia and Venezuela.

S. a. cinereus A. H. Miller, 1942 – breeds lower E slope of Rocky Mts and adjacent Great Plains, from S Alberta and Montana S to Colorado; migrates to W Middle America.

S. a. furvior Batchelder, 1918 – breeds Newfoundland, in SE Canada; migrates mainly to Cuba, Bahamas and E Middle America.



Descriptive notes. 15 cm; 15·4–26 g. Distinctive, largely terrestrial parulid with characteristic head-bobbing, tail-flicking gait. Nominate race has dark olive-green head and upperparts, distinctive head pattern of broad orange crownstripe bordered with black, and white eyering (crownstripes less obvious in fresh autumn plumage owing to narrow olive feather tips); white below, broad black malar stripe, bold black streaks on breast and flanks; iris dark; bill dark grey-brown, flesh-coloured on most of lower mandible; legs bright pinkish-flesh. Sexes similar. Juvenile has olive-buff head and upperparts with pale eyering, indistinct dusky lateral crownstripes, dark streaks on upperparts, buffy wingbars on greater and median upperwing-coverts, pale buff throat and breast, becoming whitish on lower underparts, some dusky streaking on breast and fine dark streaks on flanks; first-year similar to adult, but narrow rusty edges on tertials in fresh plumage (early autumn). Race *cinereus* is slightly paler and greyer above than nominate; *furvior* is darker and less olive above than nominate, has heavier streaking below, also orange crownstripe duller and black lateral crownstripes broader. Voice. Typical song a series of 8–10 loud, emphatic double notes rising in volume and usually also in pitch, generally transcribed as "tee-cher tee-cher tee-cher..."; apparently female, as well as male, known to sing. Flight song, usually at dusk, more varied and rambling than normal song, but often ending with more typical song phrases. Usual call a sharp, dry "chip" or "tsuk", often repeated rapidly when agitated; flight call a thin, high-pitched "seee".

Habitat. Breeds in mature deciduous and mixed forest with dense understorey, also in jack pine (*Pinus banksiana*) woodland in Great Lakes region, and in forests consisting primarily of spruce–fir (*Picea–Abies*) in Newfoundland; abundance of leaf litter on forest floor an essential component of breeding habitat, as is a fairly large contiguous area of forest or mature woodland. In one study, breeding densities 40% lower in edge habitat adjacent to roads than in forest interior, and quality of habitat possibly lower within 150 m of a road (affecting overall population density); another study suggested that this species may use forest edges more than previously thought, and that forest edge might not necessarily be inferior habitat. Study in N Pennsylvania found that forest interior was avoided and edge habitat used in preference; eastern chipmunks (*Tamias striatus*) were very abundant in forest interior in this study area, and edge was used probably in order to reduce risk of nest predation. During migration, utilizes scrubby areas with dense undergrowth, as well as forest and woodland. In winter mainly in dense primary tropical rainforest, mostly below 1500 m but in Mexico to 2200 m; occurs also in well-developed second-growth forest with closed canopy, mangroves and coffee plantations in some areas; in Jamaica occurs in wet montane forest in highlands but in dry forest in lowlands, being replaced by *S. noveboracensis* in lowland rainforest. A well-developed understorey and abundant leaf litter important components of this species' preferred habitat at all seasons.

Food and Feeding. Feeds mainly on insects and other arthropods, including snails (Gastropoda), spiders (Araneae) and earthworms (Lumbricidae), also some seeds and berries on migration and in winter; has been recorded as eating small lizards and frogs. Forages on forest floor among leaf litter, walking in deliberate manner and frequently flicking over dead leaves to search for prey. Unlike *Limnothlypis swainsonii*, mainly gleans from surface of leaf litter, rather than turning leaves over and probing forest floor beneath them. In Florida, observed to follow a nine-banded armadillo (*Dasypus novemcinctus*) in order to prey on invertebrates disturbed from litter. In Cuba, foraging individuals regularly followed by *Limnothlypis swainsonii*, which picks up prey items disturbed by present species.

Breeding. Season May–Jul, egg-laying mainly May–Jun; single-brooded, but one record of male raising a second brood. Polyandry recorded, and has been suggested that this may occur regularly where shortage of females exists. Nest a relatively complex structure with arched roof, in shape of a miniature Dutch oven, made from grass, dead leaves, moss and rootlets, lined with fine grass and hair, placed on ground. Clutch 3–6 eggs, usually 4–5; incubation period 11·5–14 days; nestling period 8–11 days, though young may leave nest after 7 days if disturbed. Nests regularly parasitized by Brown-headed Cowbird (*Molothrus ater*); rate of recorded parasitism varies from 10% of nests (in Quebec) to 52% (in Michigan), and early nests parasitized more often than later ones.

Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from late Jul, mostly during late Aug to early Sept, many moving S along Atlantic coast to Florida and on to Caribbean, others heading S through Mississippi Valley to Gulf of Mexico coast, where they either fly across Gulf or follow coast to Middle America; wintering grounds reached from late Aug, bulk arriving during Oct. Spring migration begins in Mar and basically the reverse, with arrival on breeding grounds from mid-Apr in S, early May farther N. Common in Bermuda in autumn and winter. Casual in South Carolina in winter. Vagrant W of Rockies (N to Alaska, most regularly in California); also in Greenland, Britain and Ireland in autumn/winter and in Ecuador in winter.

Status and Conservation. Not globally threatened. Generally common throughout range. Steady decline recorded, at least in E, since late 1970s, Breeding Bird Survey results showing 1% annual decline from 1978 to 1987. Local increase recorded in E Canada, thought to be due to maturation of second-growth forests, the relatively intact nature of forests in these areas and lack of human disturbance. Requires quite large tracts of intact forest and woodland, and fragmentation of this habitat probably the major threat, but also, among other things, increased rates of brood parasitism and nest predation. Seems to be particularly susceptible to flying against towers, windows and other artificial objects on migration. Clearance of forest for pasture and agriculture on wintering grounds likely also having detrimental effect on numbers.

Bibliography. Burke & Nol (1998), David & Gosselin (2002a), Ficken *et al.* (1985), Gibbs & Faaborg (1990), Hann (1937, 1940), Hiatt (1943), King *et al.* (2000), Lambert & Hannon (2000), Lein (1980, 1981), Levey (1999), Lewington *et al.* (1991), Mazerolle & Hobson (2003), Morton (2005), Ortega & Capen (1999), Porneluzi *et al.* (1993), Sangster (2008b), Short & Robbins (1967), Smith & Shugart (1987), Stenger (1958), Stodola *et al.* (2010), Strong (2000), Taylor (1972), Tramer & Kemp (1980), Van Horn & Donovan (1994), Wander (1985), Zach & Falls (1975, 1976, 1978, 1979).

49. Northern Waterthrush

Seiurus noveboracensis

French: Paruline des ruisseaux **Spanish**: Reinita Charquera Norteña
German: Drosselwaldsänger

Taxonomy. *Motacilla noveboracensis* J. F. Gmelin, 1789, Louisiana and New York, USA.

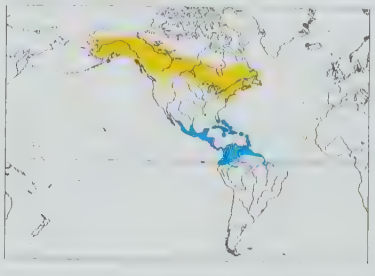
Recent studies of mitochondrial DNA suggest that this species and *S. motacilla* are not closely related to *S. aurocapilla* and should be placed in a separate genus (for which the name *Parkesia* has been proposed). The two form a species pair; sometimes regarded as constituting a superspecies, but overlap in ranges occurs in S Canada (S Ontario) and NE USA. Reported hybrid with *Dendroica striata* now thought probably to have involved *Dendroica tigrina* and present species. Geographical variation perhaps mostly clinal, and racial differences somewhat obscured by individual variation; species sometimes treated as monotypic. Birds from Newfoundland described as race *uliginosus*, but considered inseparable from nominate. Three subspecies currently recognized.

Subspecies and Distribution.

S. n. notabilis Ridgway, 1881 – breeds from Alaska and NW Canada S to NW USA (EC Oregon to extreme NW Wyoming), and E to N Ontario and Great Lakes.

S. n. limnaeus McCabe & A. H. Miller, 1933 – breeds C British Columbia (W Canada).

S. n. noveboracensis (J. F. Gmelin, 1789) – breeds SE Canada (E Ontario E to Newfoundland) and NE USA (S to N West Virginia).



Descriptive notes. 15 cm; 13·8–24·4 g. Distinctive parulid; constantly bobs tail up and down in characteristic manner. Nominate race has head and upperparts dark olive-brown, long pale buff supercilium; pale buffy white below, distinct dark streaks on breast and flanks, and usually finer dark streaks on throat; in fresh autumn plumage, upperparts have more of an olive tone and supercilium and underparts are washed pale yellowish; iris dark; bill dark brown, flesh-horn base of lower mandible; legs dull flesh-coloured. Differs from very similar *S. motacilla* in slightly smaller size, less heavy bill, uniformly buff supercilium (not white and expanding behind eye), more uniformly buffish colour below, with more distinct streaking extending to throat, duller leg colour. Sexes similar. Juvenile has head and upperparts dark

olive-brown with some cinnamon-buff feather edges, these forming wingbars on greater and median upperwing-coverts, pale buff below, heavily mottled/streaked dusky on throat and breast, less so on lower underparts; first-year similar to adult, but narrow rusty edges of tertials in fresh plumage (early autumn). Races differ minimally: *notabilis* is generally greyer above, whiter below and on supercilium, with slightly larger bill; *limnaeus* tends to be marginally darker above than previous, intermediate between latter and nominate below. Voice. Song begins with 3–4 short but loud emphatic notes and ends with downslurred flourish; can be transcribed as "swee swee swee chit chit weedleoo". Flight song, usually at dusk, longer and faster than typical song and interspersed with "chink" notes. Usual call a sharp, metallic "chink"; flight call a buzzy "zeet".

Habitat. Breeds in wide variety of woodlands, and in willow (*Salix*) and alder (*Alnus*) thickets, where there is standing or slow-moving water such as pools, bogs and slow-moving rivers; in SE of range rhododendron (*Rhododendron*) swamps and rhododendron-bordered mountain streams also used, and on islands off Newfoundland drier habitats without standing water and with less dense understorey may be utilized. Preference for standing water in woodlands maintained on migration, but then occurs also in hedgerows and thickets and open areas (e.g. lawns) if adequate cover nearby. In winter found in mangroves, gallery forest, damp forest near pools and streams, and plantations, mainly below 1500 m, but in Ecuador once at 2000 m and in Colombia at 3000 m; in Venezuela many arrive in submontane forests at end of rainy season in Nov, moving to humid lowlands when dry season begins, and in Colombia some arrive in thorn-scrub in Oct, but move out when leaves wilt (in Nov).

Food and Feeding. Feeds mainly on insects and other arthropods, molluscs and small crustaceans; occasionally takes small fish such as minnows (Leuciscinae), and has been recorded as eating small clams in Cuba. Tends to take smaller prey, and more fly (Diptera) larvae, than does *S. motacilla*. Forages on or near ground, often on fallen logs, walking over ground and along edges of pools and streams with constant "bobbing" of rear end, turning over leaves to search for prey underneath. Occasionally also foliage-gleans and twig-gleans, flycatches and hover-gleans.

Breeding. Season May–Aug, egg-laying May–Jul. Nest a cup of grass, twigs, leaves and moss, lined with hair and blossom, placed low down in roots of upturned tree or in cavity in stump. Clutch 3–6 eggs, usually 4–5; incubation period 12 days; nestling period 9 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*) relatively infrequently owing to remote dense-forest breeding habitat; in study of 83 nests in Ontario, 11 (13%) were parasitized, and in New York 7% of nests parasitized (compared with 56% of *S. motacilla* nests).

Movements. Long-distance migrant; wintering grounds of this species in Middle America, Caribbean and N South America (S to N Peru and N Brazil), but precise details for each race not known. Leaves breeding grounds in late Jul and Aug, moving S on broad front (but mostly E of Rockies) to Gulf of Mexico coast and Florida, then across Gulf, or around Gulf coast and across to Caribbean, from which area many then continue S to South America; wintering grounds reached from Sept; regular on W coast of North America in autumn, and Alaskan population wintering in coastal W Mexico may follow this route. Spring migration begins in late Mar and is basically along same route in reverse direction, reaching breeding grounds from early May. Occasionally winters in North America, mainly in S & E. Common in Bermuda in autumn and winter. Vagrant to NE Russia (Chukotka), Greenland, Britain, Ireland and France.

Status and Conservation. Not globally threatened. Generally common throughout range. Study at Long Point, in Ontario, indicated steady decline in recent years; Breeding Bird Surveys indicated non-significant local increases or declines in various areas during same period, but no overall significant change in populations. Population breeding in Maritime Provinces of Canada estimated at 45,000 pairs; estimated densities on breeding grounds include, in Ontario, 11–100 pairs/10 km² in N and 2–10 pairs/10 km² in S. On wintering grounds in Jamaica, estimates of 2 birds/10 ha in natural lowland forest, 5/10 ha in lowland parks and gardens, 2/10 ha in lowland cut-over dry forest, 8/10 ha in riverine forest and 35/10 ha in mangroves, indicating that mangroves are a particularly important winter habitat for this species. No significant alterations to breeding habitat recorded, but drainage of swamps for agriculture and conversion of wetlands into ponds or lakes may have caused local declines in SE of breeding range. On wintering grounds its mangrove habitat, in particular, is coming under increasing threat from ever-growing human demands for fuel, food and space.

Bibliography. Binford (1971), Burleigh & Peters (1948), Craig, R.J. (1981, 1984, 1985, 1987), Curson (1993a), Eaton (1957a, 1957b, 1995), Hussell (1991), Kaufman (1990), Lack & Lack (1972), Lefebvre *et al.* (1992), Lewington *et al.* (1991), McCabe & Miller (1933), McCarthy (2006), Molina *et al.* (2000), Parkes (1978, 1995), Russell (1980), Sangster (2008b), Schwartz (1964), Short & Robbins (1967), Wallace (1980), Winker *et al.* (1992), Wunderle & Waide (1993a).

50. Louisiana Waterthrush

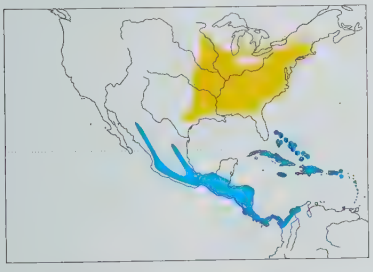
Seiurus motacilla

French: Paruline hochequeue **Spanish**: Reinita Charquera de Luisiana
German: Stelzenwaldsänger

Taxonomy. *Turdus motacilla* Vieillot, 1809, Kentucky, USA.

Recent studies of mitochondrial DNA suggest that this species and *S. noveboracensis* are not closely related to *S. aurocapilla* and should be placed in a separate genus (for which the name *Parkesia* has been proposed). The two form a species pair; sometimes regarded as constituting a superspecies, but overlap in ranges occurs in S Canada (S Ontario) and NE USA. Monotypic.

Distribution. Breeds in SE Canada (SE Ontario) and E USA from Minnesota, E Nebraska and E Texas E, discontinuously, to New Hampshire region and South Carolina (largely excluding Gulf and SE Atlantic coastal areas and Florida). Migrates to Middle America from N Mexico S to Panama (in smaller numbers to N Colombia and Venezuela) and to Caribbean (mainly Greater Antilles).



Descriptive notes. 15·5 cm; 16·8–26 g. Distinctive parulid; constantly bobs tail up and down, slowly and emphatically, in characteristic deliberate and circular action involving whole rear end of bird. Head and upperparts are dark grey-brown, with long bicoloured supercilium buff in front of eye and pure white and "flaring" behind eye; white below, distinctive buff wash on flanks and undertail-coverts, diffuse brown streaks on breast and flanks; iris dark; bill dark, flesh-coloured base of lower mandible; legs pink (usually noticeably bright). Differs from very similar *S. noveboracensis* in slightly larger size, heavier bill, broader supercilium with bicoloured pattern (and wider behind eye), generally whiter underside with contrasting buff flanks and undertail-coverts, paler and more blurred streaks on breast and flanks (usually not extending to throat), and brighter pinkish legs. Sexes similar. Juvenile is duller than adult, with supercilium off-white and less distinct, upperparts more olive, underparts pale buffy white with obscure darker streaks on breast, also has narrow cinnamon-buff edges on wing-coverts and tertials, and narrow buff feather tips on lower mantle, rump and uppertail-coverts; first-year similar to adult, but narrow rusty edges on tertials in fresh plumage (early autumn). Voice. Song a series of 3–4 shrill, slurred whistles, descending slightly in pitch, followed by variable warbling twitter; starts off louder and more musical than that of *S. noveboracensis*, but weaker at end. Flight song, given very rarely, longer and more varied than typical song. Usual call a sharp resonant "chink", very like that of *S. noveboracensis* but louder and more emphatic, also slightly lower-pitched and less metallic; flight call a high-pitched "zeet".

Habitat. Breeds in wooded ravines with running streams, preferring gravel-bottomed streams in upland deciduous forest; also in wooded swamps, but usually on higher, drier ground than that used by *S. noveboracensis* and prefers running (rather than still) water. Sometimes considerable territorial overlap with *S. noveboracensis* in area of range overlap in NE. Breeding territories usually follow a length of stream and adjoining ravine. During migration uses wider variety of wet habitats. In winter mainly by streams and lagoons in woodland, up to 2000 m, again preferring running water at higher elevations; unlike *S. noveboracensis*, seldom winters on coast.

Food and Feeding. Feeds mainly on insects, molluscs and crustaceans, taking slightly larger prey items and fewer fly (Diptera) larvae than does *S. noveboracensis*; recorded also as eating small frogs and fish. Forages on or near ground, favouring edges of running water; turns over leaves to search for concealed prey. Occasionally forages in tree branches, this often coinciding with outbreaks of insects, e.g. stoneflies (Plecoptera) in trees. Establishes feeding territory on winter grounds.

Breeding. Season Apr–Jul, egg-laying mainly Apr–Jun (occasionally into early Jul); occasionally two broods (eight out of 143 pairs in recent study). Polygyny recorded. Nest a cup of leaves, mosses, rootlets and twigs, lined with grass, hair, fern stems and fine rootlets, placed close to water and generally along streambank, among tree roots or in rock cavity. Clutch 4–6 eggs, usually 5; sometimes renests if first attempt fails; incubation period 12–14 days; nestling period 9–11 days; will feign injury to distract attention from nest. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); rates of parasitism varying locally, e.g. in Illinois from 33% (five of 15 nests) in Jackson County to 82% (nine of eleven nests) in Union County, only 35 km away.

Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from late Jun, mostly mid-Jul to Aug, W populations moving mostly S through Mississippi Valley to Gulf of Mexico coast and then around Gulf coast to Middle America, E breeders heading S along Atlantic coast to Florida and across to W Caribbean; wintering grounds reached from late Aug. Spring migration begins in Feb, with arrival back on breeding territories from first half Mar in S, early Apr in N. Recorded in Florida in winter. Uncommon transient on Cozumel I. Casual in Bermuda in autumn. Rare vagrant in W North America (including Baja California), with most records from SE Arizona; also in NE (Maritime Provinces) and Greenland. One record from Canary Is.

Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Uncommon to locally fairly common. Breeding range expanding N, this thought possibly due, at least in part, to reforestation of areas heavily logged in late 1800s and early 1900s. Estimated breeding densities (per km of stream) include 2·5 pairs in New York, one pair in S Illinois and 2·8 pairs in Connecticut; density estimates in wintering areas include 10 pairs/km of stream in Cuba.

Bibliography. Anon. (2002), Binford (1971), Craig, R.J. (1981, 1984, 1985, 1987), Curson (1993a), Eaton (1958), Hix (1916), Macouzet & Escalante-Pliego (2000b), Mattsson & Cooper (2007), McCracken (1991), Mulvihill, Cunkelman *et al.* (2002), Mulvihill, Latta & Newell (2009), Robinson (1990, 1995), Sangster (2008b), Schaeffer (1974), Wallace (1980), Wunderle & Waide (1993a).

Genus *OPORORNIS* S. F. Baird, 1858

51. Kentucky Warbler

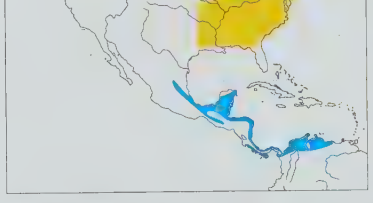
Oporornis formosus

French: Paruline du Kentucky **German**: Kentuckywaldsänger **Spanish**: Reinita de Kentucky
Other common names: Cincinnati Warbler (hybrid with *Vermivora cyanoptera*)

Taxonomy. *Sylvia formosa* A. Wilson, 1811, Kentucky, USA.

Genus sometimes subsumed in *Geothlypis*. This species is very similar, both in plumage and, according to one study, genetically, to *Geothlypis semiflava* and possibly forms a link between the two genera. Has hybridized with *Vermivora cyanoptera* (hybrid originally described as a new species, *Helminthophaga cincinnatiensis*); one of the two specimens of this pairing originally thought to have involved *O. philadelphia*, rather than present species. Recent record of hybridization with *O. philadelphia*. Birds in N of breeding range described as race *umbraticus*, apparently paler yellow below and more yellowish-olive on upperparts, but inadequately differentiated from birds in rest of species' range. Treated as monotypic.

Distribution. Breeds in E USA from S Wisconsin, SE Minnesota, E Kansas and E Texas E to New Jersey, S to C Louisiana, NW Florida and E Georgia. Migrates to wintering grounds from E & S Mexico S to Panama, also irregularly in adjacent N Colombia and N Venezuela.



Descriptive notes. 13 cm; 11·4–20·6 g. Male has distinctive head pattern, with bold yellow "spectacles" surrounded by black crown, face and side of neck, feathers of hindcrown tipped grey (in fresh non-breeding plumage, grey feather tipping on crown more extensive and feathers on face may be narrowly tipped with olive); upperparts olive-green, throat and underparts uniformly yellow; individuals occasionally develop very orange hue below, and has been suggested that this colour may be due to the eating of honeysuckle (*Lonicera*) berries during post-breeding moult; iris dark; bill blackish, with flesh-coloured base to lower mandible; legs pinkish-flesh. Female is similar to male, but duller on head, with crown mostly olive. Juvenile lacks adult head pattern, has olive-brown head and upperparts, paler olive-brown underparts, becoming yellowish on belly and undertail-coverts; first-year male resembles adult female in autumn and adult male by spring; first-year female duller than adult in autumn, with black on head restricted or lacking altogether. Voice. Song a series of 5–8 loud, rolling, whistled

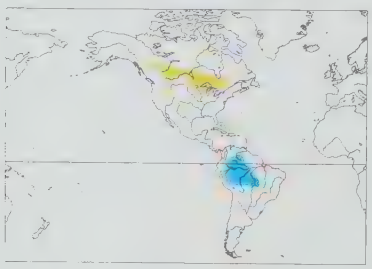
"churree" notes, often sounding almost trisyllabic; reminiscent of song of Carolina Wren (*Thryothorus ludovicianus*), but less obviously trisyllabic. Usual call a low, sharp "chup", given persistently when agitated; flight call a loud buzzy "zeep".
Habitat. Breeds in mature deciduous forest with a dense undergrowth, often in damp ravines and river bottoms; favours forests with cove hardwoods, tending to avoid oak–hickory (*Quercus–Carya*). Well-developed ground cover and dense understorey, together with intact forest blocks at least 500 ha in size, appear to be essential components of breeding habitat. Breeds also in thickly vegetated ravines at up to 1000 m in Appalachians. Although it requires large tracts of forest, the need for dense understorey may mean that older second-growth forests are currently preferred breeding habitat. In winter primarily in lowland tropical rainforest, also occasionally in well-developed humid second-growth forest, to c. 1850 m, usually below 1200 m.
Food and Feeding. Feeds mainly on insects and other arthropods, especially small spiders (Araneae); may occasionally take seeds and *Cecropia* fruits. Forages on ground and low in bushes, turning over leaves and clinging to plant stems to glean insects from leaves. In winter quarters sometimes follows swarms of army ants (Ecitoninae), and frequently associates with Spotted Antbirds (*Hylophylax naevioides*) in Panama. Generally establishes a feeding territory on wintering grounds, but will temporarily follow foraging flocks which pass through its territory.
Breeding. Season mainly May–Aug (exceptionally from late Apr), egg-laying mainly Jun–Jul. Nest a bulky cup of grasses, twigs, leaves and weed stems, lined with hair and rootlets, placed on or near ground under log or fallen tree roots, or low in bush. Clutch 3–6 eggs, usually 4–5; incubation period 11–13 days; nestling period 8–10 days, but young may leave nest after 7 days if threatened by predator; female will feign injury to distract attention from nest. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*); in one Illinois study, two out of six nests were parasitized.
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds during late Jul and Aug, most moving S to, and then crossing, Gulf of Mexico, some following Gulf coast to Middle America, and a few E breeders following Atlantic coast to Florida and crossing to Caribbean; arrives on wintering grounds mainly from late Sept. Spring migration begins in early Mar and is basically same route in reverse, but on average more to W, greater numbers following Gulf coast and then heading N up Mississippi Valley; arrival on breeding grounds from early Apr in S, late Apr in N. Casual in Florida (and occasionally elsewhere in S USA) in winter, in Bermuda in autumn (where also a few winter records), and in S Canada (S Ontario) and NE USA in spring. Vagrant in E Canada and W USA (including Alaska) and in NW Mexico.
Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Generally common. Local decline noted in N of breeding range, especially W Pennsylvania, resulting from browsing damage to forest understorey by increasing white-tailed deer (*Odocoileus virginianus*) populations. Deforestation in winter range may also be causing local declines, but as yet no direct evidence of this. Estimated densities on breeding grounds in SE USA average 1·2 pairs/10 ha; in another study, density as high as 2·2 males/10 ha in large forest tracts. Local increases and decreases recorded in various parts of breeding range in recent decades, but no significant trends in either direction.
Bibliography. Anon. (2002), Escalante *et al.* (2009), Gibbs & Faaborg (1990), Graves (1988), Hamel *et al.* (1982), Mabey (1991), Mabey & Morton (1992), McCamey (1950), McDonald (1998), McShea *et al.* (1995), Morton & Young (1986), Mulvihill *et al.* (1992), Parkes (1985a), Rappole & Warner (1980), Tramer & Kemp (1980), Wetmore *et al.* (1984), Whitcomb *et al.* (1981), Willis (1966, 1986a).

52. Connecticut Warbler

Oporornis agilis

French: Paruline à gorge grise **Spanish**: Reinita de Connecticut
German: Augenring-Waldsänger

Taxonomy. *Sylvia agilis* A. Wilson, 1812, Connecticut, USA.
Genus sometimes subsumed in *Geothlypis*. This species appears not particularly closely related to current congeners, and it has been suggested that it may merit placement in a monotypic genus. Reported hybrid with *O. philadelphia* generally considered to have been an aberrant individual of latter. Monotypic.
Distribution. Breeds in boreal zone of S Canada (from CE British Columbia E to SW Quebec) and N USA (N Minnesota E to N Michigan). Migrates to lowland South America from E Colombia and Venezuela S to N Bolivia and WC Brazil).



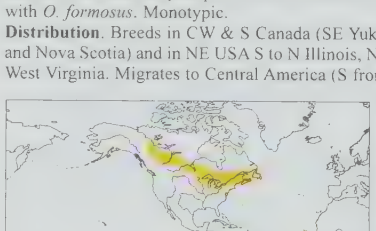
Descriptive notes. 15 cm; 10·7–26·8 g. Distinctive, with complete pale eyering and walking gait. Male has grey hood down to upper breast, contrasting white eyering (in fresh plumage in autumn, some head feathers may have narrow olive fringes); upperparts olive-green, underparts yellow; iris dark; bill blackish, flesh-coloured base of lower mandible; legs pinkish-flesh. Female is duller overall than male, having brownish-grey hood, paler throat, and paler yellow underparts. Juvenile is mostly olive-brown, with eyering buff, lower underparts buffy yellow; first-year male in autumn resembles adult female, but eyering tends to be more creamy and less whitish, by spring resembles adult male but on average slightly duller; first-year female relatively dull in autumn, with brownish-olive hood and pale buff eyering, much like adult by spring. Voice. Song loud and far-carrying, can be transcribed as "wee cher cher, wee cher cher, wee cher cher, wee", with rhythm suggestive of *Geothlypis trichas* song, but overall quality reminiscent of that of *Seiurus aurocapilla*. Usual call (not often heard) a loud sharp, nasal "plink"; flight call, given sometimes also by perched bird, a high-pitched, buzzy "zee".
Habitat. Breeds in bogs and on dry ridges in spruce (*Picea*) and tamarack (*Larix laricina*) woods, knolls in open woods of aspen (*Populus tremuloides*) and other poplars, and occasionally in young jack pine (*Pinus banksiana*) stands. Preferred habitat tamarack or spruce bogs in relatively open forest with abundant peat-moss (*Sphagnum*), together with such shrubs as Labrador tea (*Ledum*) and bog laurel (*Kalmia polifolia*) in ground layer. During migration uses all kinds of woodland with dense cover, favouring especially dense, wet thickets; regularly occurs in tropical dry thorn-scrub on passage in NW Venezuela. In winter found in submontane and montane forests and cloudforest in N South America, mesquite (*Prosopis*) scrub in N Venezuela, tropical evergreen forest in Amazonia, and shrubby second growth throughout winter range; mainly at low altitudes in S part of range, but to 4200 m farther N.
Food and Feeding. Feeds on small invertebrates; some fruits taken, at least in summer. Consumed large numbers of spiders (Araneae); gut content of one bird contained 50 spiders. Forages on ground and on fallen logs. Walks in deliberate manner, and gleans prey items from ground and low vegetation; unlike congeners, this species walks, rather than hops. Has been seen also to take spiders from surface of ponds while in flight. Solitary on wintering grounds.
Breeding. Season Jun–Jul, exceptionally to early Aug. Nest a cup of grasses and plant fibres, lined with fine grasses and hair, placed on ground, often at base of small tree. Clutch 3–5 eggs, usually 4–5; estimated incubation period 11-12 days; estimated nestling period 8-9 days; adults will feign injury to distract attention from nest. Nests sometimes parasitized by Brown-headed Cowbird (*Molothrus ater*), but extent of parasitism not known.
Movements. Long-distance migrant; some evidence of non-stop transoceanic flights between SE USA and N South America. Leaves breeding grounds from mid-Aug, moving E or SE to Atlantic coast, S to Florida and then on to South America, either non-stop or via Caribbean (route perhaps dependent on weather conditions); arrives on wintering grounds from mid-Oct. Spring migration begins in Mar, most birds moving N to Florida via Caribbean, then W & N up Mississippi and Ohio Valleys, arriving on breeding grounds from late May; thus, spring migration through North America considerably more to W than route followed in autumn; a few may fly N through Central America and across Gulf of Mexico. Casual in Bermuda in autumn (75 recorded after a tropical storm in 1987). Vagrant in W North America, mostly in autumn, in Mexico, Honduras, Belize, Costa Rica and Panama on migration, and in Ecuador (W of Andes) and Peruvian Andes in winter; possibly more regular in some of these areas, particularly E Mexico, than records suggest.
Status and Conservation. Not globally threatened. Generally uncommon and local. Estimated densities on breeding grounds include 1·7–2·7 pairs/ha in closed spruce forests and 2·9–5·6 pairs/ha in more open spruce forests. Described as thinly distributed on wintering grounds. On basis of census data, populations appear to be stable. May be vulnerable to habitat loss in winter quarters, and powerlines built across breeding habitat may cause local declines. Reported decline in numbers of passage migrants during early 1900s requires clarification.
Bibliography. Amos (1991), Bosque & Lentino (1987), Clements & Shany (2001), Curson (1992), DeGraaf, Scott *et al.* (1991), Elder (1991), Escalante *et al.* (2009), Hilty & Brown (1986), Howell & Webb (1995), Jahn *et al.* (1999), Lanyon & Bull (1967), McCarthy (2006), McKenzie & Noble (1989), Niemi & Hanowski (1984a), Parker (1982), Pitocchelli *et al.* (1997), Pyle & Henderson (1990), Rappole (1995), Ridgely & Greenfield (2001b), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Robbins (1974), Shanahan (1992), Sick (1993), Stiles & Skutch (1989), Sutton (1967), Thomas (1993), Veit & Peterson (1993), Walkinshaw & Dyer (1961).

53. Mourning Warbler

Oporornis philadelphia

French: Paruline triste **German**: Graukopf-Waldsänger **Spanish**: Reinita Plañidera

Taxonomy. *Sylvia Philadelphia* A. Wilson, 1810, within a few miles of Philadelphia, Pennsylvania, USA.
Genus sometimes subsumed in *Geothlypis*. Forms a species pair with *O. tolmiei*, the two probably constituting a superspecies; ranges overlap in W Canada (Peace Region of British Columbia); claimed hybrids from this zone have been considered variants of present species with white eye-crescents (such variants occur throughout this species' range), but recent analysis combining molecular and morphological data sets confirms numerous hybrid individuals with mixed characters, including 18 of 50 birds genotyped (36%) showing both western and eastern alleles. Also known to have hybridized with *Geothlypis trichas*, *Wilsonia canadensis* and *O. formosus*. Reported hybrid with *O. agilis* generally thought to have been aberrant individual of present species; reported hybrid with *Vermivora cyanoptera* now considered to have involved interbreeding of latter species with *O. formosus*. Monotypic.
Distribution. Breeds in CW & S Canada (SE Yukon and E British Columbia E to Newfoundland and Nova Scotia) and in NE USA S to N Illinois, N Ohio, N New England and, in Appalachians, to West Virginia. Migrates to Central America (S from S Nicaragua) and NW South America.



Descriptive notes. 13 cm; 9·6–17·9 g. Male has dark grey hood down to upper breast, heavy black mottling on breast; occasionally a whitish narrow broken eyering or thin white eye-crescents; olive-green upperparts, yellow underparts; in fresh plumage in autumn, nape and upperparts have narrow brownish feather fringes; iris dark; bill blackish, flesh-coloured lower mandible; legs pinkish-flesh. Best distinguished from very similar *O. tolmiei* by lack of or (when occasionally present) much less distinct white crescents above and below eye. Female is duller than male, with paler grey hood, paler throat, no black on breast, and narrow broken whitish eyering; differs from very similar female of *O. tolmiei* in having eyering much narrower and less pure white. Juvenile is mostly brownish-olive, with pale cinnamon wingbars on greater and median upperwing-coverts, yellowish wash on lower underparts; first-year male in autumn resembles adult female, but has yellowish wash on throat, usually breaking through breastband to meet yellowish underparts, and often faint black mottling on side of breast, by spring like adult male but may be slightly duller and sometimes still has narrow broken eyering; first-year female duller than first-year male in autumn, with brownish-olive hood, but like adult female by spring. Voice. Song rather variable, but consists of a series of 5–6 loud, slurred and rolling disyllabic notes, last 2 or 3 lower in pitch, can be transcribed as "churree churree churree chory chory". Some variants have all notes on one pitch, and these more common in W of breeding range. Usual call a sharp, unmusical "jik" or "chit"; flight call a sharp "zeee" note, less buzzy than that of *O. agilis*.
Habitat. Breeds in forest clearings and edges where dense undergrowth, often by bogs; also in young second-growth forest and dense thickets, especially of aspen (*Populus tremuloides*), birch (*Betula*) and cherry (*Prunus*). Main requirements are dense undergrowth and shrub layer typical of disturbed forest (rather than intact forest with closed canopy); in such areas canopy cover is 40–77%, and this species avoids intact forest with nearly complete canopy cover. Breeds generally at low altitudes, but to 1000 m in Appalachians. During migration uses all kinds of woodland and scrub with dense undergrowth, as well as dense thickets. In winter found mainly in dense scrub and thickets, rather than woodland, to 1400 m; such areas are frequently damp, and include abandoned pastures and fields, as well as scrub on woodland edges.
Food and Feeding. Feeds almost entirely on insects and other arthropods, especially spiders (Araneae); occasionally takes white corpuscles at leaf bases of young *Cecropia* trees in winter. Forages by gleaning low in undergrowth and on ground; turns over leaves in search for food. Generally solitary in winter, establishing a feeding territory.
Breeding. Season May to early Sept, mainly late Jun to Aug; egg-laying May–Jul, mainly late Jun and Jul. Nest a bulky cup of grasses and dead leaves, lined with rootlets and hair, usually hidden in dense tangle on or near ground. Clutch 3–5 eggs, usually 4; incubation period 12 days; nestling

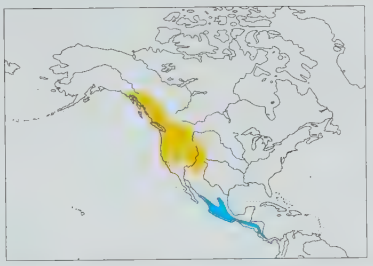
period 8–9 days. Nests parasitized by Brown-headed Cowbird (*Molothrus ater*); extent of parasitism poorly known, but may reach 10% of nests in Ontario (S Canada).
Movements. Long-distance migrant. Leaves breeding grounds from late Jul to mid-Aug, moving S through Mississippi Valley and Appalachians to Gulf of Mexico coast, then around W shore of Gulf and down through E Middle America; arrives on wintering grounds generally from mid-Sept, although a few records late Aug. Spring migration begins in late Mar, and basically along same route but in reverse; arrival on breeding grounds from mid-May, most not until Jun, this species being usually one of the last temperate-breeding warblers to arrive in spring. Casual in Bermuda in autumn and on Cozumel I (off NE Yucatán Peninsula) in spring. Vagrant in W North America (from Alaska S to Baja California, but especially California), and in Caribbean, where it may occasionally overwinter in Dominican Republic.
Status and Conservation. Not globally threatened. Generally fairly common. Populations appear to be stable or increasing locally (e.g. in Massachusetts and Michigan). This due primarily to a recent increase in preferred breeding habitat as a result of logging, mining and construction of roads and powerlines.
Bibliography. Arendt (1992), Bledsoe (1988), Buffa & Morris (1999), Cox (1960, 1973), Curson (1992), Dessecker & Yahner (1987), Escalante *et al.* (2009), Graves (1988), Hagan *et al.* (1992), Hailman (1968), Hall (1979), Hess (2010), Hussell *et al.* (1992), Irwin *et al.* (2009), Kowalski (1983b), Lanyon & Bull (1967), McCamey (1950), McCarthy (2006), Patti & Meyers (1976), Pitocchelli (1989, 1990, 1992, 1993), Pyle & Henderson (1990), Sauer & Droege (1992), Stiles & Skutch (1989), Sutton (1967), Veit & Peterson (1993).

54. MacGillivray's Warbler

Oporornis tolmiei

French: Paruline des buissons **German**: Dickichtwaldsänger **Spanish**: Reinita de Tolmie

Taxonomy. *Sylvia Tolmiei* J. K. Townsend, 1839, Columbia River = Fort Vancouver, Clarke County, Washington, USA.
Genus sometimes subsumed in *Geothlypis*. Forms a species pair with *O. philadelphia*, the two probably constituting a superspecies; ranges overlap in W Canada (Peace Region of British Columbia); claimed hybrids from this zone have been considered variants of *O. philadelphia* with white eye-crescents (such variants occur throughout that species' range), but recent analysis combining molecular and morphological data sets confirms numerous hybrid individuals with mixed characters, including 18 of 50 birds genotyped (36%) showing both western and eastern alleles. Proposed race *austinsmithi* (described from near Chico, in Montana) treated as a synonym of nominate, and *intermedia* (described from Okanagan, in S British Columbia) synonymized with *monticola*. Two subspecies currently recognized.
Subspecies and Distribution.
O. t. tolmiei (J. K. Townsend, 1839) – breeds Pacific coastal region and Cascades from extreme SE Alaska and S Yukon S in W USA to C California; migrates to region from Mexico S to Guatemala, in smaller numbers to W Panama.
O. t. monticola A. R. Phillips, 1947 – breeds from SW Canada (E British Columbia and SW Saskatchewan) S in Rocky Mts and adjacent areas to Arizona and New Mexico, with isolated population in Black Hills of South Dakota–NE Wyoming; migrates to Mexico and Guatemala.
Descriptive notes. 13 cm; 8·6–12·6 g. Male nominate race has grey hood with black lores, conspicuous thick white eye-crescents, some black mottling on breast (in fresh plumage in autumn, nape with narrow brownish feather fringes); upperparts olive-green, underparts yellow; iris dark; bill blackish, flesh-coloured lower mandible; legs pinkish-flesh. Distinguished from very similar *O. philadelphia* mainly by prominent white eye-crescents. Female is similar to male, but has duller and paler grey hood, with paler grey-buff throat. Juvenile is mostly brownish-olive, with pale cinnamon wingbars on greater and median upperwing-coverts, yellowish wash on lower underparts; first-year male in autumn resembles adult female, but often has greyer (less buffy) throat and sometimes some faint black mottling on side of breast, by spring like adult male but may be slightly duller; first-year female in autumn duller than adult, with brownish-olive hood and buffier throat (which very occasionally has slight yellowish wash), by spring resembles adult female. Race *monticola* is slightly duller than nominate, with greyish tinge above and greenish wash below, also slightly longer tail. Voice. Song 3–4 buzzy "tchee" notes on one pitch, followed by 2–3 more warbled "teeoo" notes on lower pitch; similar in pattern and quality to that of *O. philadelphia*, but more variable, especially at end. Usual call a dry, hard "tsik" or "shik"; flight call a penetrating "tseep", resembling that of *O. philadelphia* and lacking buzzy quality of *O. agilis* flight call.



Habitat. Breeds at up to 300 m elevation in forest clearings and edges with dense understorey, also in second growth with dense understorey and dense scrub on mountainsides; will use both wet and dry habitats, and both coniferous and mixed deciduous forests, main requirements being dense understorey and moderate canopy cover. Human activity such as logging and the installation of powerlines and roads often produces dense shrubby habitats favoured by this species. On migration occurs in all kinds of woodland and scrub, provided that dense understorey present. In winter found in dense scrub habitats in arid and humid areas, including abandoned fields and pastures, thorn-scrub and mangroves, and dense undergrowth at forest edges; mainly at 1000–2000 m, but occurs from lowlands to c. 3000 m.
Food and Feeding. Feeds almost entirely on insects and other arthropods, especially bugs (Hemiptera), leafhoppers (Homoptera), beetles (Coleoptera) and caterpillars (of Lepidoptera). Forages mainly by gleaning low in dense shrub cover and on ground. Generally occurs singly in winter; individuals may defend winter territory, although more study required.
Breeding. Season May–Aug, egg-laying May–Jul. Nest a cup of grasses and weed stalks, lined with fine grasses, hair and rootlets, hidden low in bush. Clutch 3–6 eggs, usually 4; incubation period 11–13 days; nestling period 8–9 days. Nests apparently only rarely parasitized by Brown-headed Cowbird (*Molothrus ater*), despite present species' preference for relatively open habitats.
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from early Aug, moving S along W coast and mountain ranges to arrive on wintering grounds from late Aug and early Sept; spring return begins in Mar and is basically along same route in reverse direction, with arrival on breeding grounds from early Apr in S, early May in N. Vagrant in E North America, but status there difficult to determine accurately owing to potential confusion with *O. philadelphia*.
Status and Conservation. Not globally threatened. Generally common throughout range. Estimated densities on breeding grounds vary, 0·26–1·21 birds/ha. On wintering grounds, estimates include 84·9 birds/10 ha in evergreen forest edges, 56 birds/10 ha in thorn-scrub, 50·7 birds/10 ha in plantations, 27·8 birds/10 ha in second growth, and 10 birds/10 ha in mangroves. Populations thought to be stable overall, but Breeding Bird Survey results have shown local decreases, including in Idaho and S California, and increases in mountains of N California. Range has expanded over last two centuries or so, owing mainly to human disturbance of forest habitats, creating the dense shrubby tangles favoured by this species. Other human activities, e.g. ranching, can destroy potential habitat on breeding and wintering grounds, as well as on migration routes.
Bibliography. Cox (1973), Curson (1992), Ely (1962), Escalante *et al.* (2009), Hailman (1968), Hall (1979), Hess (2010), Hutto (1981, 1992), Irwin *et al.* (2009), Kowlaski (1983b), Lanyon & Bull (1967), McNicholl (1980), Morrison (1981), Patti & Meyers (1976), Phillips (1947), Pitocchelli (1990, 1995), Pyle & Henderson (1990), Ridgely & Gwynne (1992).



PLATE 56

inches 3
cm 8

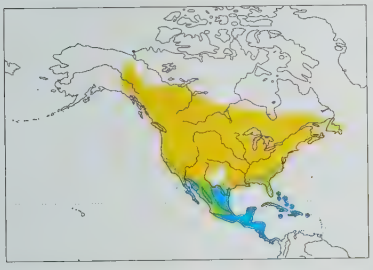
Genus *GEOTHLYPIS* Cabanis, 1847

55. Common Yellowthroat

Geothlypis trichas

French: Paruline masquée **German**: Weidengelbkehlchen **Spanish**: Mascarita Común
Other common names: Maryland Yellowthroat; Chapala Yellowthroat (*chapalensis*)

Taxonomy. *Turdus Trichas* Linnaeus, 1766, northern America = Charleston, South Carolina.
Forms a superspecies with *G. beldingi* and *G. rostrata*, presumably also including *G. flavovelata*; the four have sometimes been regarded as conspecific. Has hybridized with *Oporornis philadelphia*. Race *chapalensis* sometimes considered to represent a separate species. Geographical variation complex within huge range; up to 29 or more races have been described, many of these too poorly differentiated to warrant recognition. Recent work involving mitochondrial DNA suggests W and E groupings of present species may be closer to other congeners than to each other; further study required. Proposed races *yukonicola* (described from Jarvis River, in SW Yukon) and *brachidactylus* (described from "N provinces" of USA) sometimes regarded as worthy of recognition, but presently treated as synonyms of, respectively, *campicola* and nominate; in Mexico, *riparia* (described from Tesia, on R Mayo, in S Sonora) synonymized with *chryseola*, but possibly merits recognition. Type locality previously listed as Maryland, but this was based on reference to a 1702 publication now shown to apply instead to *Dendroica dominica*. Thirteen subspecies currently recognized.
Subspecies and Distribution.
G. t. arizela Oberholser, 1899 – breeds Pacific coastal region from extreme SE Alaska S to C California; migrates to area from California S to NW Mexico (Baja California and N Sonora).
G. t. sinuosa Grinnell, 1901 – breeds San Francisco Bay area of California; in winter locally also along California coast, mainly to S of the bay.
G. t. scirpicola Grinnell, 1901 – extreme SW USA and adjacent NW Mexico (N Baja California and extreme NW Sonora).
G. t. campicola Behle & Aldrich, 1947 – breeds interior NW North America from SW Canada (S Yukon E to W Ontario) S in USA to Idaho and NW Nebraska; migrates to SW USA and N Mexico, at least.
G. t. occidentalis Brewster, 1883 – breeds in interior SW USA (S from E Oregon and Kansas); winters SW USA, W Mexico and Guatemala.
G. t. chryseola van Rossem, 1930 – SW USA (S Arizona E to W Texas) and N Mexico (S to S Sonora and Durango); non-breeding also slightly farther S.
G. t. trichas (Linnaeus, 1766) – breeds SE Canada (WC Ontario E to Newfoundland and Nova Scotia) and S in USA to E Texas and SE Virginia (excluding SE coastal regions); migrates to wintering area from S USA S to Costa Rica (casually S to adjacent NW South America) and Caribbean.
G. t. typhicola Burleigh, 1934 – breeds SE USA coastal belt N of Florida and Gulf of Mexico coast; non-breeding also around Gulf coast S to E Mexico (Veracruz).
G. t. insperata Van Tyne, 1933 – S Texas (lower Rio Grande Valley S of Brownsville).
G. t. ignota Chapman, 1890 – coastal plain of S USA (SE Louisiana E to Florida).
G. t. modesta Nelson, 1900 – W coast of Mexico from C Sonora S to Colima.
G. t. melanops S. F. Baird, 1865 – C Mexico from Zacatecas and N Jalisco E to Veracruz and Oaxaca.
G. t. chapalensis Nelson, 1903 – L Chapala (E Jalisco), in SW Mexico.



Descriptive notes. 13 cm; 7·6–15·5 g. Male nominate race has broad black mask from forehead back through and below eye to side of neck, bordered above and at rear by greyish-white band (in fresh plumage in autumn, black mask may have a few pale feather fringes); hindcrown to nape and upperparts olive-green; throat and breast yellow, belly and vent whitish, olive wash on flanks, undertail-coverts yellow; iris dark; bill blackish, when not breeding has pale horn base of lower mandible; legs pinkish-flesh. Female lacks male's head pattern, has rufous-tinged olive crown, mottled olive ear-coverts, and indistinct pale eyering and short supercilium; yellow on breast slightly paler than male's. Juvenile has dark olive-brown head and upperparts, obscure pale eyering, obscure cinnamon wingbars on greater and median upperwing-coverts, tawny-brown throat and breast, merging into buffish-yellow lower underparts; first-year male in autumn has few black feathers in mask area, otherwise like adult female, by spring resembles adult male but retains some buff in eyering; first-year female in autumn relatively dull, with throat/breast and undertail-coverts pale buffy yellow, resembles adult by spring. Races differ mainly in tone of upperparts, extent and tone of yellow below, colour and width of band above black mask, and wing/tail ratios: *typhicola* has relatively smaller bill and browner wash on flanks than nominate; *insperata* is paler than nominate and has wider, paler forecrown band and noticeably longer bill; *ignota* has upperparts browner than nominate, flanks a warm brown colour, and breast a brighter yellow; *campicola* is slightly greyer above than nominate, has whiter forecrown band, less extensive yellow on breast; *occidentalis* is more yellow-olive above than previous, with more extensive yellow on underparts; *arizela* has upperparts more olive-green and breast duller yellow than *campicola*; *sinuosa* is smallest race, dark above, with extensive yellow on underparts; *scirpicola* is extensively yellow below; *chryseola* is even more extensively yellow than previous, some being almost entirely yellow below and with yellow in forecrown band; *modesta* is similar to last, but darker above and more uniformly yellow below; *melanops* is similar, but paler above and with relatively long tail; *chapalensis* is similar to last, but forecrown band entirely yellow and relatively wide. Voice. Song loud and rollicking, with distinctive rhythm, e.g. as "witchity witchity witchity witch", and subject to considerable variation, both within and between populations, although basic rhythm remains same. Flight song longer, and more variable and warbling, but usually ending with distinctive phrases of the more familiar song. After pairing, a low-volume version of song often uttered, used for communicating with mate, perhaps to elicit copulation solicitations or to provide information about predators. Usual call a dry, husky "tjip"; also gives dry rattle or chatter call, often in aggressive encounters with conspecific males; flight call a low-pitched, buzzy, unmusical "zeet".
Habitat. Most races occur throughout year in wide variety of lowland wet habitats, such as cat-tail (*Typha*) marshes, wet grassy fields, marshes and shrubby borders of these habitats. Has been suggested that dense undergrowth (typical of these habitats), rather than dampness itself, is critical factor; in drier W regions commonly occurs also in drier habitats with dense understorey, such as upland pine (*Pinus*) forest, palmetto thickets, hedgerows and orchards, although even here is most abundant in riparian growth (especially races *scirpicola* and *chryseola*) and pond/stream margins. Generally below 2500 m and usually well below this altitude. Race *sinuosa* restricted to coastal and brackish saltmarshes; *modesta* largely confined to mangroves, but may occur also in coastal saltmarshes.
Food and Feeding. Feeds almost entirely on insects and other arthropods, especially spiders (Araneae). Grit has been found in stomach contents, but not clear whether ingested deliberately (perhaps to aid digestion) or accidentally. Forages mainly by gleaning low down in dense vegetation and on ground. Also hover-gleans and performs short flycatching sallies; at least in California, males tend to flycatch more than females and males tend also to forage at higher levels than females. Both sexes forage at higher levels later in breeding season. In Mexico, recorded as feeding at swarms of army ants (Ecitoninae) in winter.
Breeding. Season Apr–Jul; appears to be regularly double-brooded in S Minnesota and S Texas, and this may be the case throughout much of range. Polygyny recorded. Nest a bulky cup of grasses, leaves and weed stalks, lined with fine grasses and hair, hidden in dense vegetation on or close to ground. Clutch 3–5 eggs, usually 4, exceptionally 1, 2 or 6; incubation period 12 days; nestling period 8–10 days. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*), recorded rates varying from 14·3% of nests in Minnesota to 47·4% in Michigan.
Movements. Resident to long-distance migrant. Nominate race (except some S populations), *campicola*, *occidentalis*, and N populations of *typhicola*, *arizela* and *chryseola* migratory; other races sedentary, although *sinuosa* may make local movements along coast in winter. Migratory populations leave breeding grounds mainly during late Aug and Sept, generally arriving back on breeding grounds from late Mar in S, late May in N; NW populations wintering on Pacific coast arrive earlier, from early Apr. Casual N of breeding range in spring and autumn, and in E Caribbean (Lesser Antilles) in autumn and winter. Vagrant in Greenland and Britain, and reported also from Venezuela and Tobago. Specimens of W races *occidentalis* and *campicola* have been collected in Florida.
Status and Conservation. Not globally threatened. Generally abundant throughout range. Highest breeding densities in E Canada and NE USA; estimates here include 244 males/km² in black spruce (*Picea mariana*) swamps in NE Ontario, 335 males/km² in dry bogs in Algonquin Provincial Park (Ontario), and 111 pairs/40·5 ha in Maryland. Densities in SW riparian growth in arid areas generally much lower, e.g. 4·7 and 5·7 birds/40 ha in same location in different years in Arizona, and 11 birds/40 ha in California. Races *sinuosa* and *insperata* are highly localized: *sinuosa* has declined by estimated 80–95% over the past 100 years owing to an 83% loss of its saltmarsh habitat, and has been proposed as a candidate for federal Endangered status, but no action has yet been taken; *insperata* virtually extirpated in recent years and presumably deserves same consideration, but again there has been no action as yet. No information on status of race *chapalensis*, confined to L Chapala, in E Jalisco (SW Mexico).
Bibliography. Atwood (1992), Behle (1950), Bledsoe (1988), Borror (1967), Chen Peilin (1993), Curson *et al.* (1994), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Ewert & Lanyon (1970), Foster (1977), Guzy & Ritchison (1999), Hardy (1974), Hofslund (1959), Howell & Webb (1995), Kelly & Wood (1996), Klicka (1994), Kowolski (1983a), Lewington *et al.* (1991), Lewis (1972), Marshall & Dedrick (1994), McCarthy (2006), Olson (2009b, 2010), Powell & Jones (1978), Raffaele *et al.* (1998), Ritchison (1991, 1995), van Rossem (1930), Shuford (1993), Stewart (1953), Taylor (1976a, 1976b), Wunderle (1978b, 1979), Zink & Klicka (1990).

56. Belding's Yellowthroat

Geothlypis beldingi

French: Paruline de Belding **German**: Beldinggelbkehlchen **Spanish**: Mascarita de Belding
Other common names: Peninsular Yellowthroat

Taxonomy. *Geothlypis beldingi* Ridgway, 1882, San José del Cabo, Baja California, Mexico.
Forms a superspecies with *G. trichas* and *G. rostrata*, presumably also including *G. flavovelata*; the four have sometimes been regarded as conspecific. Variation in coloration considered clinal by some authors, who prefer to treat species as monotypic. Two subspecies currently recognized.
Subspecies and Distribution.
G. b. goldmani Oberholser, 1917 – C Baja California, in NW Mexico.
G. b. beldingi Ridgway, 1882 – S Baja California.



Descriptive notes. 14 cm; 13·8–17·7 g. Male nominate race has black mask from forehead back through and below eye to side of neck, bordered above and at rear by broad yellow band; crown to nape and upperparts olive, throat and underparts rich yellow; iris dark; bill black; legs flesh-coloured. Differs from very similar *G. trichas* in larger size and longer, heavier bill, and yellow (not greyish) forecrown band. Female lacks male's head pattern, has crown and ear-coverts olive, crown washed with warm brown, pale olive-yellow supercilium (indistinct) and broken eyering; underparts paler than male's, often whitish on belly and washed olive-brown on flanks. Juvenile has brownish-olive head and upperparts, obscure pale cinnamon wingbars on greater and median upperwing-coverts, and greyish-buff underparts. Race *goldmani* differs from nominate in having forecrown band greyish-white (not yellow), upperparts slightly greyer, underparts paler, especially on belly, which is yellowish-white. Voice. Song transcribed as "wi te-wich-uh", similar to that of *G. trichas* but fuller, deeper and more powerful, sometimes with buzzy notes admixed, and phrasing slightly different. Usual call a dry "djip", slightly fuller and deeper than that of *G. trichas*; also gives a dry rattle.

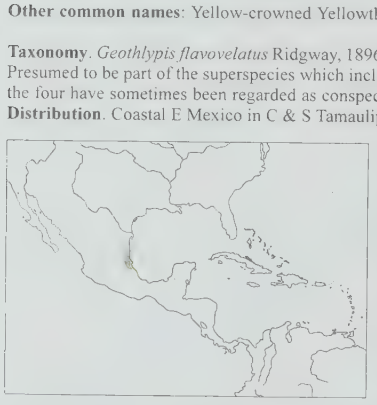
On following pages: 57. Altamira Yellowthroat (*Geothlypis flavovelata*); 58. Bahama Yellowthroat (*Geothlypis rostrata*); 59. Olive-crowned Yellowthroat (*Geothlypis semiflava*); 60. Black-polled Yellowthroat (*Geothlypis speciosa*); 61. Hooded Yellowthroat (*Geothlypis nelsoni*); 62. Masked Yellowthroat (*Geothlypis aequinoctialis*); 63. Grey-crowned Yellowthroat (*Geothlypis poliocephala*).

Habitat. Freshwater marshes containing extensive reed, cat-tail (*Typha*) or hard-stemmed bulrush (*Schoenoplectus acutus*), often along marshy river edges; may also occur in brackish coastal marshes and mangroves fringing coastal estuaries.
Food and Feeding. Little known. Feeds on insects and other invertebrates, foraging mainly by gleaning low in marsh vegetation.
Breeding. Season probably Mar–Jun, egg-laying Mar–May. Nest a deep cup of cat-tail or bulrush leaves, lined with hair and fine plant fibres, attached to living stems at up to 1·5 m above ground or water level. Clutch 2–4 eggs, usually 3; no information on incubation and nestling periods.
Movements. Sedentary.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Baja California EBA. Global population no more than a few thousand at very most. Total area of occupied habitat very small; suitable habitat severely fragmented, and species recently extirpated from at least one site. In recent surveys, found to be present at a total of at least 26 sites. N race *goldmani* found at twelve localities, and appears to be common at most of these; total population last estimated to number 1100 individuals, but current total probably higher than that, e.g. estimated population 537–648 individuals at one locality (San Ignacio); extent of suitable habitat, however, likely to be very small. Nominate race known from at least 14 sites, with main concentrations at Estero de San José del Cabo (219–480 individuals) and Punta San Pedro (70); last count of this race produced figure of c. 550 individuals, most of which were in a single population (at San José del Cabo). Species was formerly locally common in Baja California, where it inhabited lowland freshwater marsh, but most populations have collapsed recently owing to almost complete destruction of habitat; this a result largely of human activity, but also of natural events such as droughts and hurricanes. One of main sites, Estero de San José del Cabo (a 42-ha freshwater coastal lagoon at S tip of Baja California), was designated a Ramsar site in 2008; two small local groups in adjacent town have traditionally taken an active interest in conservation of area. Current conservation initiatives include development of a "Conservation Area Plan", whereby main threats identified and a conservation strategy set up, and continuation of research and monitoring to ascertain present status of and threats to this species in Estero de San José del Cabo Ecological Reserve and at other historically important sites; also, erection of information boards planned at this reserve and material to be distributed to local schools. By end of 2008, more than 80 local bird guides had been trained; these will attempt to raise the profile of this yellowthroat and reinforce ties between local economic practices and conservation of this species. Presently, main threats are continued destruction of habitat during housing and tourist developments, drainage of wetlands for agriculture, and drying-out of reedbeds during droughts and fires; natural events can also have serious adverse effect on such a small and fragmented population, hurricanes frequently destroying areas of reeds. Brood parasitism by Brown-headed Cowbird (*Molothrus ater*) not recorded, but could become a problem if numbers of this parasite increase in S Baja California.
Bibliography. Anon. (2009f), Behle (1950), Brewster (1902), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Dunn & Garrett (1997), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Howell (1999b), Howell & Webb (1992a, 1995), Kaufman (1979), Oberholser (1917), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Todd (1911).

57. **Altamira Yellowthroat**
Geothlypis flavovelata

French: Paruline à couronne jaune **Spanish**: Mascarita de Altamira
German: Goldscheitel-Gelbkehlchen
Other common names: Yellow-crowned Yellowthroat

Taxonomy. *Geothlypis flavovelatus* Ridgway, 1896, Alta Mira, near Tampico, Tamaulipas, Mexico.
Presumed to be part of the superspecies which includes also *G. trichas*, *G. beldingi* and *G. rostrata*; the four have sometimes been regarded as conspecific. Monotypic.
Distribution. Coastal E Mexico in C & S Tamaulipas, extreme E San Luis Potosí and N Veracruz.



Descriptive notes. 13 cm; 10·2–11·5 g. Male typically has head mostly yellow with black facial mask; rear crown, nape and upperparts quite bright olive; throat and underparts bright yellow, washed olive on flanks; some males (apparently especially in C Tamaulipas) have less yellow on head, giving appearance of broad yellow frontal band, possibly individuals in fresh plumage (with olive feather tips obscuring yellow bases); iris dark; bill blackish; legs flesh-coloured. Distinguished from all congeners by brighter general appearance. Female lacks black mask, has crown and ear-coverts olive, crown faintly washed brown, with forehead, supercilium, eye-crescents and side of neck yellow. Juvenile has olive head and upperparts, possibly with greyish wash on side of head, and paler olive underparts, becoming buffy yellow on belly and undertail-coverts. Voice. Song a series of rich scratchy phrases, apparently very similar to that of *G. trichas*. Call a husky "cheh" or "chrek", similar to that of *G. trichas* but apparently rather huskier.
Habitat. Freshwater marshes containing extensive reedbed vegetation; also smaller areas of reeds in ponds and irrigation ditches.
Food and Feeding. Virtually no information. Presumably feeds on insects and other invertebrates, foraging principally in cat-tails (*Typha*).
Breeding. Female in breeding condition in May and of "immature" in Aug. No other information.
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in North-east Mexican Gulf Slope EBA. Uncommon; reliant on freshwater marshes containing extensive reedbeds. Has declined seriously in recent years, principally as a result of habitat loss; several populations now extirpated. Present stronghold in Tamaulipas, where large population in Laguna Champayán area, but this possibly under threat from drainage associated with industrial development. Now very rare in Veracruz, where stronghold the area inland from Tecolutla; further population near El Naranjo, in E San Luis Potosí. Previously reported from Laguna de Tamiahua area and near Tamuin and Ebano, on Veracruz–San Luis Potosí border, but no recent records from these areas. In addition to drainage linked with industrialization, the drainage of marshes for cattle-ranching is a potential threat in many areas. This species is able to persist in small fragments of habitat, but these perhaps unsustainable in long term, and in Veracruz probably insufficient habitat remains to support a viable population.
Bibliography. Anon. (2009f), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Delaney (1992), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Hoffman (1989), Howell (1999b), Howell & Webb (1995), Mountfort & Arlott (1988), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

58. **Bahama Yellowthroat**
Geothlypis rostrata

French: Paruline des Bahamas **Spanish**: Mascarita de las Bahamas
German: Bahamagelbkehlchen
Other common names: Andros Yellowthroat (*exigua*)

Taxonomy. *Geothlypis rostratus* H. Bryant, 1867, Nassau, New Providence, Bahamas.
Forms a superspecies with *G. trichas* and *G. beldingi*, presumably also including *G. flavovelata*; the four have sometimes been regarded as conspecific. Four subspecies currently recognized.
Subspecies and Distribution.
G. r. tanneri Ridgway, 1886 – Grand Bahama and Abaco Is, in N Bahama Is.
G. r. exigua Ridgway, 1902 – Andros, in WC Bahamas.
G. r. rostrata H. Bryant, 1867 – New Providence I, in C Bahamas.
G. r. coryi Ridgway, 1886 – Eleuthera I and Cat I, in EC Bahamas.

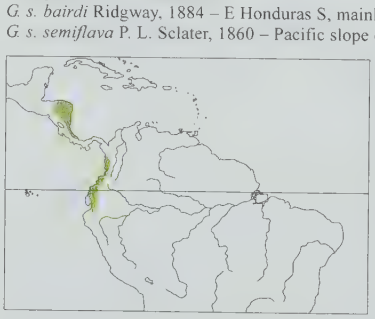


Descriptive notes. 15 cm; 15·1–17·3 g. Male nominate race has broad black mask from forehead back through and below eye to side of neck, bordered above and at rear by narrow greyish-white band, tinged yellowish at side; hindcrown and nape mid-grey, tinged yellowish-olive, upperparts yellowish olive-green; throat and underparts yellow, slightly paler on belly, washed olive on flanks; iris dark; bill black; legs flesh-coloured. Differs from similar *G. trichas* in larger size and heavier build, noticeably longer, heavier bill, and more uniformly yellow underparts. Female lacks male's head pattern, has crown washed brownish and ear-coverts greyish, narrow greyish-white supercilium. Juvenile undescribed; first-year in autumn slightly duller than adult, with slightly browner upperparts and more buffish underparts, male probably with less distinct head pattern. Race *exigua* is slightly smaller and slightly smaller-billed than nominate, also darker above, male has darker grey crown and narrower forecrown band usually broken in middle; *coryi* is brightest, with crown mostly olive, narrow forecrown band mostly or entirely yellow, less of an olive wash on flanks; *tanneri* is intermediate between previous and nominate in head pattern, and has heavier olive wash on flanks than previous. Voice. Song a loud "witchity witchity witchit", very similar to that of *G. trichas* but somewhat richer and delivered more slowly. A quiet "whisper-song", including short trills and spluttering notes, has also been described. Usual call a rather sharp "tuck", less harsh than that of *G. trichas*; also gives dry rattle.
Habitat. Dense scrubby understorey of open pine (*Pinus*) forest, especially where bracken (*Pteridium*) and thatch palm (*Thrinax morrisii*) dominant; also, less commonly, in other woodlands. Usually not found in damp or marshy habitats.
Food and Feeding. Feeds on insects and berries; occasionally takes anole lizards (*Anolis*). Forages by gleaning; actions noticeably slower and more deliberate than those of *G. trichas*.
Breeding. Season May–Jul. Nest a cup, usually placed low in dense vegetation, sometimes in tree stump or high up in pine tree; clutch 2 eggs. No other information.
Movements. Sedentary. Three unconfirmed reports of vagrancy in SE USA (Florida).
Status and Conservation. Not globally threatened. Restricted-range species: present in Bahamas EBA. Race *tanneri* appears common on Grand Bahama and Abaco, as well as on some of the offshore cays; *exigua* has apparently declined, and now scarce on Andros; *coryi* remains common on Cat I, but has declined on Eleuthera. Nominate race now apparently seriously threatened on New Providence; decline here and on the other islands due primarily to habitat loss, but the various populations may now be threatened also by brood parasitism from Shiny Cowbirds (*Molothrus bonariensis*), which arrived in Bahamas in 1994.
Bibliography. Baltz (1994), Bangs (1900), Bonhote (1903), Brudenell-Bruce (1975, 1988), Curson *et al.* (1994), Dodrill & Gilmore (1978), Dunn & Garrett (1997), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Kaufman (1984), King *et al.* (1979), Raffaele *et al.* (1998), Schwartz (1970), Stattersfield *et al.* (1998), Sykes (1974), Todd (1911).

59. **Olive-crowned Yellowthroat**
Geothlypis semiflava

French: Paruline des bambous **Spanish**: Mascarita Coronioliva
German: Olivscheitel-Gelbkehlchen

Taxonomy. *Geothlypis semiflava* P. L. Sclater, 1860, Babahoyo, Ecuador.
Not obviously closely related to any other member of genus. In one study found to be very similar genetically to *Oporornis formosus*; the two are similar also in plumage, and has been suggested that they may form a link between the two genera (which are sometimes merged). Races widely separated geographically, and may be better treated as two species, with *G. aequinoctialis chiriquensis* apparently another close relation. Two subspecies recognized.
Subspecies and Distribution.
G. s. bairdi Ridgway, 1884 – E Honduras S, mainly on Caribbean slope, to NW Panama.
G. s. semiflava P. L. Sclater, 1860 – Pacific slope of W Colombia and W Ecuador.



Descriptive notes. 13·5 cm; 17 g. Male has broad black mask extending over forecrown and down to side fo neck; rest of head and upperparts olive-green; throat and underparts yellow, washed olive on flanks; iris dark; bill blackish, when not breeding has pale base of lower mandible; legs pinkish-flesh. Distinguished from congeners by more extensive black on crown. Female lacks black on head, has crown and ear-coverts olive-green, narrow yellowish supercilium; distinguished from *G. aequinoctialis* by lack of grey tinge on head, from *G. trichas* by uniformly yellow underparts and brighter green upperparts. Juvenile has greyish olive-brown head and upperparts, and pale yellowish-buff underparts, probably with more olive wash on throat and breast. Races differ little: *bairdi* has slightly longer bill and shorter tail than nominate. Voice. Song a long and quite musical warble, beginning with short series of two-syllable phrases and then going into varied and jumbled twitter; much longer and more varied than

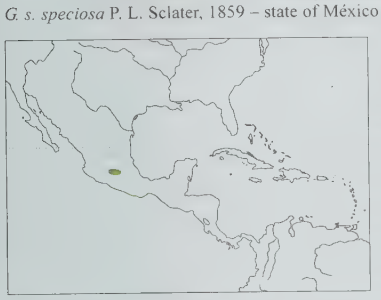
that of *G. aequinoctialis*, and slightly reminiscent of song of some *Basileuterus* species. Calls include hoarse "chuck", nasal "chee-uw" or "chreeuw", and short descending chatter in alarm.
Habitat. Mainly tall, damp grassland in forest edges and clearings, and in shrubby pastures adjacent to woodland or scrub. Found in damper habitats than those used by *G. aequinoctialis*, and often, though not always, near standing water. Occurs from lowlands to c. 1200 m, occasionally to 1500 m; once at 2300 m in Ecuador.
Food and Feeding. Little known. Feeds mainly on insects and other invertebrates; gleans items low in dense vegetation.
Breeding. Egg-laying in Apr–Jun in Costa Rica; birds in breeding condition in Jan–Feb in Colombia. Nest a cup of grasses, lined with finer grasses, concealed low in grass clump. Clutch 1–2 eggs, usually 2. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common in Central America; generally uncommon to locally common in Colombia and Ecuador. No population estimates available.
Bibliography. Curson *et al.* (1994), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Hilty & Brown (1986), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Stiles & Skutch (1989).

60. Black-polled Yellowthroat

Geothlypis speciosa

French: Paruline à face noire **Spanish**: Mascarita Transvolcánica
German: Ockerbrust-Gelbkehlchen
Other common names: Orizaba Yellowthroat

Taxonomy. *Geothlypis speciosa* P. L. Sclater, 1859, central Mexico.
Affinities within genus not known; no obvious close relatives. Two subspecies recognized.
Subspecies and Distribution.
G. s. limnatis Dickerman, 1970 – S Guanajuato and N Michoacán, in C Mexico.
G. s. speciosa P. L. Sclater, 1859 – state of México (C Mexico).



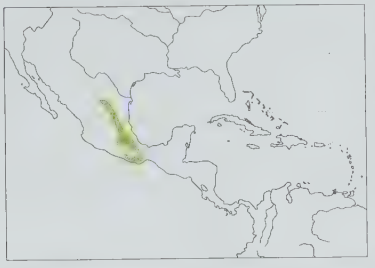
Descriptive notes. 13 cm; 10–11·6 g. Distinctive yellowthroat, both sexes noticeably darker than congeners. Male nominate race has black mask extending back to forecrown and down to side of neck; rear crown black, mottled brown, nape and upperparts quite dark brownish-olive; throat and underparts rich golden-yellow, brownish-cinnamon wash on side of breast and flanks; iris dark; bill black; legs greyish-flesh. Female lacks male's head pattern, has head and upperparts dark greyish-olive, lacking warm brown tones, throat and underparts rich yellow, with heavy olive wash on breast side, flanks and belly. Juvenile has brownish-olive head and upperparts, and paler dusky-olive underparts with distinct yellowish wash. Race *limnatis* is greener above than nominate, and male has more olive, less cinnamon, wash on flanks. Voice. Song a series of loud ringing notes on one pitch or descending slightly towards end; distinctly different from songs of congeners. Calls include liquid "chwik" and slightly nasal "chweh".
Habitat. Occurs in river marshes and associated wetlands with cat-tails (*Typha*) and hard-stemmed bulrushes (*Schoenoplectus acutus*), known also as "tule", in volcanic belt, at 1750–2500 m, favouring lakeshores and marsh areas where tule more than 1·5 m tall. Unlike most congeners, appears to be dependent on extensive areas of reedbed, and not found in degraded habitats.
Food and Feeding. Little known. Feeds on insects; gleans items low down in cat-tails and associated vegetation.
Breeding. Paired birds seen in Mar–May (in 1947) and apparently "breeding in abundance" in late May and Jun (in 1948), and juveniles in Jun, Jul and Sept; season probably Mar–Jun. No other information.
Movements. Sedentary.
Status and Conservation. ENDANGERED. Restricted-range species: present in Central Mexican Marshes EBA. Locally common to rare. Has declined dramatically in recent years, many populations having become extinct. Formerly occurred from Michoacán E to Valley of Mexico, but currently known from only four small, discrete areas: Lago Yuriria (in Guanajuato), Lago Cuitzeo and Lago Pátzcuaro (in Michoacán), and upper R Lerma (in México). Global population not known, but certain to be very small. At Lago Cuitzeo was abundant in 1980s and in upper R Lerma was still common in same period, but no counts since that time. Loss of habitat the main reason for decline, and much of remaining habitat still threatened by land drainage; water from upper Lerma used for supplying Mexico City, which makes it difficult to instigate suitable protection measures, and remaining habitat here becoming increasingly fragmented. In other three areas, water levels falling through both land drainage and a build-up of organic material, with consequent loss of reedbed habitat on which this species depends.
Bibliography. Anon. (2009f), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Delaney (1992), Dickerman (1970), Edwards & Martin (1955), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Howell & Webb (1995), Lea & Edwards (1950), Mountfort & Arlott (1988), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Wege & Long (1995), Wilson & Ceballos-Lascuráin (1986).

61. Hooded Yellowthroat

Geothlypis nelsoni

French: Paruline de Nelson **German**: Nelsongelbkehlchen **Spanish**: Mascarita Matorralera
Other common names: Brush Yellowthroat

Taxonomy. *Geothlypis nelsoni* Richmond, 1900, Cofre de Perote, near Jalapa, Veracruz, Mexico.
Species originally named as *G. cucullata*, but that name invalid, as preoccupied. Affinities within genus not known; no obvious close relatives. Has been suggested that race *karlenae* or possibly an undescribed race may occur on the Volcanes de Colima (W Mexico); further study required. Two subspecies recognized.
Subspecies and Distribution.
G. n. nelsoni Richmond, 1900 – Sierra Madre Oriental (from SE Coahuila S to WC Veracruz and N Puebla), in C Mexico.
G. n. karlenae R. T. Moore, 1946 – C highlands of Mexico from Distrito Federal and S Puebla S to Oaxaca.



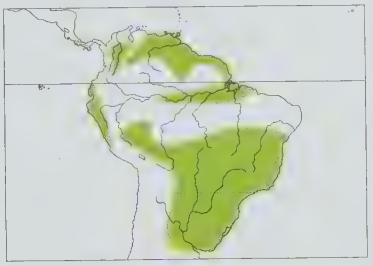
Descriptive notes. 13 cm; 10·1–11·8 g. Male nominate race has broad black mask from forehead back through and below eye to side of neck, bordered above and at rear by mid-grey band; rest of head and upperparts dull olive-green; throat and underparts yellow, slightly paler on belly, washed olive on flanks; iris dark; bill black, when not breeding has pale lower mandible; legs flesh-coloured. Differs from very similar *G. trichas* mainly in having proportionately longer tail and more slender bill. Female lacks male's head pattern, has crown and ear-coverts dull olive, pale greyish supraloral stripe. Juvenile is mostly sooty-olive, with paler underparts; first-year plumage apparently undescribed. Races are very similar: *karlenae* male has forecrown band on average slightly wider than on nominate, female has brighter (more orangey) tinge on breast and more bronze-yellow undertail-coverts. Voice. Song a series of "witchy" notes ending with upward-inflected notes, similar to that of *G. trichas* in overall quality but phrases generally of two (rather than three) syllables and has distinct flourish at end. Usual call a dry "tchip" or "tchrrek"; also gives softer "tchk", reminiscent of *Oporornis tolmiei*, and a dry rattle like that of *Troglodytes* wren when agitated.
Habitat. Occurs in dry scrub, brush and chaparral in highlands, at 1400–3100 m; typically found in *pedregal* (semi-arid cactus scrub found on lava beds on highland plateau of C Mexico). May occur in damp situations within these habitats. Sometimes in adjacent dense scrub on woodland edges in winter.
Food and Feeding. Feeds on insects and other invertebrates. Gleans items low down in dense scrub.
Breeding. Adults carrying food seen in May–Jul, indicating breeding season probably Apr–Jul. Nest a cup of grasses, lined with finer grasses, placed low in dense grass clump. No other information.
Movements. Resident; possibly some very localized movements from *pedregal* to adjacent scrubby woodland in winter.
Status and Conservation. Not globally threatened. Not well known; generally described as fairly common to common but local throughout range. No population estimates available.
Bibliography. Curson *et al.* (1994), Delaney (1992), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Howell & Webb (1995), Moore (1946), Wilson & Ceballos-Lascuráin (1986).

62. Masked Yellowthroat

Geothlypis aequinoctialis

French: Paruline équatoriale **German**: Maskengelbkehlchen **Spanish**: Mascarita Equinoccial
Other common names: Black-lored Yellowthroat (*auricularis*, *peruviana*); Chiriqui Yellowthroat (*chiriquensis*); Southern Yellowthroat (*velata*)

Taxonomy. *Motacilla aequinoctialis* J. F. Gmelin, 1789, French Guiana.
Races geographically discrete; *chiriquensis* sometimes considered a separate species, and recently suggested, on basis of mitochondrial DNA, to be closer to *G. subflava* than to other forms currently included herein. In one recent study, nominate race, *chiriquensis*, *auricularis* and *velata* found to be genetically distinct from one another; vocal differences also apparent. They may be better treated as four separate species, with *peruviana* then a race of *auricularis*; some authors have suggested that *peruviana* differs from *auricularis* in its song, and that it, too, may merit elevation to species rank. Further research required. Five subspecies currently recognized.
Subspecies and Distribution.
G. a. chiriquensis Salvin, 1872 – S Costa Rica and adjacent SW Panama.
G. a. aequinoctialis (J. F. Gmelin, 1789) – N Colombia and Venezuela S to N Amazonian Brazil; also Trinidad.
G. a. auricularis Salvin, 1883 – Pacific slope of W Ecuador and NW Peru.
G. a. peruviana Taczanowski, 1884 – upper Marañón Valley, in NW Peru (probably also in adjacent SE Ecuador).
G. a. velata (Vieillot, 1809) – SE Peru, N Bolivia and extreme S Amazonian Brazil S to NE Argentina and Uruguay.



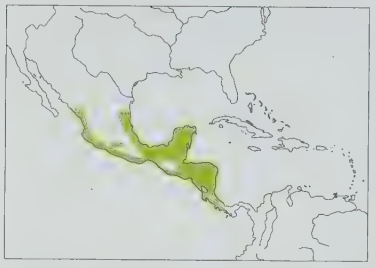
Descriptive notes. 13–14 cm; 11·2–15 g. Male nominate race has grey forehead and forecrown, black mask from side of lower forehead back through and below eye to upper side of neck; rear crown, nape and upperparts olive-green; throat and underparts yellow, faint olive wash on flanks; iris dark; bill blackish, flesh-horn lower mandible; legs flesh-coloured. Female lacks male's head pattern, has crown and ear-coverts olive with noticeable grey wash, pale yellowish-white supraloral stripe and eyering. Juvenile apparently undescribed. Race *auricularis* is smaller than nominate, has black mask restricted to loral and ocular areas; *peruviana* is very similar to previous in head pattern but larger (closer to nominate in size), and grey of crown slightly paler and duller; *velata* is slightly smaller than nominate, and grey of crown extends down onto side of head behind mask; *chiriquensis* is smaller than nominate and, unlike all other races, black mask extends onto forehead. Voice. Song of race *auricularis* a short, vigorous series of clear notes ending with warble, transcribed as "swee-swee-swee-swee-chuchuchcu". Song of *peruviana* reported as starting with pleasant warble and ending with faster series of shorter, descending notes (based on singing birds from Zumba, in SE Ecuador). Song of nominate similar to that of *auricularis* but sweeter and distinctly more warbled, transcribed as "tee-chee-chee teecheweet teecheweet"; also high-pitched series of "weechu" notes, dropping slightly in pitch, on Trinidad. Song of *velata* slightly faster, longer and more warbling than that of nominate, especially at end, and finishing with abrupt note; partners sometimes duet with a series of slowly delivered harsh grating notes. Song of race *chiriquensis* similar to that of *auricularis*, but with phrases repeated many times and becoming progressively faster, weaker and higher, and ending with distinct flourish. Calls of all races include fast chatter, descending in pitch, and fine, sharp "chip"; also a plaintive "chiew".
Habitat. Found in variety of damp habitats, including damp grassland, marshes, seasonally flooded savanna, and dense undergrowth in forest edges and clearings, from lowlands to 1500 m, in Ecuador exceptionally to 2000 m. Race *auricularis* more in scrubby undergrowth in dry tropical forest, and nominate sometimes occurs in sugar-cane fields in Trinidad. Race *velata* breeds in marshes in EC Argentina, but often occurs in dry scrubby areas on migration in this area.

Food and Feeding. Feeds on insects and other invertebrates. Foraging behaviour little recorded.
Breeding. Nest with eggs in May in Costa Rica; season of nominate race appears to be quite protracted, with birds in breeding condition in Jan–May and Aug in Colombia, and in Feb, May, Aug and Oct in Trinidad; race *velata* apparently breeds during Sept in EC Argentina. Nest a deep cup of grasses, lined with finer plant material, placed low in grass or scrub. Clutch 2 eggs (one nest in Costa Rica). No other information.
Movements. Mostly sedentary. S race *velata* a partial migrant, some moving S to breed in EC Argentina, at extreme S edge of range, arriving from late Sept, and mostly vacating this area during austral winter; a few may winter in Buenos Aires area. This race apparently also largely absent from humid regions of extreme NE Argentina during austral breeding season, although occurs there in winter.
Status and Conservation. Not globally threatened. Locally common throughout range. No population estimates available; race *chiriquensis*, at least, appears to have shown local increases as a result of deforestation in its range, and same may be true of other races.
Bibliography. Barnett & Pearman (2001), Clements & Shany (2001), Curson *et al.* (1994), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), ffrench (1991), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Sick (1993), Stiles & Skutch (1989).

63. Grey-crowned Yellowthroat
Geothlypis poliocephala

French: Paruline à calotte grise **German**: Wiesengelbkehlchen **Spanish**: Mascarita Coronigrís
Other common names: (Grey-crowned) Ground Chat, Meadow Warbler

Taxonomy. *Geothlypis poliocephala* S. F. Baird, 1865, Mazatlán, Sinaloa, Mexico.
Often placed in a monotypic genus, *Chamaethlypis*. Differs from present congeners in many characters, including vocalizations, morphology and some plumage features. Geographical variation not very marked and mostly clinal, birds becoming more olive above, deeper and more extensively yellow below, darker grey on head and with less obvious eye-crescents from N to S. Proposed race *pontilis* (described from Morelos, in S Mexico) is synonymized with nominate. Six subspecies currently recognized.
Subspecies and Distribution.
G. p. poliocephala S. F. Baird, 1865 – Pacific slope of Mexico from N Sinaloa S to extreme W Oaxaca.
G. p. ralphi Ridgway, 1894 – Gulf slope of Mexico in Tamaulipas and San Luis Potosí.
G. p. palpebralis Ridgway, 1887 – E slope from E Mexico (Veracruz) and Yucatán Peninsula S to N Costa Rica.
G. p. caninucha Ridgway, 1872 – Pacific slope from S Mexico (E Oaxaca) S to S Honduras.
G. p. icterotis Ridgway, 1889 – Pacific slope from Nicaragua S to W Costa Rica.
G. p. ridgwayi (Griscom, 1930) – SW Costa Rica S to SW Panama.
Descriptive notes. 14 cm; 13·2–16·4 g. Distinctive yellowthroat having stout bill with curved culmen, and long, graduated tail. Male nominate race has grey crown, black lores and ocular area, white eye-crescents, remainder of head olive-grey; upperparts greyish olive-brown; below, yellow throat, breast and undertail-coverts, pale yellowish-white belly, buff wash on flanks; iris dark; bill grey-brown, flesh-coloured on lower mandible; legs flesh-coloured. Distinguished from other yellowthroats by stout bill with noticeably curved culmen, long tail with graduated shape, and distinctive head



pattern. Female is similar to male, but has duller head with greyish (not black) lores and ocular area, yellowish-white (not white) eye-crescents, and a heavier brownish-olive wash on rest of head. Juvenile has brownish-olive head and upperparts, lemon-olive wingbars on greater and median upperwing-coverts, tawny-olive underparts becoming paler and more buffy yellow on belly and undertail-coverts; first-year male in autumn similar to adult female, but with black lores and buffier breast, by spring resembles adult male; first-year female duller than adult, especially below, where throat and breast have buffy-olive wash. Races vary to only limited extent: *ralphi* differs from nominate in being greyer above, especially on tail, and having paler breast, whiter lower underparts; *palpebralis* is more olive above than nominate, richer and more extensively yellow on breast, with flanks olive-yellow, bill larger, also male darker on crown and sometimes lacking eye-crescents; *caninucha* resembles previous, but male has slightly more black on face, white eye-crescents faint or lacking; *icterotis* is much duller than last, with less yellow below, male with crown olive-grey (less contrast with nape) and black facial markings duller and less extensive; *ridgwayi* is like *caninucha*, but greener above and brighter yellow on breast. Voice. Song a long rich series of varied and jumbled musical phrases, sounding rather like song of a *Passerina* bunting, quite different from songs of other yellowthroats. In Costa Rica, at least, has a second song, consisting of a series of rapidly delivered clear whistled notes accelerating into descending trill; a second song in Mexico described as a series of rich rising and falling whistles, reminiscent of that of Canyon Wren (*Catherpes mexicanus*). Most common call a high-pitched, grating "cheed-l-eet", final note slightly higher in pitch than first one; other calls include descending series of three-syllable notes e.g. as "peet-a-loo, peet-a-loo, peet-a-loo", also a loud slapping "chack", and a "chee".
Habitat. Damp, grassy fields with some shrubs, hedgerows, semi-arid scrub and savanna, and other open grassy habitats with scrub, including sugar-cane fields; mostly in lowlands, locally to c. 2000 m.
Food and Feeding. Feeds on insects and other invertebrates. Forages mainly by gleaning low in scrub and grass, and sometimes on ground; also flycatches.
Breeding. Egg-laying in Apr–Jul. Nest a deep cup of grasses, lined with finer grasses and hair, placed low down in dense vegetation. Clutch 2–4 eggs, usually 2 in S of range. No other information.
Movements. Sedentary. Race *ralphi* now just a rare vagrant in extreme S USA (SE Texas).
Status and Conservation. Not globally threatened. Generally fairly common to common throughout range. No population estimates available; has increased in some areas (e.g. Caribbean slope of Costa Rica) with deforestation, which provides suitable early-successional habitat. May have recently colonized Cozumel I (off NE Yucatán Peninsula) following forest clearance there. Race *ralphi* formerly bred in extreme S USA (extreme SE Texas), but disappeared as a result of habitat degradation caused by overgrazing and changing agricultural practices; in 2005 a pair bred in Texas for first time since 1894, but nest was preyed on within four days of discovery. In N Tamaulipas (NE Mexico) similar habitat degradation to that in Texas may be causing further localized declines of this race.
Bibliography. Coffey & Coffey (1990), Curson *et al.* (1994), Dunn & Garrett (1997), Eisenmann (1962a), Escalante *et al.* (2009), Escalante-Pliego (1991a, 1991b), Howell (2004), Howell & Webb (1995), Lorenz *et al.* (2006), McCarthy (2006), Ridgely & Gwynne (1989), Stiles & Skutch (1989), Wetmore (1944).

PLATE 57 ➤


64
65
66
67
♂
♀
68
ssp *pusilla*
69
70
ssp *melanauris*
71
72
ssp *chryseola*
ssp *ruber*
73
74
75
ssp *miniatus*
ssp *sanctaemartae*
76
ssp *castaneocapilla*
77
ssp *duidae*
78
inches
3
cm
8

PLATE 57

Genus *MICROLIGEA* Cory, 1884

64. **Green-tailed Warbler**

Microligea palustris

French: Paruline aux yeux rouges **German**: Graubrust-Waldsänger **Spanish**: Reinita Coliverde
Other common names: Green-tailed Ground-tanager, (Green-tailed) Ground Warbler, Grey-breasted (Ground) Warbler

Taxonomy. *Ligea palustris* Cory, 1884, Santo Domingo = Villa River, Dominican Republic.
Formerly considered quite closely related to *Geothlypis* or *Dendroica*, and was also believed to be close to similarly monotypic *Xenoligea*. Recent genetic and morphological evidence suggests that both latter and present species may belong, instead, with the tanagers (Thraupidae); in particular, recent research indicates that this species appears not to form part of a monophyletic parulid family; further study required. Population of this species recently found in xeric lowlands of NW Haiti may represent an additional, as yet undescribed, race. Two subspecies currently recognized.
Subspecies and Distribution.
M. p. palustris (Cory, 1884) – highlands of Hispaniola.
M. p. vasta Wetmore & Lincoln, 1931 – xeric lowlands of SW Dominican Republic.



Descriptive notes. 14·5 cm; 9·5–15·2 g. Nominate race has grey head and upper mantle (faintly washed olive), contrasting olive-green upperparts; white crescents above and below eye, loral area can be diffusely marked darker grey in front of eye and paler beside bill, or can be paler on upper lores; underparts pale greyish, whiter on belly; iris ruby-red; bill and legs blackish to grey. Sexes alike. Juvenile undescribed; first-year similar to adult, but slightly duller, with brown iris. Race *vasta* is paler overall and more extensively whitish on underparts than nominate. Voice. Short rasping call frequently accelerated to form what may be song. Song described also as "sip sip sip".
Habitat. Nominate race occurs in montane forest with dense, undisturbed understorey; *vasta* in semi-arid xeric scrub in lowlands.
Food and Feeding. Little known. Feeds largely on insects; forages mainly in dense undergrowth and thickets.
Breeding. Season May–Jun in mountains, possibly slightly earlier in xeric lowlands. Nest a cup, placed less than 1 m up in shrub or blackberry (*Rubus*) thicket. Clutch 2 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Hispaniola EBA. Locally fairly common. No population estimates available. Has apparently undergone recent decline, possibly as a result of nest predation by introduced small Indian mongoose (*Herpestes auropunctatus*), but not currently threatened in the way that *Xenoligea montana* is.
Bibliography. Curson *et al.* (1994), Dávalos & Brooks (2001), Lovette & Bermingham (2002), McDonald (1987, 1988), Raffaele *et al.* (1998), Reynard (1981), Stattersfield *et al.* (1998), Wetmore & Lincoln (1933).

Genus *TERETISTRIS* Cabanis, 1855

65. **Yellow-headed Warbler**

Teretistris fernandinae

French: Paruline de Fernandina **German**: Gelbkopf-Waldsänger **Spanish**: Reinita Chillina

Taxonomy. *Anabates fernandinae* Lembeye, 1850, Cuba.
Relationships of genus unclear; placement in present family recently questioned, as a detailed study indicates that it appears not to form part of a monophyletic family clade. Forms a closely related species pair with *T. fornsi*. Monotypic.
Distribution. W Cuba and I of Pines.



Descriptive notes. 13 cm; 6·5–18·5 g. Has yellow hood (tinged olive on crown and nape), contrasting grey upperparts and greyish-white underparts; yellow eyering; iris dark; bill blackish, grey base of lower mandible; legs bluish-grey. Sexes alike. Juvenile undescribed. Voice. Song a series of buzzy grating notes interspersed with sweeter, more musical notes. Usual call a rapid, high-pitched, staccato chattering, sometimes described as a rasping trill, generally repeated many times; also various other buzzy and grating notes.
Habitat. All types of forest with relatively undisturbed understorey, also scrubby thickets in semi-arid areas, from lowlands to high mountains.
Food and Feeding. Feeds on insects and other invertebrates; apparently also takes small lizards. Forages at low to mid-levels, mostly in understorey, also on ground. Forages mainly by gleaning among branches and foliage. Often in flocks.
Breeding. Season Mar–Jul, egg-laying Apr–May. Nest a cup of grasses, rootlets and other plant fibres, placed low or fairly low in bush, vine or sapling. Clutch 2–3 eggs; no information on incubation and fledging periods.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cuba EBA. Common to very common within its limited range. No population estimates available.
Bibliography. Curson *et al.* (1994), Garrido (2000b), Garrido & Kirkconnell (2000), Lovette & Bermingham (2002), Quesada & de las Pozas (1984), Raffaele *et al.* (1998), Reynard (1981), Stattersfield *et al.* (1998).

66. **Oriente Warbler**

Teretistris fornsi

French: Paruline d'Oriente **German**: Fornswaldsänger **Spanish**: Reinita de Oriente

Taxonomy. *Teretistris fornsi* Gundlach, 1858, eastern Cuba.
Relationships of genus unclear; placement in present family recently questioned, as a detailed study indicates that it appears not to form part of a monophyletic family clade. Forms a closely related species pair with *T. fernandinae*. Birds from Pico Turquino, in SW of range, recently proposed as race *turquinensis*, allegedly slightly larger and longer-tailed than others, also darker, more sooty grey on crown and upperparts and with grey (rather than brownish) wash on rear flanks; further study required. Treated as monotypic.
Distribution. E Cuba.



Descriptive notes. 13 cm; 7·4–13 g. Has crown, nape and upperparts grey, face, throat and most of underparts yellow, becoming white on rear underparts, with dull brownish wash on flanks; yellow eyering; iris dark; bill blackish-grey; legs bluish-grey. Sexes alike. Juvenile undescribed. Voice. Song a series of buzzy notes interspersed with sweeter notes, very similar to that of *T. fernandinae* but slightly more monotonous. Calls similar to those of *T. fernandinae*, but slightly less harsh, and include sharp "tchip".
Habitat. Occurs in all types of forest having relatively undisturbed understorey, also in scrubby thickets in semi-arid areas, from lowlands to high mountains; tends to be found in semi-arid scrubby woodlands near coast and in more humid forests higher in mountains.
Food and Feeding. Feeds on insects and other invertebrates, also small lizards; small fruits may also be taken. Stomach contents indicate that diet mostly of beetles (Coleoptera), with smaller numbers of homopteran bugs and Lepidoptera. Forages at low to middle levels, mostly in understorey, also on ground; generally at higher levels (mostly above 5 m in middle storey) in morning, descending to lower levels, and frequently ground, in afternoon. Feeds mainly by gleaning, but also hover-gleaning; also by probing bark crevices and clumps of dead leaves. Outside breeding season generally in flocks of 4–16 individuals, which often act as nucleus of mixed-species foraging flocks.
Breeding. Season Mar–Jul, egg-laying generally Mar–Apr. Nest made from *Tillandsia* moss, rootlets, vines and fine grasses, unlined, placed c. 1 m above ground on horizontal branch or tree fork, usually concealed in clump of *Tillandsia*. Clutch 2–3 eggs; incubation period 8–9 days; nestling period 10–11 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cuba EBA. Little recorded on status; probably common within its limited and rather discontinuous range.
Bibliography. Curson *et al.* (1994), García Sarmiento & Rojas Tito (1997), Garrido (2000b), Garrido & Kirkconnell (2000), Gundlach (1858), Lovette & Bermingham (2002), Raffaele *et al.* (1998), Reynard (1981), Stattersfield *et al.* (1998).

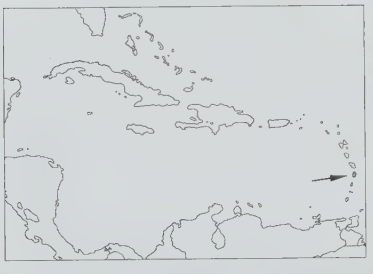
Genus *LEUCOPEZA* P. L. Sclater, 1876

67. **Semper's Warbler**

Leucopeza semperi

French: Paruline pied-blanc **German**: Blassfuß-Waldsänger **Spanish**: Reinita de Semper

Taxonomy. *Leucopeza semperi* P. L. Sclater, 1876, St Lucia.
Affinities uncertain; appears not to be closely related to any of the other Caribbean genera. Monotypic.
Distribution. St Lucia, in Lesser Antilles.



Descriptive notes. 14·5 cm. Dull parulid with long, deep-based and rather pointed bill. Has dark grey head and upperparts, with paler superciliary, browner wing and tail; whitish below, extensive grey-brown wash on side of breast and flanks; iris dark; bill dark greyish-horn, flesh-coloured over most of lower mandible; legs flesh-coloured. Sexes alike. Juvenile undescribed; first-year browner above, washed pale buff below. Voice. Song undescribed. Only documented calls are a soft "tuck-tick-tick-tuck" and a chattering uttered when bird is alarmed.
Habitat. Lower montane and montane rainforests and elfin woodland with undisturbed understorey.

On following pages: 68. Hooded Warbler (*Wilsonia citrina*); 69. Wilson's Warbler (*Wilsonia pusilla*); 70. Canada Warbler (*Wilsonia canadensis*); 71. Red-faced Warbler (*Cardellina rubrifrons*); 72. Red Warbler (*Ergaticus ruber*); 73. Pink-headed Warbler (*Ergaticus versicolor*); 74. Painted Whitestart (*Myioborus pictus*); 75. Slate-throated Whitestart (*Myioborus miniatus*); 76. Brown-capped Whitestart (*Myioborus brunniceps*); 77. Tepui Whitestart (*Myioborus castaneocapilla*); 78. Yellow-faced Whitestart (*Myioborus pariae*).

Food and Feeding. Virtually no information. Apparently forages in dense understorey, usually close to ground; possibly largely terrestrial.
Breeding. No definite information. Thought to nest on or near ground.
Movements. Sedentary.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Lesser Antilles EBA. Not certainly recorded since 1961, despite extensive searches. Unconfirmed, but probably reliable, sightings in May 1989 at Gros Piton (possibly involving two individuals), Sept 1995 at Piton Flore, and in 2003; a previously published sight record, from roadside at Barre de l'Isle, in Feb 1972, no longer considered valid. May have been locally common in 19th century but became excessively rare in 20th century, with only five certain records since 1920s, all from Barre de l'Isle ridge between Piton Flore and Piton Canaries. Despite destruction and degradation of habitat, suitable forest still exists on St Lucia, and the species' decline to probable extinction is thought to have been due to nest predation by small Indian mongoose (*Herpestes auropunctatus*), introduced on St Lucia in 1884 to control fer-de-lance snakes (*Bothrops carribaeus*). These snakes, however, were still common in Piton Flore area until at least 1960s, indicating that mongooses may have been rare in the warbler's last stronghold and therefore perhaps not sole culprits, habitat destruction or other unknown factors playing a part.
Bibliography. Anon. (2009f), Babbs *et al.* (1988), Bond (1961), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Danforth (1935), Evans (1990), Keith (1997), King (1981), Mountfort & Arlott (1988), Raffaele *et al.* (1998), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Tobias *et al.* (2006).

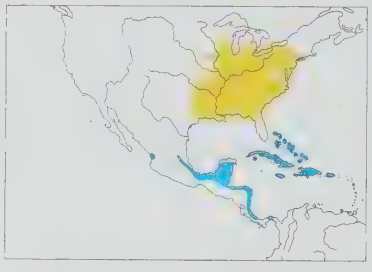
Genus *WILSONIA* Bonaparte, 1838

68. Hooded Warbler

Wilsonia citrina

French: Paruline à capuchon **German**: Kapuzenwaldsänger **Spanish**: Reinita Encapuchada

Taxonomy. *Muscicapa citrina* Boddaert, 1783, Louisiana, USA.
Relationship with congeners not clear; recent study suggests that this species may be closer to *Dendroica*. Monotypic.
Distribution. Breeds in SE Canada (extreme SE Ontario) and in E USA from S Great Lakes and S New England S patchily to E Oklahoma, Gulf of Mexico coast and N Florida. Migrates to Mexico and Central America (primarily in E) and Caribbean.



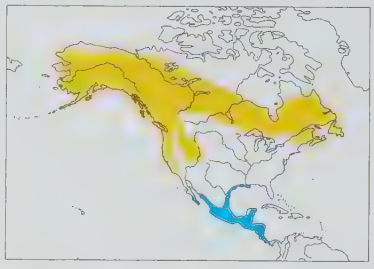
Descriptive notes. 13 cm; 8·1–13·9 g. Male has yellow face and forehead (isolating dark eye) completely surrounded by black hood; upperparts olive-green, tail with extensive white in outer three rectrices (conspicuous during frequent tail-fanning); underparts yellow; iris dark; bill blackish; legs pinkish-flesh. Female is variable, but always duller than male on head and with less white in tail; brightest individuals approach male, but black feathers on head always have olive fringing, giving mottled effect, whereas dullest birds have throat yellow (concolorous with face and forehead) and rear crown and nape olive-green, with only trace of black; distinguished from *W. pusilla* by white in tail, also by dark lores, larger size and slimmer shape. Juvenile is mostly yellowish sepia-brown, with creamy-yellow lower underparts, and obscure pale buff wingbars on greater and median upperwing-coverts, bill pale flesh-coloured, legs slightly paler than those of adult; first-year male similar to adult, first-year female almost always lacks black on head. VOICE. Song somewhat variable, typically a series of 4 loud and musical paired notes with emphasis on final pair, last note of which descends in pitch, can be transcribed as "too-ee, too-ee, too-ee, tee-chu". Usual call a loud, sharp, metallic "chink" or "tchip".
Habitat. Breeds in mature deciduous woodland with dense, undisturbed understorey, favouring vicinity of streams and ravines in maple (*Acer*), beech (*Fagus*), oak (*Quercus*) and hickory (*Carya*) woodlands; will use pine (*Pinus*) forests so long as there is a dense understorey, and frequently occurs in cypress (*Taxodium*) swamps in S of range, and in laurel and rhododendron (*Rhododendron*) thickets in Appalachians. In winter found in lowland tropical deciduous and semi-evergreen forests, forest edge, second growth, and brushy fields and scrub. Territorial in winter, with males often dominant over females (especially first-years) and excluding them from favoured habitats of undisturbed forest; some evidence also that females have innate preference for second-growth habitats, rather than primary forest.
Food and Feeding. Feeds on insects and spiders (Araneae). Forages often by flycatching from low perch and by hover-gleaning; also gleans in understorey. Although territorial in winter, individuals will often temporarily join mixed-species foraging flock as it passes through territory.
Breeding. Season May–Aug, egg-laying May–Jul; sometimes double-brooded (many such reports involve renesting following brood parasitism). Extra-pair copulations very frequent, with up to 40% of young the result of such liaisons; strong social component to this apparent, with at least one record of co-operative breeding, and has been suggested that breeding less likely in forest fragments that are too small to offer opportunities for extra-pair copulation; males less site-faithful than females in successive years, and site-faithful females tend to be less mate-faithful. Nest a cup of dead leaves, bark strips and spider webs, lined with bark shreds and grasses, placed low down in dense undergrowth or in fork of seedling or shrub. Clutch 3–5 eggs, usually 3–4; replacement laid if first breeding attempt unsuccessful; incubation period 12 days; nestling period 8–9 days, but young may leave nest prematurely to avoid predation. Nests heavily parasitized by Brown-headed Cowbird (*Molothrus ater*), despite forest breeding habitat ("chipping" call of females near nest may make them especially conspicuous to cowbirds); parasitism rates vary, from 5% in Arkansas to 75% in Illinois; in one study, experimental removal of female cowbirds during breeding season decreased parasitism rate from 53% (control nests) to 9%, but did not increase nesting success (increased predation likely). Productivity higher in larger forest fragments than in smaller ones, probably owing to higher number of young fledged (post-fledging survival in the two forest types similar); double-brooded females produce on average 1·9 more young per season than so single-brooded females.
Movements. Medium-distance to long-distance migrant. Most leave breeding grounds in late Jul and early Aug (some linger until early Sept), moving S to Gulf of Mexico coast, then across Gulf or following Gulf coast to NE Mexico and Yucatán, and on to E Central America; arrival on wintering grounds from mid-Sept. Spring migration begins in Mar and route more to W, majority following Gulf coast to Texas coast, arriving on breeding grounds from mid-Apr in S, early May in N. Regular in small numbers in Bermuda in autumn and winter; casual in Florida, California, Colombia, Venezuela and Lesser Antilles in winter. Vagrant N of breeding range, throughout much of W North America, and in Britain.
Status and Conservation. Not globally threatened. Fairly common to common throughout most of range. In Canada, restricted to remnant Carolinian forest in S Ontario, and considered threatened there owing to fragmentation and loss of this habitat. Elsewhere, estimated breeding densities based on Breeding Bird Survey data 0·12–0·7 males/ha, with higher densities in more contiguous forest areas with a more dense understorey. Local declines reported following clearance of forest; also local increases where selective logging has resulted in denser understorey.
Bibliography. Evans Ogden & Stutchbury (1994, 1996), Gartshore (1988), Howlett & Stutchbury (1996, 2003), Klein *et al.* (2004), Lewington *et al.* (1991), Lynch *et al.* (1985), Morton (1989, 1990), Morton, Lynch *et al.* (1987), Morton, van der Voort & Greenberg (1993), Neudorf *et al.* (1997), Niven (1993), Norris & Stutchbury (2001), Powell & Rappole (1986), Ramos (1986), Rappole & Warner (1980), Rush & Stutchbury (2008), Stutchbury (1994, 1997, 1998), Stutchbury & Evans Ogden (1996), Stutchbury & Howlett (1995), Stutchbury, Piper *et al.* (1997), Stutchbury, Rhymer *et al.* (1994), Tarof & Stutchbury (1996), Tarof *et al.* (1998).

69. Wilson's Warbler

Wilsonia pusilla

French: Paruline à calotte noire **German**: Mönchswaldsänger **Spanish**: Reinita de Wilson
Other common names: Black-capped/Pileated Warbler

Taxonomy. *Muscicapa pusilla* A. Wilson, 1811, southern New Jersey, USA.
Relationship with congeners not clear. Three subspecies currently recognized.
Subspecies and Distribution.
W. p. pileolata (Pallas, 1811) – breeds N Alaska S along coast to C British Columbia, including Queen Charlotte Is, also in W USA S in Rockies to N New Mexico and in coastal mountain ranges to C California; migrates to region from NW Mexico S to W Panama.
W. p. pusilla (A. Wilson, 1811) – breeds C & S Canada (Mackenzie District of Northwest Territories and N Alberta E to Newfoundland and Nova Scotia) and NE USA (New England); migrates to region from E Mexico S to Costa Rica, also extreme S USA (extreme SE Texas and SW Gulf coast).
W. p. chryseola Ridgway, 1902 – breeds Pacific coast and W slope of coastal mountain ranges from SW British Columbia S to S California; migrates to region from NW Mexico (including Baja California) S to Panama.



Descriptive notes. 12 cm; 5·4–10·5 g. Male nominate race has solid black cap, yellow forehead and face (washed olive on ear-coverts), isolating dark eye; nape and upperparts olive-green, darker upperwing and tail; below, uniformly yellow; iris dark; bill blackish, dark flesh-coloured base of lower mandible; legs pinkish-flesh to brown. Female is similar to male, but lacks solid black cap, black on crown varying from a few feathers to (occasionally) a full cap but flecked with green; differs from *W. citrina* in being smaller and dumpier, with pale lores and no white in tail. Juvenile is mostly dull olive-brown with pale yellowish lower underparts, obscure pale buff wingbars on greater and median upperwing-coverts, bill pinkish-buff, legs slightly paler than those of adult; juvenile plumage apparently very ephemeral, post-juvenile moult normally well advanced by time when young fledge; first-year similar to adult, but first-winter female always lacks black on head. Race *pileolata* is on average slightly larger and brighter than nominate, female usually has more extensive black on crown; *chryseola* is noticeably brighter, often with faint orange tinge on face and throat, female has extensive black cap flecked with olive. VOICE. Song a series of staccato "chip" notes, with some regional variation: nominate race sings a rather weak series that drops in pitch and accelerates slightly towards end; *chryseola* a more vigorous series that accelerates towards end but does not change in pitch; *pileolata* song not well described, may be intermediate between these two. A record of a female singing in California (race *chryseola*). Usual call a loud, flat, fairly low-pitched "tchep" or "timp", often sounding quite nasal (particularly W races); flight call a sharp, downslurred "tsip", often given also by perched birds.
Habitat. Breeds in various wooded habitats, including open coniferous and mixed forest, especially boggy areas with peat-moss (*Sphagnum*), and shrubby areas along streams where alder (*Alnus*), willow (*Salix*) and birch (*Betula*) dominate; also in wide variety of shrub and scrub habitats; nominate race mainly in lowlands, but *pileolata* and *chryseola* also in scrubby woodland on edge of alpine meadows at up to 3000 m. Undisturbed understorey is main habitat requirement in all areas; generally avoids closed forest with sparse understorey. During migration uses all kinds of woodland and tall scrub, usually keeping to areas with dense undergrowth. In winter found in variety of wooded and scrubby habitats, including open forest and forest edges, scrub with dense undergrowth, hedgerows, abandoned fields, thorn-scrub and mangroves, but usually avoiding dense forest; again, a well-developed understorey the most important factor; regularly occurs above tree-line in the *páramo* in Costa Rica.
Food and Feeding. Feeds mainly on insects and spiders (Araneae); occasionally eats berries and the honeydew produced by scale insects (Coccoidea) in winter. Forages mainly at low to middle levels, but also in canopy, by gleaning, hover-gleaning and flycatching. Most individuals defend a feeding territory in winter, but high concentrations often occur in favoured habitat, and individuals will temporarily join mixed-species foraging flocks which pass through territory.
Breeding. Season Apr–Jul, exceptionally to early Aug, egg-laying mostly Jun; some Pacific coast populations appear to be regularly double-brooded. Polygyny recorded, particularly in Sierra Nevada of California. Extra-pair paternity often very frequent, up to 53% in one study in Colorado (W USA). May appear to form loose "colonies", but these possibly concentrations of territories in ideal habitat. Nest a bulky cup of grasses, leaves and mosses, lined with grasses and hair, placed on ground, often under shrub or in grass clump. Clutch 4–6 eggs, usually 5, exceptionally 2–7; incubation period 11–13 days; nestling period 9–11 days. Nests regularly parasitized by Brown-headed Cowbird (*Molothrus ater*); frequency of parasitism generally low but varying locally, from none (recorded in inner coastal California over five-year period) to 43% (21 of 49 nests in Marin County, California) and 55% (6 of 11 nests in S coastal California).
Movements. Medium-distance to long-distance migrant. Leaves breeding grounds from early Aug, arriving on wintering grounds from early Sept. E populations move S to Gulf of Mexico coast,

most then following Gulf coast to Middle America, some flying across Gulf; W populations follow coast and mountain ranges S. Spring migration begins in early Mar and basically follows same routes in reverse, but E birds taking a more W route through North America and most migrating W of Appalachians; arrival on breeding grounds from late Mar in SW, early May in far N. In both spring and autumn, W populations tend to migrate slightly earlier than E ones. Casual in Caribbean on migration and in winter. Vagrant to Greenland, NE Russia (Chukotka), Britain, Bermuda and Colombia.

Status and Conservation. Not globally threatened. Generally common throughout range, and abundant in parts of W North America; less common in much of E. Estimates of breeding density include: 5·6 males/ha in N Colorado; 3·25, 2·49 and 0·59 males/ha in, respectively, montane, subalpine and alpine zones in C Colorado; 5·3 males/ha in Contra Costa County, California; 1·9 males/ha in Marin County, California; fewer than 0·9 males/ha in Sierra Nevada of California; and 0·002–0·01 pairs/ha in S Ontario and 0·01–0·1 pairs/ha in N Ontario. On Pacific coast, race *chryseola* appears to have declined significantly in recent decades, at least in Santa Barbara County (California) this due mainly to destruction of riparian-thicket breeding habitat and increases in cowbird parasitism; declines reported also in several E regions. Decreases in numbers of passage migrants over same period reported in both E & W. Local increases detected in NW & NE regions of range, thought to be due to increase in dense shrub layers in forested areas following logging.

Bibliography. Ammon & Gilbert (1999), Chase *et al.* (1997), Finch (1989), Gilbert & Carroll (1999), Hallock (1984), Hussell *et al.* (1992), Kelly *et al.* (2002), Kessel (1998), Koblik *et al.* (2006), Lewington *et al.* (1991), McNicholl (1977), Otahal (1995), Pomara *et al.* (2003), Pyle *et al.* (1994), Raley & Anderson (1990), Ramos & Warner (1980), Smaldon (1990), Stewart (1972, 1973), Stewart *et al.* (1977), Yong *et al.* (1998).

70. Canada Warbler

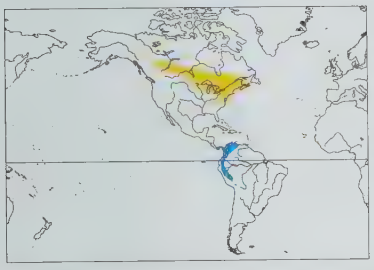
Wilsonia canadensis

French: Paruline du Canada **German**: Kanadawaldsänger **Spanish**: Reinita Canadiense

Taxonomy. *Muscicapa canadensis* Linnaeus, 1766, Canada.

Relationship with congeners not clear. Has hybridized with *Oporornis philadelphia*. Monotypic.

Distribution. Breeds in S Canada (NE British Columbia and N Alberta E to Nova Scotia) and NE USA E from Minnesota and S in Appalachians to extreme N Georgia. Migrates to NW South America W of Andes, S to C Peru; also irregularly S Central America.



Descriptive notes. 13 cm; 8·5–13·5 g. Male has black forehead and face with yellow supraloral stripe and variably yellow and white eyering; crown, nape, ear-coverts and upperparts bluish-grey, streaked black on crown (in fresh plumage in autumn, black streaking on crown slightly reduced and some olive fringing on mantle feathers); yellow below, fading to white on vent and undertail-covets, with necklace of bold black streaks across breast; iris dark; bill blackish-grey, flesh-coloured base of lower mandible; legs pinkish-flesh. Female is similar to male but duller, with head and upperparts dull grey, black on head replaced with olive-grey, and streaks on breast greyish and quite indistinct. Juvenile has greyish-brown head and upperparts, obscure pale buff wingbars on greater and median upperwing-coverts, is pale ochre-yellow below, with olive-brown wash on throat, breast and flanks, and whiter undertail-coverts; first-year male in autumn like adult female but generally brighter, often with fairly bold blackish streaks across breast, by spring resembles adult male but often slightly duller; first-year female in autumn relatively dull, with no black on head, yellowish-olive forehead, distinct olive wash on head and upperparts, greyish breast streaking very indistinct, by spring resembles adult. Voice. Song a variable series of jumbled staccato notes, which start (and often end) with sharp "chip" note. A flight song also recorded, longer than typical song but otherwise similar. Usual call a sharp "tik" or "chik", also softer, slightly lisping "tsip" sometimes given; flight call a high-pitched "zzee".

Habitat. Breeds in deciduous and mixed forests with undisturbed dense understorey, also in tall brushy scrub; favours damp areas, such as *Sphagnum* bogs and stream edges, and areas close to open water; occurs to c. 900 m in Appalachians (locally to c. 2000 m in North Carolina). During migration uses mainly deciduous woodland and scrub, and may then occur in lowlands in South America. In winter mostly in submontane forests and forest edges where there is dense undergrowth, in Andes between 500 m and 2000 m; also in cloudforest, secondary forest and shrubby forest edge.

Food and Feeding. Feeds mainly on insects and other arthropods, especially spiders (Araneae); fruit recorded in faecal samples in Rhode Island. Forages at low to middle levels, but mainly in understorey; occasionally feeds on ground. Main methods gleaning, hover-gleaning and flycatching; flycatches more frequently than do many other parulids, mainly by making short aerial sallies from shrub layer. In winter months usually in small flocks, which regularly join mixed-species foraging flocks.

Breeding. Season late May to early Aug, egg-laying May–Jul (mostly Jun). Nest a bulky cup of grass, leaves, weeds and bark shreds, lined with rootlets and hair, placed on or near ground, usually in mossy hummock, tree stump or upturned tree roots. Clutch 3–5 eggs, usually 4; few data on incubation and fledging periods, former reported as 12 days and latter as 8–10 days; both sexes may feign injury to distract predators from nest. Nests regularly parasitized by Brown-headed Cowbird (*Molothrus ater*), at least in parts of range, but few details; recorded parasitism rates include 20% of nests in Ontario study, and 21·4% and 54·5% in separate studies in Michigan.

Movements. Long-distance migrant. An early autumn migrant and late spring migrant, both migration periods quite compressed. Leaves breeding grounds from late Jul, mostly during Aug, majority moving S through Mississippi Valley and Appalachians to Gulf of Mexico; some may then cross Gulf to Isthmus of Tehuantepec (S Mexico), but probably most follow Gulf coast and move S through highlands of Middle America to reach South American wintering grounds from late Sept. Spring migration begins in Mar (Peru) to mid-Apr (Colombia) and basically follows same route in reverse, but some of those on W wintering grounds may fly across E Pacific to reach S Mexico directly from South America, and some may cross W Gulf of Mexico; arrival on breeding grounds from late Apr in S, late May in N. Casual in Caribbean and Bermuda in autumn. Vagrant throughout much of W North America, mainly in autumn, and in Lesser Antilles (Caribbean), Venezuela (including a record in Jun), Greenland and Iceland.

Status and Conservation. Not globally threatened. Listed as a species of conservation concern by US Fish & Wildlife Service. Generally common throughout range. Population density in breeding areas typically 1–5 pairs/10 ha, but ranges from 0·25 pairs/10 ha in mature maple–beech–birch–hemlock (*Acer–Fagus–Betula–Tsuga*) forest in New York to 13 pairs/10 ha in mixed deciduous–coniferous cut-over forest in NE Ontario. Steady decline over recent decades, particularly in NE of breeding range. Declines thought to be due to fragmentation and loss of breeding habitat, but selective logging may have benefited this species in some areas by increasing density of understorey; browsing of understorey by deer may affect breeding densities in places where deer numerous. Local increases in density can occur during outbreaks of spruce budworm (*Choristoneura fumiferana*). On wintering grounds thought to be vulnerable to rapid modification of forests, but will tolerate some disturbance to forests and is apparently still common in N Andes, where habitat loss proceeding rapidly.

Bibliography. Anon. (2002), Baird (1990), Casebere (1978), Conway (1999), Cooper *et al.* (1997), Crawford & Jennings (1989), DeGraaf, Healy & Brooks (1991), Hagan *et al.* (1992), Hall (1984b), Hallworth *et al.* (2008), Hussell *et al.* (1992), James *et al.* (1996), Keith (1997), Lebbin (2004), Lewington *et al.* (1991), Mallet-Rodrigues (2002), McCarthy (2006), Milosevich & Olsen (1981), Parrish (1997), Petit *et al.* (1995), Pierson (1978), Rappole (1983), Robinson (1997), Welsh & Fillman (1980), Witham & Hunter (1992).

Genus *CARDELLINA* Bonaparte, 1850

71. Red-faced Warbler

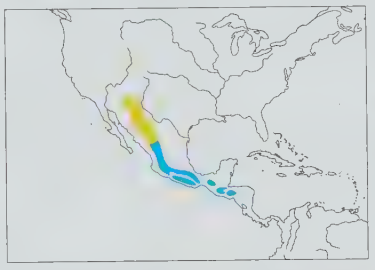
Cardellina rubrifrons

French: Paruline à face rouge **German**: Dreifarben-Waldsänger **Spanish**: Reinita Carirroja
Other common names: American Red-faced Warbler

Taxonomy. *Muscicapa rubrifrons* Giraud, 1841, Texas; error = Mexico.

Genus thought by some authors to be closely related to and perhaps better subsumed in *Wilsonia*; others consider it closer to *Ergaticus*. Birds from Guatemala proposed as a geographical race, *bella*, but this generally considered not tenable. Treated as monotypic.

Distribution. Breeds in SW USA (from Arizona and SW New Mexico) S in NW Mexico to S Durango. Winters from Sinaloa and Durango S through highlands of Mexico and Guatemala to W Honduras and N El Salvador.



Descriptive notes. 14 cm; 8·2–11·2 g. Unmistakable, with distinctive head pattern and coloration. Male has mostly red head, black on central crown extending down side to cover most of ear-coverts, narrow whitish band on nape; upperparts grey, white rump, pale grey to white wingbar on median upperwing-coverts; throat and breast carmine-red, continuous with red of face, rest of underparts pale greyish-white (with faint pink wash in fresh plumage in autumn); iris dark; bill greyish-horn, slightly paler base of lower mandible; legs greyish-flesh. Female is like male, but on average slightly duller. Juvenile has sooty-brown head and upperparts, whitish rump, obscure pale buff wingbars on greater and median upperwing-coverts, slightly paler brown underparts becoming whitish on undertail-coverts, bill and legs paler than those of adult; first-year slightly duller than adult in fresh plumage in autumn; first-winter female may be relatively dull, with quite dull pinkish-red or orange-red on face, throat and breast, and upperparts washed brownish. Voice. Song a series of ringing whistled notes, those towards end sounding sharply slurred, and with emphatic and abrupt ending. Usual call a rather low-pitched, smacking "tship" or "chup".

Habitat. Breeds in pine–oak (*Pinus–Quercus*), spruce (*Picea*) and fir (*Abies*) forests, at 2000–3000 m; favours canyons and steep valley sides where mixture of oaks, aspen (*Populus tremuloides*) and canyon maple (*Acer grandidentatum*) and firs or spruces present. Prefers pine–oak over pure pine forests, and in one study was absent from stands of ponderosa pine (*Pinus ponderosa*) that did not contain also Gambel oak (*Quercus gambelii*). May occur also at lower elevations on migration, especially in spring. In winter found in pine–oak forest, humid montane forest and cloudforest and in riparian woodland, mostly at 1300–3000 m; occasionally winters in semi-deciduous woodland in foothills.

Food and Feeding. Feeds mainly, perhaps entirely on insects, especially lepidopteran larvae, also flies (Diptera) and homopteran bugs. Forages mainly by gleaning from terminal branches and twigs in middle level of trees, but also hover-gleans and flycatches; tends to favour oaks for foraging. In one study, females tended to glean during egg-laying and incubation stages of breeding cycle, but to hover-glean more when feeding nestlings. Single individuals often join mixed-species foraging flocks in winter.

Breeding. Season May–Jul, egg-laying May–Jun. At least one record of a male and two females attending same nest. In studies on Mogollon Rim (Arizona), in S USA, males responded to extra-pair male intrusion into territory by staying closer to mate, particularly during nest-building stage (when most mating occurs). Nest a loose cup of pine needles, bark strips and dead leaves, lined with grasses and hair, placed on ground, generally under log, small shrub or rock on steep bank. Clutch 4–5 eggs, occasionally 3 or 6; incubation period 13 days; nestling period 11–13 days (usually 12 days). Nests parasitized rarely by Brown-headed Cowbird (*Molothrus ater*), which generally rare in breeding habitat, but little information; in one study on Mogollon Rim, 2 out of 117 nests (1·7%) were parasitized. Early nests may fail owing to unseasonal snowstorms in spring at higher altitudes.

Movements. Short-distance to medium-distance migrant. Disperses from nesting area from late Jun, soon after young fledge, and leaves breeding grounds from Jul, mainly during Aug, moving S through W mountains to reach wintering grounds from late Sept. Return migration begins in late Feb, most birds departing by early Mar; arrival on breeding grounds from early Apr in S Arizona, but mainly during early May. Casual in SW Texas on migration. Vagrant elsewhere in Texas and elsewhere in S USA to NW & NE of breeding range.

Status and Conservation. Not globally threatened. Fairly common throughout most of range; less common near limits of geographical distribution. Populations described as stable or perhaps declining slightly. Logging on breeding grounds is adversely affecting this species locally, and is most likely cause of declines.

Bibliography. Barber *et al.* (1998), Bulmer (1966), Decker & Conway (2009), Dobbs & Martin, T.E. (1998), Franzreb & Franzreb (1983), Howell & Webb (1995), Hutto (1980, 1985), Lasley *et al.* (1982), Martin & Barber (1995), Moore (1993), Phillips *et al.* (1964), Rosenstock (1998), Schottler (1994).

Genus *ERGATICUS* S. F. Baird, 1865

72. **Red Warbler**

Ergaticus ruber

French: Paruline rouge **German**: Purpurwaldsänger **Spanish**: Reinita Roja
Other common names: Black-eared Warbler (*melanauris*)

Taxonomy. *Setophaga rubra* Swainson, 1827, woods of Valladolid [= Morelia], Michoacán, Mexico.
Forms a superspecies with *E. versicolor*; has been considered conspecific, but differs in plumage (especially head pattern) and no indication of increased similarity in S of range, where geographically closest. Three subspecies recognized.
Subspecies and Distribution.
E. r. melanauris R. T. Moore, 1937 – NW Mexico in Sierra Madre Occidental from SW Chihuahua S to N Nayarit.
E. r. ruber (Swainson, 1827) – C & W Mexico (Jalisco SE to N Oaxaca).
E. r. rowleyi Orr & Webster, 1968 – Guerrero and S Oaxaca (S Mexico).



Descriptive notes. 13 cm; 7·6–8·7 g. Nominate race is bright rose-red, with contrasting silvery-white ear-coverts; upperwing and tail darker, brown, with narrow red edgings; iris dark; bill horn-coloured, paler on lower mandible; legs flesh-coloured. Sexes similar. Juvenile is rich cinnamon-brown or tawny-brown in place of adult's red, but has white ear-coverts (like adult), paler bill and legs. Race *melanauris* is like nominate, but ear-coverts darker, silvery grey, and upperparts slightly brighter and more scarlet; *rowleyi* has white ear-coverts like nominate, but upperparts noticeably brighter than those of both other races.
Voice. Song a varied series of warbling trills on different pitches, interspersed with rich warbling notes. Usual call a rather loud but plaintive "pseet".
Habitat. Breeds mainly in humid and semi-humid pine (*Pinus*), fir (*Abies*) and pine–oak (*Pinus–Quercus*) forests, mainly at 2800–3500 m; in non-breeding season usually below 2800 m (down to 1800 m) in zone of pine–oak and oak forests. Requires undisturbed forests with dense understorey at all seasons.
Food and Feeding. Feeds on insects. Forages by gleaning in understorey and up to middle levels. Pair-members remain together throughout year; may join mixed-species foraging flocks in winter, when they move to lower elevations.
Breeding. Little known. Season primarily Feb–May, egg-laying probably mainly Mar–Apr. Nest an oven-shaped structure of grasses and pine needles with side opening, placed on ground, often on bank and hidden under log or tree stump, or in dense vegetation. Clutch 3–4 eggs; no information on incubation and fledging periods.
Movements. Altitudinal migrant; descends from humid pine-forest zone to oak-forest zone during winter.
Status and Conservation. Not globally threatened. Generally fairly common to common throughout its range. No population estimates available.
Bibliography. Coffey & Coffey (1990), Curson *et al.* (1994), Elliott (1965, 1969), Howell & Webb (1995), Orr & Webster (1968).

73. **Pink-headed Warbler**

Ergaticus versicolor

French: Paruline à tête rose **German**: Rosenwaldsänger **Spanish**: Reinita Rosada

Taxonomy. *Cardellina versicolor* Salvin, 1863, Volcán del Fuego, Totonicapam, and Chilasco, Guatemala.
Forms a superspecies with *E. ruber*; has been considered conspecific, but differs in plumage (especially head pattern) and no indication of increased similarity in NW of range, where geographically closest. Monotypic.
Distribution. Highlands of S Mexico (E Chiapas) and Guatemala (E to Sierra de las Minas).



Descriptive notes. 13 cm; 10 g. Front of face is dark pink with variably dusky lores, rest of head down to throat and upper breast pale silvery pink (forming distinctive hood); upperparts maroon, deep red on rump (in fresh plumage in autumn, upperpart feathers have greyish fringes); upperwing and tail dark brownish, two pink wingbars are formed by tips of greater and median coverts; lower underparts deep red; iris dark; bill dark brown, horn-coloured lower mandible; legs dark flesh-coloured. Sexes similar. Juvenile is cinnamon-brown or tawny-brown, with maroon tinge on upperparts, brown wings and tail, tawny wingbars on greater and median coverts. Voice. Song a short, sweet series of notes, shorter, slower, and less varied and trilling than song of *E. ruber*. Usual call a thin, high, slightly buzzing "tseeip".
Habitat. Occurs primarily in humid or semi-humid pine–oak (*Pinus–Quercus*) and cypress (*Cupressus*) forests with dense, undisturbed understorey at 1800–3800 m, mainly above 2800 m. In Guatemala may also utilize forests with disturbed understorey and more open brushy slopes at forest edge; this perhaps due to local high concentrations, forcing some to use suboptimal habitat.
Food and Feeding. Feeds mainly on insects. Forages mainly by gleaning in dense understorey; occasionally makes aerial sallies after flying insects. Pair-members remain together on territory throughout year; in winter will temporarily join mixed-species foraging flocks which pass through territory.
Breeding. Season probably Apr–Jun, egg-laying Apr–May. Nest a dome of pine needles with side entrance, lined with moss, placed on or very near ground. Clutch 2–4 eggs; incubation period 11 days; nestling period 10–11 days. Young probably pair up during first autumn.
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in North Central American Highlands EBA. Very rare and local in most of Chiapas; locally common in extreme SE Chiapas (Volcán Tacaná) and in Guatemala. Global population estimated at 20,000–50,000 individuals. Was formerly common throughout range, but has declined greatly. In Chiapas, where under continual threat from eruptions of active Volcán Chichonal, numbers probably fell to all-time low following major eruption in 1982, which covered large area with ash and perhaps caused significant insect die-off, which affected this parulid's food supply; apparent slight increase at two locations in this area from late 1980s. Decline in Chiapas probably exacerbated by the 1982 eruption, but main threat is habitat degradation and destruction, especially clearing of understorey and subsequent grazing in forests where this species lives; clearance for timber, charcoal, agriculture and road-building also serious threats to forests. Currently, no more than c. 400 km² of highly fragmented cloudforest thought to remain in C Chiapas, and not all of this at suitable altitudes. In Guatemala, surviving cloudforest estimated at c. 900 km², only c. 3% of original extent, and only about half of it currently occupied by this warbler.
Bibliography. Anon. (2009f), Bubb (1991), Butchart & Stattersfield (2004), Coffey & Coffey (1990), Curson *et al.* (1994), Dawn (1963), Howell & Webb (1995), Skutch (1954), Stattersfield & Capper (2000), Wilson & Will (1997).

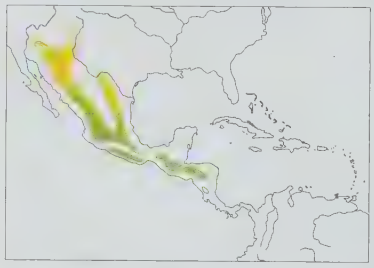
Genus *MYIOBORUS* S. F. Baird, 1865

74. **Painted Whitestart**

Myioborus pictus

French: Paruline à ailes blanches **German**: Rotbrust-Waldsänger **Spanish**: Candelita Aliblanca
Other common names: Painted Redstart

Taxonomy. *Setophaga picta* Swainson, 1829, Real de Monte, Hidalgo, Mexico.
Differs significantly from congeners in many characters, including song, plumage, behaviour, and migratory tendencies, and has been suggested that it may be better placed in a monotypic genus, for which the name *Erythrosoma* is available. Such treatment not supported by recent phylogenetic study, which did, however, indicate that it is sister-taxon to the other species in present genus. Two subspecies recognized.
Subspecies and Distribution.
M. p. pictus (Swainson, 1829) – SW USA (Arizona and SW New Mexico) S to SC Mexico (Oaxaca and Veracruz); N birds migrate into S part of range.
M. p. guatemalae (Sharpe, 1885) – S Mexico (Chiapas) S locally to N Nicaragua.



Descriptive notes. 13·5 cm; 5·9–11·5 g. Distinctive parulid; frequently spreads wings and fans tail, revealing prominent white patches. Nominate race has head, throat and upperparts black, white lower eye-crescent, large white wing patch on greater upperwing-coverts, white tertial edges, extensive white in outer tail; breast and belly carmine-red, sides and flanks black, undertail-coverts barred black and white; iris dark; bill and legs blackish. Sexes similar. Juvenile has body plumage sooty brownish-grey, becoming paler on belly and undertail-coverts, white areas, including lower eye-crescent, as on adult, but wing patch often tinged pale buff or yellowish. Race *guatemalae* is very similar to nominate, but has less white in tail and little or no white on tertial edges. Voice. Song a short, rich musical warble often transcribed as "weeta weeta weeta wee", distinctly different from songs of congeners; female sometimes sings, duetting with male. Calls include sharp, whistled disyllabic "cheree", second syllable higher-pitched, reminiscent of Pine Siskin (*Carduelis pinus*) call; also "zeeeettt" in alarm, and high-pitched "dee dee dee" during courtship.
Habitat. Occurs in pine–oak (*Pinus–Quercus*) and pinyon–juniper (*Pinus–Juniperus*) forests, especially on steep canyon sides, mainly at 1000–3000 m; often at slightly lower elevations within this range in winter. In N part of range favours lush vegetation in deeply shaded canyon bottoms, close to permanent water; farther S prefers more arid pine–oak forests. Recorded in pine forest in Jalapa region of Veracruz (Mexico).
Food and Feeding. Feeds mainly on insects; also takes sugar water and visits feeders in S USA (Arizona); recorded as drinking sap from deciduous trees in spring. Forages by gleaning, hover-gleaning and flycatching; frequently gleans by flitting on to tree trunks, generally low down and sometimes on ground, to pick off insects. Uses frequent wing-flicking and tail-fanning to flush insects from foliage, then pursuing prey in air or gleaning it from substrate. In winter months, single individuals or small groups often join mixed-species foraging flocks, especially those dominated by *Dendroica townsendi* and *Dendroica occidentalis*.
Breeding. Season Apr to early Jul, egg-laying Apr–Jun; often double-brooded, two out of ten females rearing second brood in one Arizona study. Polygyny possibly regular, as trios (presumably a male and two females) observed fairly frequently in N Arizona. Nest built by female, a shallow cup of bark shreds, grasses and weed stalks, placed on ground under rock or tree roots. Clutch 3–7 eggs, usually 4; incubation period 13–14 days; nestling period 13 days, but if disturbed young will leave nest at only 9 days, when incapable of flying. Nests rarely parasitized by Brown-headed (*Molothrus ater*) and Bronzed Cowbirds (*Molothrus aeneus*); in S Arizona, parasitism rates in Chiricahua Mts (by Brown-headed Cowbird) vary from 4% to 23%; generally, early nests (begun before cowbirds arrive) parasitized less often and parasitism rates appear significantly higher in dry years (23%) than in rainy ones (7%).
Movements. Resident in C & S of range. Those breeding in N are mostly short-distance migrants, most moving S of Mexico City in winter, but a few remaining on or near breeding grounds all year. Migrants return to breeding grounds from mid-Mar in SE Arizona, late Mar to early Apr farther N. Vagrant N & E of breeding range in North America, mostly to S California but N to Canada (British Columbia, S Ontario) and NE USA (Massachusetts and New York); also W to Baja California and E to Mississippi and Alabama.
Status and Conservation. Not globally threatened. Fairly common to abundant throughout most of range. Estimates of densities in Arizona vary from 0·15 birds/ha in oak–juniper woodland to 1·71 birds/ha along a creek bottom in Chiricahua Mts; another estimate from Chiricahua Mts (along cave Creek) gave 2·8–3·8 territories/km of canyon. In riparian habitats, densities in N Arizona 0·25 birds/ha and in S Arizona (Chiricahua Mts) 0·54 birds/ha.

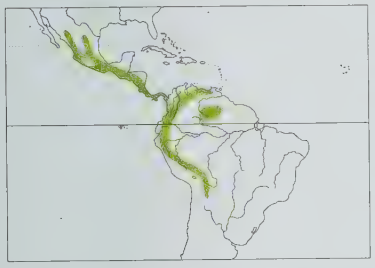
Bibliography. Barber *et al.* (2000), Cygan & Jablonski (1998, 2000), Howell & Webb (1995), Hutto (1980, 1985, 1992), Jablonski (1993, 1994, 1998, 1999), Jablonski & Strausfeld (1998), Marshall (1957), Marshall & Balda (1974), Parkes (1961), Pérez-Emán (2005), Spofford (1976, 1983), Wibble (1967).

75. Slate-throated Whitestart

Myioborus miniatus

French: Paruline ardoisée **German**: Larvenwaldsänger **Spanish**: Candelita Plomiza
Other common names: Slate-throated Redstart; Yellow-bellied Redstart (*verticalis*)

Taxonomy. *Setophaga miniata* Swainson, 1827, woods of Valladolid [= Morelia], Michoacán, Mexico.
Geographical variation largely clinal, e.g. colour of underparts gradually changing from dark red in N to yellow in South America and amount of black on face decreasing from N to S. Recently suggested by some authors that *ballux* and *subsimillis* be synonymized with *verticalis*. Twelve subspecies currently recognized.
Subspecies and Distribution.
M. m. miniatus (Swainson, 1827) – Mexico from S Sonora, SW Chihuahua and San Luis Potosí S to S Oaxaca.
M. m. molochinus Wetmore, 1942 – Sierra de Tuxtla, in SE Veracruz (E Mexico).
M. m. intermedius (Hartlaub, 1852) – S Mexico (extreme E Oaxaca, N & E Chiapas) and E Guatemala (NE of Pacific cordillera).
M. m. hellmayri van Rossem, 1936 – Pacific cordillera from S Guatemala S to SW El Salvador.
M. m. connectens Dickey & van Rossem, 1928 – El Salvador and Honduras S to NC Nicaragua.
M. m. comptus Wetmore, 1944 – W & C Costa Rica.
M. m. aurantiacus (S. F. Baird, 1865) – E Costa Rica and W Panama.
M. m. ballux Wetmore & Phelps, Sr, 1944 – SE Panama, N Colombia (excluding Santa Marta Mts) and W Venezuela (E to Loja) S through Colombian Andes to N Ecuador.
M. m. sanctaemartae J. T. Zimmer, 1949 – Santa Marta Mts (N Colombia).
M. m. pallidiventris (Chapman, 1899) – N Venezuela from Falcón E to Sucre and Monagas.
M. m. subsimillis J. T. Zimmer, 1949 – W Andes in SW Ecuador and NW Peru.
M. m. verticalis (d'Orbigny & Lafresnaye, 1837) – E Andes from S Ecuador S to C Bolivia; also tepuis of S Venezuela, N Guyana and N Brazil.



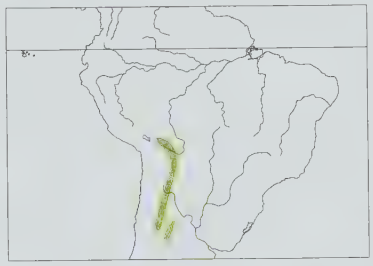
Descriptive notes. 13–13·5 cm; 6–15 g. Nominate race has front of face and throat blackish, crown patch tawny, rest of head and upperparts slate-grey, tail black with extensive white in outer three rectrices; breast and belly vermilion-red, vent and undertail-coverts barred blackish and white; iris dark; bill and legs blackish. Sexes similar. Juvenile is sooty grey on head, throat, breast and upperparts, slightly paler grey on lower underparts, which broadly streaked with cinnamon. Races differ mainly in colour of underparts, amount of black on face and amount of white in outer rectrices: *molochinus* is close to nominate but darker above, brighter on crown and underparts, with a little less white in outer tail, more extensive white on undertail-coverts; *intermedius* is slightly paler, more orange-red, below than nominate, with less white in tail; *hellmayri* has slightly more white in tail than previous, pinkish-orange underparts; *connectens* is like last, but paler orange below; *comptus* has underparts orange-yellow; *aurantiacus* is orange-yellow below, has more white in tail; *ballux* has more white in tail than previous, underparts yellow with slight orange tinge; *sanctaemartae* has crown patch indistinct, rufous and smaller than in other races, underparts yellow; *pallidiventris* resembles previous, but crown patch bigger, slightly darker upperparts, more white in tail; *subsimillis* is like last, but duller grey above, darker on throat, deeper yellow below; *verticalis* is similar to *ballux*, but has somewhat more white in tail, underparts slightly paler yellow, orange suffusion confined to uppermost breast. Voice. Song in Mexico a variable series of rich "s-wee" notes, changing in pitch in middle, second part accelerating towards end and finishing with one or more notes on different pitch; in Ecuador a series of weak "chi" notes, rising slightly in pitch and accelerating towards end. Call a sharp "tsip".
Habitat. In N of range occurs in humid pine (*Pinus*) and pine–oak (*Pinus–Quercus*) forest and cloudforest, mainly at 1000–3000 m; breeds mainly above 2500 m (majority above 2800 m in Distrito Federal), descending in winter mainly to pine–oak zone below 2300 m, locally down to 250 m. In Central America and South America occurs in submontane and montane forest, in Costa Rica mainly at 700–2000 m and in South America at 500–2500 m; replaced at higher altitudes by *M. torquatus* in Central America and by e.g. *M. ornatus*, *M. albifrons* and *M. flavivertex* in South America. Also found in more humid forests than that favoured by *M. pictus* in N of range where it overlaps with that species. In N of range where overlaps with *M. pictus*, found in more humid forests than those favoured by latter species. Will tolerate some disturbance to habitat, and frequently found in second growth and on forest edges.
Food and Feeding. Feeds on insects and other arthropods. Forages generally at middle to high levels, by gleaning and flycatching; often probes dead-leaf clumps; often clings momentarily to tree trunks and branches to glean items, but not so persistent in this behaviour as is *M. pictus*. Like many congeners, very active when foraging, constantly drooping wings and flicking and spreading tail to reveal white tail sides; this thought to flush insect prey, which it then pursues in air. Flush-pursuit employed more than flycatching as a foraging method during brood-feeding stage of annual cycle. Single individuals, pairs or family parties frequently join mixed-species foraging flocks outside breeding season; this may reduce predation pressure and allow for more efficient foraging.
Breeding. Egg-laying in Apr–May in Costa Rica and Dec–Jul in Colombia; dependent young seen in Aug in W Venezuela (Mérida), Feb in C Ecuador (Chimborazo) and Dec in SC Peru (Junín). Nest a cup of mosses, placed on or near ground, often sunk into steep bank. Clutch 1–3 eggs, usually 2–3; incubation period 13–15 days; nestling period 12–14 days; female will feign injury to distract attention from nest.
Movements. N populations (in Mexico, at least) altitudinal migrants, making post-breeding descent to below 2300 m. Individuals (presumably of nominate race) have occurred as vagrants in SW USA (Arizona and New Mexico; sight record from Texas); vagrant also in NE Argentina, to S of range.
Status and Conservation. Not globally threatened. Generally common throughout its range. No population estimates available. This species' ability to utilize disturbed forests and second growth may mean that it is less susceptible to forest degradation than are many other members of its genus.
Bibliography. Buskirk (1972), Clements & Shany (2001), Curson *et al.* (1994), Di Giacomo *et al.* (1995), Harris (1964), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Howell & Webb (1995), Meyer de Schauensee (1982), Mumme (2003), Pérez-Emán (2005), Pomara *et al.* (2003), Ridgely & Greenwood (2001), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Sick (1993), Stiles & Skutch (1989).

76. Brown-capped Whitestart

Myioborus brunniceps

French: Paruline basanée **Spanish**: Candelita Coronicastaña
German: Braunkappen-Waldsänger
Other common names: Brown-capped Redstart

Taxonomy. *Setophaga brunniceps* d'Orbigny and Lafresnaye, 1837, Yungas, Bolivia.
Formerly considered conspecific with *M. castaneocapilla*, but the two differ in their songs and are widely separated geographically; treatment as separate species supported by recent phylogenetic study, which suggested that close plumage similarities between the two may be due to retention of ancestral traits, rather than to genetic similarity. Monotypic.
Distribution. C Bolivia S on E slope of Andes to NC Argentina; also Sierras de Córdoba (C Argentina), SE of main range.



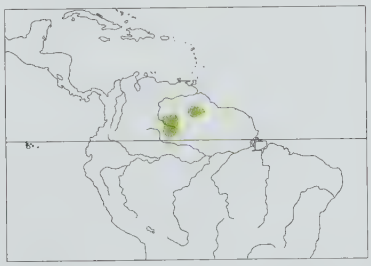
Descriptive notes. 13 cm; 8·5–10·2 g. Has grey head with rufous crown patch, white eye-crescents and weaker whitish supraloral stripe; upperparts grey, distinct olive patch on mantle; tail black, extensive white in outer rectrices; throat and underparts yellow, white undertail-coverts. iris dark; bill and legs blackish. Differs from similar *M. castaneocapilla* in having eye-crescents and supraloral more distinct, upperparts less olive-grey and with olive patch on mantle, and rufous crown patch more extensive. Sexes similar. Juvenile has brownish-grey head and upperparts, buffy-brown throat and breast, sometimes spotted darker, and pale yellow lower underparts. Voice. Song a fast, high-pitched and sibilant trill on one pitch; quite different from that of other members of genus, similar to that of *Dendroica striata*. Call a repeated "check" or "tchip" note, extended into monotone rattle when agitated.
Habitat. Submontane and montane forest, forest edges and clearings, mostly at 1400–3200 m, but to 3800 m in Cochabamba (Bolivia); most common at 1400–1700 m in Argentina; down to 400 m in S of range in non-breeding season. In Bolivia mainly in dry deciduous forest and alder (*Alnus*) woodland, being replaced in more humid forests by *M. melanocephalus*, but farther S, where latter species absent, occurs also in humid forests.
Food and Feeding. Feeds on insects and presumably other arthropods. Forages mainly by gleaning actively at low to middle levels. Unlike many congeners, seldom uses wing-flicking and tail-flicking as means of disturbing prey. Single individuals and small groups sometimes join mixed-species foraging flocks.
Breeding. Dependent young seen in Jan–Feb in S Bolivia (Tarija). No other information.
Movements. Altitudinal migrant in at least S part of range, making post-breeding descent to lower levels.
Status and Conservation. Not globally threatened. Generally common throughout its range; may be less common in Bolivia than in Argentina. No population estimates available. Currently extending its range S in Argentina.
Bibliography. Alabarce, A. *et al.* (1990), Alabarce, E. & Antelo (1994), Barnett & Pearman (2001), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hennessey *et al.* (2003), Meyer de Schauensee (1982), Pérez-Emán (2005), Phelps (1972), Ridgely & Tudor (1989).

77. Tepui Whitestart

Myioborus castaneocapilla

French: Paruline des tépuis **German**: Tepuiwaldsänger **Spanish**: Candelita de Tepuí
Other common names: Tepui Redstart

Taxonomy. *Setophaga castaneocapilla* Cabanis, 1848, Roraima, 7000 feet [c. 2130 m], Venezuela.
Forms a superspecies with *M. cardonai* and *M. albifacies*, and *M. pariae* presumably also part of same group. Formerly considered conspecific with *M. brunniceps*, but the two differ in their songs and are widely separated geographically; treatment as separate species supported by recent phylogenetic study, which suggested that close plumage similarities between the two may be due to retention of ancestral traits, rather than to genetic similarity. Three subspecies recognized.
Subspecies and Distribution.
M. c. castaneocapilla (Cabanis, 1848) – tepuis in SE Venezuela (Gran Sabana region of Bolívar) and in adjacent parts of Guyana and N Brazil.
M. c. duidae Chapman, 1929 – Cerro Jáua (in S Bolívar) and Cerros Parú, Huachamacari and Duida (in C Amazonas), in S Venezuela.
M. c. maguirei Phelps, Sr & Phelps, Jr, 1961 – Cerro de la Neblina, in extreme S Amazonas (S Venezuela).



Descriptive notes. 13 cm; 8·9–12 g. Nominate race has grey head with rufous crown patch, indistinct pale grey supraloral stripe and narrow whitish eye-crescents; upperparts grey with olive tinge; tail black, extensive white in outer two rectrices, large white spot at tip of adjacent inner rectrix; throat and underparts yellow, white undertail-coverts; iris dark; bill blackish; legs dusky grey to blackish. Differs from similar *M. brunniceps* in having eye-crescents and supraloral line less distinct, upperparts more olive-grey and without olive patch on mantle, and rufous crown patch less extensive. Sexes similar. Juvenile undescribed. Race *duidae* is considerably brighter than others, with rich orange-yellow underparts, more conspicuous supraloral stripe and eye-crescents, and purer grey upperparts; *maguirei* has paler yellow underparts and more conspicuous eye-crescents than nominate. Voice. Song a thin, unmusical trill, accelerating towards while dropping in pitch; call a fairly sharp "tsip".
Habitat. Montane forest, forest edges and clearings, at 1200–2200 m.

Food and Feeding. Feeds on insects and presumably other arthropods. Forages by gleaning at low to middle levels. Pairs or small groups often join mixed-species foraging flocks.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tepuis EBA. Nominate race, at least, appears to be fairly common to common. No population estimates available.
Bibliography. Curson *et al.* (1994), David & Gosselin (2002a), Hilty (2002, 2003), Mayr & Phelps (1967), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Tudor (1989), Stattersfield *et al.* (1998).

78. Yellow-faced Whitestart

Myioborus pariae

French: Paruline de Paria **German**: Goldaugen-Waldsänger **Spanish**: Candelita de Paria
Other common names: Paria Redstart/Whitestart, Yellow-faced Redstart

Taxonomy. *Myioborus brunniceps pariae* Phelps, Sr and Phelps, Jr, 1949, Cerro Azul, Cristóbal Colón, Paria Peninsula, Sucre, Venezuela.
Considered closest to and presumed to form a superspecies with *M. castaneocapilla*, *M. cardonai* and *M. albifacies*. Originally described as a race of *M. brunniceps*, but now generally afforded species status. Monotypic.
Distribution. Paria Peninsula (NE Sucre), in NE Venezuela.
Descriptive notes. 13 cm. Has grey head with rufous crown patch, prominent broad yellow "spectacles", with yellow supraloral stripe meeting broad yellow eyering, separated from crown patch by blackish line; upperparts grey, faint olive tinge on mantle; tail black, extensive white in outer rectrices; throat and underparts yellow, whiter undertail-coverts; iris dark; bill and legs blackish. Sexes similar; possible that male has, on average, bolder "spectacles" and purer grey mantle, but confirmation required. Juvenile undescribed. Voice. Song said to be bright and lively, sometimes rising in middle and almost always louder and more insistent (also rising) at end, e.g. as "wheetsa-wheetsa-wheetsa-wesee, tezsa-sweet-see-zéé-zéét"; variable, often with high and low notes mixed. Call a rather soft, liquid "tship".
Habitat. Mostly encountered at edges and in clearings of humid montane forest and cloudforest, and largely absent from dense forest interior; also found at edges of adjacent coffee plantations.



Usually recorded at 800–1150 m, but once at 685 m (on lower mountain of Cerro El Olvido); at elevations much lower than those at which most other members of genus occur, which is due to lack of higher mountains on Paria Peninsula.
Food and Feeding. Feeds predominantly on a variety of insects. Forages mainly at low to middle levels of forest, by means of gleaning, flycatching, and hovering to pick prey from leaves. Pairs regularly join mixed-species foraging flocks.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. ENDANGERED. Restricted-range species: present in Caripe-Paria region EBA. Locally fairly common to common. Has very small range. Almost all records from a single mountain, Cerro Humo; a few older records farther E on peninsula, and several seen there recently. Away from Humo, has been recorded from Cerro El Olvido (including several seen in Jan 1999), Cerro Azul (one collected in 1948), and possibly Cerro Patao. El Olvido records possibly indicative of presence of small population, separate from main one on Cerro Humo, or perhaps involve seasonal dispersal E from Humo; further fieldwork and surveys required. On Cerro Humo still easily seen on S slope and probably fairly common, often 4–6 individuals can be observed in single day; amount of suitable habitat on Cerro Humo very small, possibly only 15 km², and species' total population may be very small. Although Paria Peninsula National Park covers most of the species' range, S slope of this mountain (which may now support most of population) lies outside boundaries of the park; this area now accessible by road and increasingly subject to disturbance, and is also subject to forest clearance for agriculture. This parulid was captured for cagebird trade, certainly up to 1979, and there are reports that this trade may still be pursued. In late 1980s, construction of a gas pipeline through Paria Peninsula was proposed; at present judged to be an uneconomical venture, but remains a potential future threat.
Bibliography. Anon. (2009f), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Hayes & McNair (2003), Hilty (2002, 2003), Meyer de Schauensee (1982), Mountfort & Arlott (1988), Pérez-Emán (2005), Ridgely & Tudor (1989), Rodríguez & Rojas-Suárez (1995), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

PLATE 58 ➤



PLATE 58

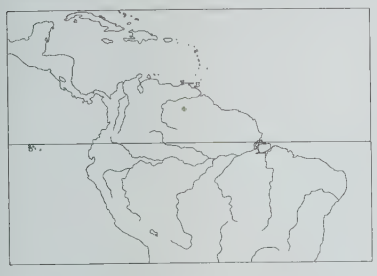
inches 3
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79. Guaiquinima Whitestart

Myioborus cardonai

French: Paruline de Cardona **German**: Cardonawaldsänger **Spanish**: Candelita de Cardona
Other common names: Saffron-breasted Whitestart/Redstart, Guaiquinima Redstart

Taxonomy. *Myioborus cardonai* J. T. Zimmer and Phelps, Sr, 1945, Mount Guaiquinima, 1220 m, Paragua River, Bolívar, Venezuela.
Forms a superspecies with *M. castaneocapilla* and *M. albifacies*, with *M. pariae* presumably part of same group. Previously regarded as closest to, and possibly conspecific with, *M. albifacies*, but recent phylogenetic study suggests that it may be more closely related to race *maguirei* (and perhaps also *duidae*) of *M. castaneocapilla*. Monotypic.
Distribution. Cerro Guaiquinima (C Bolívar), in EC Venezuela.



Descriptive notes. 13 cm. Has forehead and crown solid black, face and upperparts slate-grey, white eye-crescents; tail black, extensive white in outer rectrices; throat and underparts deep orange-yellow, white undertail-coverts; iris dark; bill and legs blackish. Differs from similar *M. albifacies* only in having dark grey, not white, face. Sexes similar. Juvenile undescribed. Voice. Apparently undescribed.
Habitat. Humid cloudforest, forest edge, gallery forest and dense scrub, at 1200–1600 m.
Food and Feeding. No information.
Breeding. No information.
Movements. Presumably sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Tepuis EBA. Has tiny global range; estimated 500–600 km² of suitable habitat on Cerro Guaiquinima, within which this species is described as being common. Although there has been mining for many years at base of the mountain, this thought not to have had significant impact, and no agriculture within the species' range. In addition, wet climate and large river valleys surrounding the mountain make loss of habitat through fire fairly unlikely.
Bibliography. Anon. (2009f), Butchart & Stattersfield (2004), Curson *et al.* (1994), Hilty (2002, 2003), Meyer de Schauensee (1982), Pérez-Emán (2005), Pérez-Emán *et al.* (2003), Ridgely & Tudor (1989), Rodríguez & Rojas-Suárez (1995), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

80. White-faced Whitestart

Myioborus albifacies

French: Paruline à face blanche **Spanish**: Candelita Cariblanca
German: Weißwangen-Waldsänger
Other common names: White-faced Redstart

Taxonomy. *Myioborus albifacies* Phelps, Sr and Phelps, Jr, 1946, Cerro Paraque, 1450 m, Territorio Amazonas, Venezuela.
Forms a superspecies with *M. castaneocapilla* and *M. cardonai*, with *M. pariae* presumably part of same group. Previously regarded as closest to, and possibly conspecific with, *M. cardonai*, but recent phylogenetic study suggests that latter may be more closely related to race *maguirei* (and perhaps also *duidae*) of *M. castaneocapilla*. Monotypic.
Distribution. SC Venezuela: Cerros Sipapo (Paraque), Guanay and Yaví, in NW Amazonas.



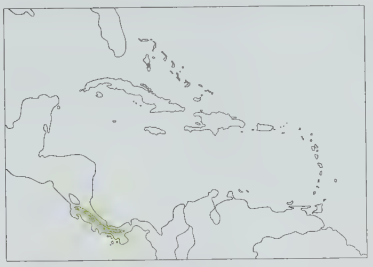
Descriptive notes. 13 cm. Has forehead and crown solid black, contrasting white face from lores to ear-coverts; upperparts slate-grey, tail black, extensive white in outer rectrices; throat and underparts deep orange-yellow, white undertail-coverts; iris dark; bill and legs blackish. Distinguished from similar *M. cardonai* by white face. Sexes similar. Juvenile undescribed. Voice. Apparently undescribed.
Habitat. Recorded in rainforest and cloudforest in upper tropical and subtropical zones of mountains at 900–2250 m.
Food and Feeding. No information.
Breeding. No information.
Movements. Presumably sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tepuis EBA. No information on current status. The three tepuis on which this species occurs are protected and out of bounds to visitors; it may not, therefore, be under any immediate threat, despite its undoubtedly small population.
Bibliography. Curson *et al.* (1994), Hilty (2002, 2003), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Tudor (1989), Sibley & Monroe (1990), Stattersfield *et al.* (1998).

81. Collared Whitestart

Myioborus torquatus

French: Paruline ceinturée **German**: Halsband-Waldsänger **Spanish**: Candelita Collareja
Other common names: Collared Redstart

Taxonomy. *Setophaga torquata* S. F. Baird, 1865, San José, Costa Rica.
Relationship with other members of genus unclear; differs from all in plumage. Monotypic.
Distribution. N Costa Rica S to WC Panama.



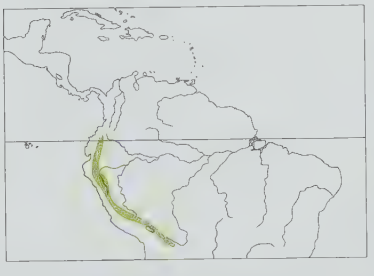
Descriptive notes. 13 cm; 10·5 g. Distinctive whitestart. Has face and throat yellow, isolating dark eye, rufous crown patch with black border; upperparts grey; tail blackish-grey, extensive white in outer rectrices; throat and underparts yellow, divided by prominent grey breastband, white on undertail-coverts; iris dark; bill and legs blackish. Sexes similar. Juvenile has dark greyish head, throat, breast and upperparts, washed brownish on upperparts, and pale yellowish lower underparts. Voice. Song a series of ringing "chee" notes with trills and warbles often intermixed; similar to that of *M. miniatus*, but longer, higher-pitched and more musical. Call a sharp "tzip".
Habitat. Montane forest, especially of oak (*Quercus*), brushy ravines, forest edges, and highland pastures where cattle present, from 1500 m to tree-line; in Costa Rica, generally above 1500 m in Cordillera de Tilarán, above 2200 m in Cordillera Central and above 2500 m in Cordillera de Talamanca.
Food and Feeding. Feeds on insects. Forages at all levels. Uses gleaning and flycatching, and frequently darts out to catch insects disturbed by other birds or mammals; frequently follows cattle in highland pastures, and will follow humans for same purpose. Frequently postures with drooping wings, flicking and spreading tail to reveal white sides; this thought to flush insect prey, which it then pursues in air.
Breeding. Egg-laying in Mar–May. Nest a domed structure with side entrance, made from dried bamboo leaves, other fibrous vegetation and scales of tree-ferns, hidden on ground on grassy bank or under fallen log. Clutch 2–3 eggs; no information on incubation and fledging periods.
Movements. Primarily sedentary; may make some localized altitudinal movements, descending to 1500 m in Cordillera de Tilarán and to 2000 m in Cordillera de Talamanca during non-breeding season, and especially towards end of rainy season.
Status and Conservation. Not globally threatened. Restricted-range species: present in Costa Rica and Panama Highlands EBA. Common throughout its rather limited range. No population estimates available.
Bibliography. Curson *et al.* (1994), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Gwynne (1989), Stattersfield *et al.* (1998), Stiles & Skutch (1989).

82. Spectacled Whitestart

Myioborus melanocephalus

French: Paruline à lunettes **German**: Brillenwaldsänger **Spanish**: Candelita de Anteojos
Other common names: Spectacled Redstart; Rufous-crowned/Chestnut-crowned Whitestart/Redstart (*ruficoronatus*, *griseonuchus*); Colombian Redstart (*ruficoronatus*)

Taxonomy. *Setophaga melanocephala* Tschudi, 1844, Marayniooc, Junín, Peru.
Forms a superspecies with *M. ornatus*, and possibly also *M. albifrons*; the three form a monophyletic clade. It has been suggested that present species and *M. ornatus* may be better regarded as conspecific, but such treatment appears not to be supported by recent study of phylogeny of genus. Seems especially close to race *chrysops* of *M. ornatus*, and several records in potential zone of range overlap (extreme SW Colombia and adjacent NW Ecuador) of individuals intermediate in head pattern between race *ruficoronatus* of present species and *chrysops*; these originally thought to be variants of *ruficoronatus*, but may be result of hybridization, or even be an undescribed race of one or other species; recent record of pair of apparently phenotypically pure *chrysops* from this area lends weight to hybrid theory. Within present species, rufous-capped races *ruficoronatus* and *griseonuchus* formerly considered to represent a separate species; latter race, however, has small rufous crown patch and shares pattern of extended black on face with adjacent black-crowned race *malaris*; thus, *griseonuchus* and *malaris* appear to link black-crowned and rufous-crowned forms. Five subspecies recognized.
Subspecies and Distribution.
M. m. ruficoronatus (Kaup, 1852) – Andes in extreme SW Colombia and Ecuador.
M. m. griseonuchus Chapman, 1927 – W Andes in NW Peru.
M. m. malaris J. T. Zimmer, 1949 – C Andes in N Peru.
M. m. melanocephalus (Tschudi, 1844) – E Andes in C Peru.
M. m. bolivianus Chapman, 1919 – Andes in S Peru and W Bolivia.



Descriptive notes. 13–13·5 cm; 10–13 g. Nominate race has crown and face black, prominent yellow eyering and supraloral stripe ("spectacles"); nape and upperparts grey; tail black, extensive white in outer feathers; throat (including submoustachial area below ear-coverts) and underparts yellow, undertail-coverts white; iris dark; bill and legs blackish. Sexes similar. Juvenile has olive-grey head and upperparts, buffy-grey throat and breast, pale creamy-yellow lower underparts, whitish undertail-coverts. Race *bolivianus* is very similar to nominate, but on average smaller, and is slightly paler yellow below; *malaris* is like nominate, but has more black on face, including submoustachial area below ear-coverts; *griseonuchus* resembles previous in extent of black on face, but has small rufous crown patch; *ruficoronatus* has larger rufous crown patch than last, and extent of black on head otherwise similar to that of nominate. Voice. Song a variable series of high-pitched, twittering "tsee" notes; contact call a high-pitched "tsip".
Habitat. Humid montane forest, elfin forest, cloudforest, forest edges and adjacent scrub, at 2000–4000 m; often favouring elfin forest, cloudforest and *Polylepis* forest near tree-line. Overlaps with *M. miniatus* at lower altitudinal limit.

On following pages: 83. Golden-fronted Whitestart (*Myioborus ornatus*); 84. White-fronted Whitestart (*Myioborus albifrons*); 85. Yellow-crowned Whitestart (*Myioborus flavivertex*); 86. Neotropical Fan-tailed Warbler (*Euthlypis lachrymosa*); 87. Grey-and-gold Warbler (*Basileuterus fraseri*); 88. Two-banded Warbler (*Basileuterus bivittatus*); 89. Golden-bellied Warbler (*Basileuterus chrysogaster*); 90. Citrine Warbler (*Basileuterus luteoviridis*); 91. Pale-legged Warbler (*Basileuterus signatus*); 92. Black-crested Warbler (*Basileuterus nigrocristatus*); 93. Grey-headed Warbler (*Basileuterus griseiceps*); 94. Grey-throated Warbler (*Basileuterus cinereicollis*); 95. White-lored Warbler (*Basileuterus conspicillatus*); 96. Russet-crowned Warbler (*Basileuterus coronatus*); 97. Three-banded Warbler (*Basileuterus trifasciatus*).

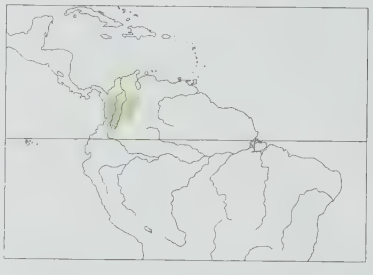
Food and Feeding. Feeds on insects and other arthropods. Forages at all levels, but especially high in canopy and at tops of smaller bushes. Obtains food items by gleaning and flycatching. Frequently postures with drooping wings, flicking and spreading tail to reveal white sides; this thought to flush insect prey, which it then pursues in air. Occasionally found in same flock as, and frequently aggressive towards, *M. miniatus* where the two occur together.
Breeding. Recently fledged young seen in mid-Feb in S Ecuador (near Cuenca), Mar, Apr, Jul and Sept in NW Ecuador, Feb and Mar in N Peru (Amazonas) and Jun and Dec in C Peru, and Jan in Bolivia (La Paz); season apparently protracted. Nest undescribed; clutch 2 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally common throughout its range. No population estimates available.
Bibliography. Clements & Shany (2001), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hennessey *et al.* (2003), Hilty & Brown (1986), McCarthy (2006), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Robbins *et al.* (1994).

83. Golden-fronted Whitestart

Myioborus ornatus

French: Paruline dorée **German**: Schwarzohr-Waldsänger **Spanish**: Candelita Adornada
Other common names: Golden-fronted/Ornate Redstart; Andean Redstart (*chrysops*)

Taxonomy. *Setophaga ornata* Boissonneau, 1840, Santa Fé de Bogotá, Colombia.
Forms a superspecies with *M. melanocephalus*, and possibly also *M. albifrons*; the three form a monophyletic clade. The two races have discrete ranges, and it has been suggested that *chrysops* may be more closely related to *M. melanocephalus* than it is to nominate race of present species, and perhaps, therefore, conspecific with latter; such treatment appears not to be supported by recent study of phylogeny of genus. In potential zone of range overlap (extreme SW Colombia and adjacent NW Ecuador), several records of individuals intermediate in head pattern between race *chrysops* of present species and race *ruficoronatus* of *M. melanocephalus*; these were originally thought to be variants of *ruficoronatus*, but may be result of hybridization, or even an undescribed race of one or other species; recent record of pair of apparently phenotypically pure *chrysops* from this area lends weight to hybrid theory. Two subspecies recognized.
Subspecies and Distribution.
M. o. chrysops (Salvin, 1878) – W & C Andes and S part of E Andes of C & S Colombia; possibly also N Ecuador (Napo).
M. o. ornatus (Boissonneau, 1840) – extreme W Venezuela (Páramo de Tamá, in SW Táchira) and S in E Andes of Colombia (S to Bogotá).



Descriptive notes. 13–13·5 cm; 10·8–13·1 g. Nominate race has forehead and forecrown bright yellow, face white, rear crown and rear side of head blackish, faint white crescent on rear edge of ear-coverts; upperparts grey, tail blackish-grey, extensive white at sides of tail; throat and underparts bright yellow, white undertail-coverts; iris dark; bill and legs blackish. Sexes similar. Juvenile has grey head and upperparts with olive tinge, brownish-olive throat and breast, creamy-yellowish belly, becoming whitish on undertail-coverts. Race *chrysops* has face entirely yellow, continuous with yellow of forecrown and throat, more extensive black on rear crown, and yellow areas brighter than nominate. Voice. Song a prolonged and jumbled series of high-pitched "tsit" and "tsweet" notes; usual call a soft "tsip" or "tssp".
Habitat. Montane forest, cloudforest and elfin forest at 2000–3400 m, usually above 2400 m; especially frequent in elfin forest near tree-line.
Food and Feeding. Feeds on insects and probably other arthropods. Forages mainly at middle to high levels and in outer branches of trees and bushes. Obtains food items by gleaning and flycatching. Frequently postures with drooping wings, flicking and spreading tail to reveal white sides, but not so persistently as some congeners; this action thought to flush insect prey, which it then pursues in air. Pairs or family parties may form nucleus of mixed-species foraging flocks.
Breeding. In Colombia, male in breeding condition in Jul, also recently fledged young seen in Apr and Nov in Cundinamarca, May and Jul in Cauca and Mar in Huila, indicating extended breeding season. Nest an open cup of plant fibres, lined with finer plant material, and probably placed on or near ground. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common to common throughout its range. Up to four seen in one day in Mar 1991 in Páramo de Tama (on Venezuela–Colombia border) and minimum of ten seen at same location in two days in Jan 1993. No population estimates available.
Bibliography. Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hilty (2002, 2003), Hilty & Brown (1986), McCarthy (2006), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Robbins *et al.* (1994).

84. White-fronted Whitestart

Myioborus albifrons

French: Paruline à front blanc **German**: Weißstirn-Waldsänger **Spanish**: Candelita Frentiblanca
Other common names: White-fronted Redstart

Taxonomy. *Setophaga albifrons* P. L. Sclater and Salvin, 1871, Sierra Nevada of Mérida, Venezuela.
Forms a monophyletic clade with *M. melanocephalus* and *M. ornatus*. Although range is virtually continuous with that of latter, the two are separated by Táchira Valley and contact therefore unlikely; no hybrid or intermediate individuals have been found. Monotypic.
Distribution. Andes of W Venezuela (Trujillo, Mérida and Táchira).
Descriptive notes. 13–13·5 cm. Has crown black with narrow rufous patch in centre (many of rufous feathers tipped black), side of head grey, white forehead, supraloral stripe and prominent eyering (forming "spectacles"); upperparts grey, tail black, extensive white at side of tail; throat and underparts yellow, white undertail-coverts; iris dark; bill and legs blackish. Sexes similar; one member in apparently mated pairs sometimes has slightly smaller and less conspicuous "spectacles", such individuals possibly female, but more study required. Juvenile has olive-grey head and upperparts, and pale grey-buff underparts, becoming yellower on belly and whitish on undertail-coverts. Voice. Song consists of a jumbled and prolonged twittering warble of high-pitched notes, similar to that of *M. ornatus* but more varied and musical. Call is a sharp, high "tsip".



Habitat. Inhabits montane forest and forest edge, less commonly found in elfin forest near tree-line; at 2200–3200 m, occasionally up to 4000 m.
Food and Feeding. Feeds on insects and probably also other arthropods. Forages mainly at high levels in canopy, by gleaning and flycatching. Frequently postures with drooping wings, flicking and spreading tail to reveal white sides, but not so persistently as do some congeners; this behaviour thought to flush insect prey, which it then pursues in air. Pairs or family parties may form nucleus of mixed-species foraging flocks.
Breeding. Recently fledged young seen in Jun. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Cordillera de Mérida EBA. Fairly common to common within its limited range. No population estimates available. Some large areas of suitable habitat remain, but loss of habitat through logging and clearance for cattle ranching has been severe; E slope of Cordillera de Mérida extensively cleared for cattle, and logging extending to higher elevations in many areas. Other threats to surviving habitat include mining activities and road-building.
Bibliography. Anon. (2009f), Butchart & Stattersfield (2004), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hilty (2002, 2003), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Tudor (1989), Stattersfield & Capper (2000), Stattersfield *et al.* (1998).

85. Yellow-crowned Whitestart

Myioborus flavivertex

French: Paruline à cimier jaune **German**: Salvinwaldsänger **Spanish**: Candelita Coronigualda
Other common names: Yellow-crowned/Paragua Redstart, Santa Marta Whitestart/Redstart.

Taxonomy. *Setophaga flavivertex* Salvin, 1887, neighbourhood of Sierra Nevada de Santa Marta, Colombia.
Geographically isolated and phenotypically quite distinct. Often regarded as closest to the clade formed by *M. melanocephalus*, *M. ornatus* and *M. albifrons*; this, however, not supported by recent phylogenetic study, which suggests that it may be closer to the *M. castaneocapilla* superspecies. Monotypic.
Distribution. Santa Marta Mts, in N Colombia.



Descriptive notes. 13 cm. Has head black, conspicuous light yellow crown patch and buffy supraloral stripe and upper eye-crescent; upperparts olive-green, tail blackish-grey with extensive white at side; black spot on central chin, throat yellow, often washed ochraceous, underparts yellow, undertail-coverts white; iris dark; bill and legs blackish. Sexes alike. Juvenile has olive-brown head and upperparts, pale olive-buff tips on greater and median upperwing-coverts, buff underparts, becoming paler on belly and undertail-coverts. Voice. Song a rather weak but sibilant series of high-pitched "chwee" notes on one pitch; call a sharp "chip".
Habitat. Humid montane forest, cloudforest and forest edges, at 1200–3050 m; generally above 2000 m. Co-occurs with *M. miniatus* at 1500–2000 m, and in areas of overlap is replaced by that species below 1500 m.
Food and Feeding. Feeds on insects and probably other arthropods. Forages mainly at middle to high levels, by gleaning and occasionally flycatching. Rarely, postures with drooped wings while flicking and fanning tail; frequently wags tail up and down. Family parties frequently join mixed-species foraging flocks.
Breeding. Recently fledged juvenile seen in Jul. Nest a bulky cup, hidden on or near ground. One active nest contained 2 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Santa Marta Mountains EBA. Fairly common to common within its very small range. No population estimates available.
Bibliography. Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hilty & Brown (1986), Meyer de Schauensee (1982), Pérez-Emán (2005), Ridgely & Tudor (1989), Stattersfield *et al.* (1998), Strewe & Navarro (2004b).

Genus *EUTHLYPIS* Cabanis, 1851

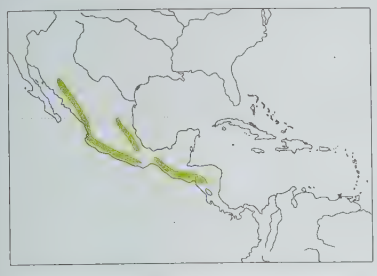
86. Neotropical Fan-tailed Warbler

Euthlypis lachrymosa

French: Paruline des rochers **German**: Fächerwaldsänger **Spanish**: Reinita Roquera
Other common names: (American) Fan-tailed Warbler

Taxonomy. *Basileuterus lachrymosa* Bonaparte, 1850, Laguna Huetulacán, Veracruz, Mexico.
Affinities uncertain. Generally considered closest to *Basileuterus*, and genus sometimes subsumed in latter; in bill shape and long, graduated tail resembles *Icteria*, but this may be due to convergence. Paler birds in N of range described as race *tephra* and darker ones in S as *schistacea*, but differences are clinal and naming of races appears unwarranted. Monotypic.

Distribution. N Mexico S to NW Nicaragua.



Descriptive notes. 15 cm; 10–21 g. Has front of head blackish, with conspicuous yellow crown patch, white loral spot and narrow white eye-crescents; rear of ear-coverts, nape and upperparts, including tail, dark grey, faint olive wash on mantle; tail long and graduated, with white tips of feathers; throat and underparts yellow, rich tawny-yellow wash on flanks, white undertail-coverts; slight clinal variation, S birds darker and purer grey on upperparts, more extensively black on head and with richer tawny wash on breast than N ones; iris dark; bill black; legs flesh-coloured. Sexes similar. Juvenile has ash-grey head and upperparts, narrow buff wingbars on greater and median upperwing-coverts, brownish-grey throat, breast and flanks, becoming pale buffy olive on belly and undertail-coverts, and paler bill and legs; paler, flesh-coloured, bill retained into first winter. Voice. Song a series of clear, downslurred whistles, rising sharply on penultimate note, can be transcribed as "wee wee wee wee wee wee-cher"; also a more variable series on more even pitch and with slow terminal flourish. Usual call a thin, high-pitched "tseeng" or "schree", also a shorter "si".
Habitat. Submontane and lower montane evergreen or semi-deciduous forest with undisturbed understorey, favouring rugged, rocky areas such as ravines and forest-covered lava flows; in foothills and lower mountains, at 50–1800 m.
Food and Feeding. Feeds on insects and other invertebrates. Forages mainly by gleaning and picking prey from leaves and rocks, on ground and low in undergrowth. Regularly following swarms of army ants (Ecitononae) in some areas, feeding on invertebrates fleeing from the swarm; up to a dozen individuals gather at large swarms. Has been recorded as foraging in association with nine-banded armadillos (*Dasypus novemcinctus*). Individuals or pairs may join mixed-species foraging flocks outside breeding season.
Breeding. Nest an open cup of dried leaves, grasses and pine needles, hidden on ground, often under leaf litter. No other information.
Movements. Mainly sedentary. N populations (those in Sonora and Chihuahua) may move S in winter. Vagrant to SE Arizona and Texas (S USA) and adjacent N Sonora, mostly in late spring, and in NW Baja California.
Status and Conservation. Not globally threatened. Fairly common, but often local. Appears to be rather thinly distributed throughout most of range. No population estimates available.
Bibliography. Curson *et al.* (1994), Dickey & van Rossem (1926), Dunn & Garrett (1997), Howell & Webb (1995), Komar & Hanks (2002), Levy (1962), Robbins (1981), van Rossem (1934), Schaefer & Fagan (2006), Sibley & Monroe (1990).

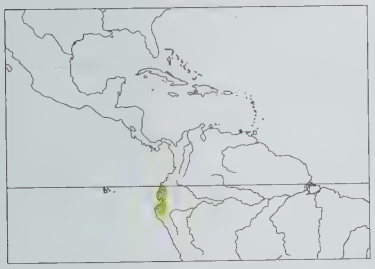
Genus *BASILEUTERUS* Cabanis, 1848

87. Grey-and-gold Warbler

Basileuterus fraseri

French: Paruline de Fraser **German**: Feenwaldsänger **Spanish**: Reinita de Fraser
Other common names: Fraser's Warbler

Taxonomy. *Basileuterus fraseri* P. L. Sclater, 1884, Pallatanga and Babahoyo, western Ecuador.
Affinities within genus uncertain; may be closest to *B. bivittatus* and/or *B. chrysogaster*. Races apparently intergrade in SW Ecuador (SE Guayas). Two subspecies recognized.
Subspecies and Distribution.
B. f. ochraceicrista Chapman, 1921 – W Ecuador.
B. f. fraseri P. L. Sclater, 1884 – SW Ecuador and adjacent NW Peru.



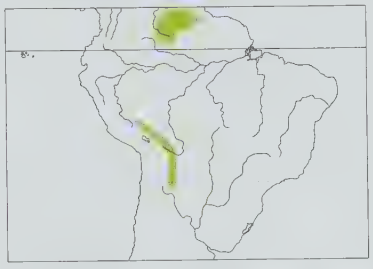
Descriptive notes. 14 cm; 11·6 g. Nominate race has crown black with narrow yellow central stripe, white supraloral stripe, rest of head and upperparts blue-grey, olive patch on mantle; throat and underparts yellow; iris dark; bill black; legs bright straw/orange. Sexes alike. Juvenile is not well known one moulting juvenile (of race *ochraceicrista*) had grey-brown head with some black-tipped and orange feathers in crown, grey-brown upperparts with obscure olive patch on mantle, pale yellow underparts with olive wash, and dark horn bill. Race *ochraceicrista* is similar to nominate, but central crownstripe orange. Voice. Song consists of a variable series of musical "tew" notes, rising in pitch and often accelerating at end; call a clear whistle.
Habitat. Thought to breed mainly in dry deciduous forest and forest edges (also second growth and scrub), and to use more humid evergreen forest when not breeding; lowlands of Tumbesian area W of Andes and on lower slopes up to c. 1700 m (locally up to 2100 m in S Loja) in Ecuador, up to 1900 m in Peru.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages by gleaning at mainly low to middle levels, often in dense cover. Does not join mixed-species foraging flocks as regularly as most congeners.
Breeding. Several singing in SW Ecuador in Feb (1991), indicating that in this area, at least, breeding season probably Jan–Apr (rainy season). No other information.
Movements. Resident; appears to undertake local movements between dry deciduous forest, where thought to breed during rainy season, and more mesic habitats at other times.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tumbesian Region EBA. Generally reckoned to be fairly common to locally common. No population estimates available.
Bibliography. Berg (1994), Best (1992), Best & Kessler (1995), Clements & Shany (2001), Curson *et al.* (1994), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Stattersfield *et al.* (1998), Todd (1929b).

88. Two-banded Warbler

Basileuterus bivittatus

French: Paruline rubanée **German**: Bindenwaldsänger **Spanish**: Reinita Bandeada
Other common names: Roraiman Warbler (*roraimae*)

Taxonomy. *Muscicapa bivittata* d'Orbigny and Lafresnaye, 1837, Yungas, Chiquitos, Bolivia.
Closely related to and may form a superspecies with *B. chrysogaster*; the two are separated altitudinally in small area of S Peru where ranges overlap. Race *roraimae* geographically remote from the other two, and treated as a separate species by some recent authors. Three subspecies recognized.
Subspecies and Distribution.
B. b. roraimae Sharpe, 1885 – tepuis of S Venezuela, W Guyana and N Brazil.
B. b. bivittatus (d'Orbigny & Lafresnaye, 1837) – E slope of C Andes from S Peru S to C Bolivia.
B. b. argentinae J. T. Zimmer, 1949 – E slope of Andes from SC Bolivia S to N Argentina.



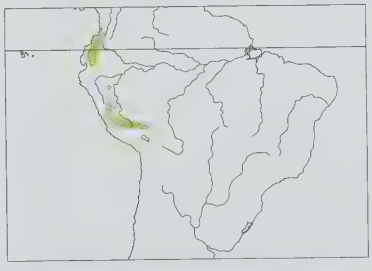
Descriptive notes. 13·5–14 cm; 14·6 g. Nominate race has black crown, some feathers tipped olive, central crownstripe orange-rufous admixed with yellow, yellow supercilium joins upper eye-crescent and fades behind eye, lower eye-crescent buffy-white to yellow; rest of head and upperparts olive-green; throat and underparts yellow, faint olive wash on side of breast and flanks; iris dark; bill blackish; legs yellowish-flesh. Differs from similar *B. chrysogaster* in having only faint olive wash on flanks, no yellow supercilium. Sexes alike. Juvenile has olive head and upperparts, faint darker eyestripe and yellow eye-crescents, yellow below, olive on breast (extensive yellow on underparts probably indicating start of post-juvenile moult). Race *argentinae* is similar to nominate, but central crownstripe mostly yellow, black feathers of crown have more extensive olive tipping, yellow supraloral more extensive, upperparts slightly paler; *roraimae* is brighter overall, especially on head, with solid black crown and solid orange-rufous central crownstripe. Voice. Song of race *argentinae* a fast, jumbled, musical warbling, and female often sings, especially in response to male's song; call of Andean birds a harsh, scolding "fit". Race *roraimae* song described as a series of rapidly accelerating short notes ending in rising buzz, "tis, tis-tis-tic'tic'tic't't't'z'zzzzzzzzzzé", also a more hesitant song speeding up and rising a little, e.g. "tis, tis tis my wish-wish-to'go'wee'wee".
Habitat. Humid submontane and montane forests and cloudforest with dense, undisturbed understorey, also in bamboo thickets (especially in Peru); mainly on lower slopes, at 700–1800 m.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages by gleaning at low to middle levels, mostly in undergrowth; often climbs up plant and vine stems in manner of a *Herpsilochmus* antwren. Pairs or small groups frequently join mixed-species foraging flocks.
Breeding. Juvenile (which had probably started post-juvenile moult) seen with adult in Feb in Argentina. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally fairly common to common. No population estimates available.
Bibliography. Barnett & Pearman (2001), Clements & Shany (2001), Curson *et al.* (1994), Hennessey *et al.* (2003), Hilty (2002, 2003), Mayr & Phelps (1967), Meyer de Schauensee (1982), Ridgely & Tudor (1989), Sick (1993), Todd (1929b).

89. Golden-bellied Warbler

Basileuterus chrysogaster

French: Paruline à ventre doré **German**: Goldbauch-Waldsänger **Spanish**: Reinita Ventridorada
Other common names: Cuzco Warbler (*chrysogaster*); Chocó Warbler (*chlorophrys*)

Taxonomy. *Setophaga chrysogaster* Tschudi, 1844, Chanchamayo Valley, Junín, Peru.
Closely related to and may form a superspecies with *B. bivittatus*; the two are separated altitudinally in small area of S Peru where ranges overlap. Races geographically discrete and have recently been treated by some authors as two distinct species, based primarily on significant differences in song. Two subspecies recognized.
Subspecies and Distribution.
B. c. chlorophrys Berlepsch, 1907 – Andes of SW Colombia and W Ecuador (S to Chimborazo).
B. c. chrysogaster (Tschudi, 1844) – E slope of Andes in C & S Peru and W Bolivia.



Descriptive notes. 13 cm; 11·1 g. Nominate race has black crown with olive feather tips, orange-yellow central crownstripe (also with olive feather tips), prominent yellow supercilium from bill base to side of nape, narrow yellow eye-crescents; rest of head and upperparts olive-green; throat and underparts yellow, heavy olive wash on side of breast and flanks; iris dark; bill blackish; legs yellowish-straw. Distinguished from similar *B. bivittaus* by prominent yellow supercilium (not just supraloral stripe) and much heavier olive wash on flanks. Sexes alike. Juvenile undescribed. Race *chlorophrys* has supercilium mostly pale olive, with yellow restricted to supraloral area. Voice. Song of nominate race a series of c. 7–10 full notes, each slightly downslurred, at medium pace; call a hard "tic" or "chit". Song of *chlorophrys* a fast and buzzing accelerating series of thin notes, transcribed as "t-t-t-t-t-tzzzzzzzzz"; call apparently undescribed.
Habitat. Lowland rainforest and humid submontane forest and second growth with dense understorey; at 300–1200 m.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages by gleaning mostly at middle levels in top of understorey and lower canopy; at higher levels than most congeners. Pairs or small groups often join mixed-species foraging flocks.
Breeding. No information.
Movements. Sedentary.

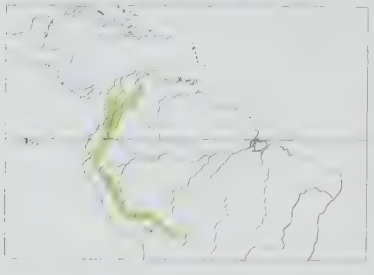
Status and Conservation. Not globally threatened. Race *chlorophrys* fairly common to locally common in Ecuador; nominate race apparently rare in Peru. No population estimates available.
Bibliography. Clements & Shany (2001), Curson *et al.* (1994), Meyer de Schauensee (1982), Perry *et al.* (1997), Planqué & Vellinga (2010), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Todd (1929b).

90. Citrine Warbler

Basileuterus luteoviridis

French: Paruline citrine **German**: Bonapartewaldsänger **Spanish**: Reinita Citrina

Taxonomy. *Trichas luteoviridis* Bonaparte, 1845, Santa Fé de Bogotá, Colombia.
Closely related to *B. signatus* and *B. nigrocristatus*. Race *eophrys* formerly considered a race of latter species, but closer in morphology to present species and linked to nominate race by intermediate *striaticeps*. Race *richardsoni* sometimes treated as a separate species, but linked to nominate by intermediate race *quindianus*. A specimen from Colombia (at 3400 m) may represent an additional, undescribed, race, apparently resembling nominate race, but may be an undescribed race of *B. signatus*. Five subspecies currently recognized.
Subspecies and Distribution.
B. l. richardsoni Chapman, 1912 – Pacific slope of W Andes of Colombia.
B. l. quindianus Meyer de Schauensee, 1946 – C Andes of Colombia.
B. l. luteoviridis (Bonaparte, 1845) – E Andes from SW Venezuela (Mérida) S to Ecuador.
B. l. striaticeps (Cabanis, 1873) – Andes of N & C Peru.
B. l. euophrys P. L. Sclater & Salvin, 1876 – Andes from S Peru S to C Bolivia.



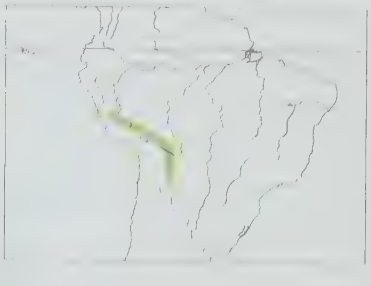
Descriptive notes. 14 cm; 16·5 g. Nominate race has crown, nape, ear-coverts and upperparts olive-green, flecked yellow on ear-coverts, short yellow supercilium, short blackish eyestripe, indistinct olive-yellow to dirty white lower eye-crescent; throat and underparts yellow, washed olive on side of breast and flanks; iris dark; bill blackish; legs flesh-coloured. Distinguished from extremely similar *B. signatus* mainly by having only indistinct (not bright yellow) lower eye-crescent. Sexes similar. Juvenile is mostly dark olive-brown with faint ochre-yellow supercilium, pale ochre-yellow on lower underparts, bill and legs paler than those of adult. Race *richardsoni* is noticeably duller than nominate, with whitish throat and supercilium, pale buffy-yellow underparts, slightly paler and greyer upperparts; *quindianus* is intermediate in plumage between previous and nominate; *striaticeps* has longer supercilium than nominate, usually some black on side of crown above supercilium, is brighter yellow below; *euophrys* has longer and broader supercilium than last, blacker eyestripe, and extensive black on front and side of crown. Voice. Song a long, pulsating trill with a few clearer introductory notes, rising and falling erratically in pitch; generally longer, faster and more trilling than similar song of *B. signatus*. Call a sharp, high "tsit". Also, one record of a pair in Venezuela duetting, one individual giving rapid chatter and the other a series of squeaks and high notes.
Habitat. Humid montane forest and forest edge where dense understorey present; mainly at 2300–3400 m, occasionally down to 2000 m (e.g. Cordillera de Huacamayos, in Ecuador).
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages primarily by gleaning at low to middle levels, mainly 2–5 m up and slightly higher than *B. signatus*; race *euophrys* forages at lower levels, mainly in understorey. Pairs or small groups often join mixed-species foraging flocks when not breeding; *euophrys* regularly occurs in larger groups (up to 12 individuals) than other races.
Breeding. Birds in breeding condition birds in Colombia in Sept and Oct, and recently fledged young seen in Colombia in Feb (Cauca), Jul (Nariño) and Sept (Cundinamarca), in Bolivia (La Paz) in Jan and in Peru (Huánuco) in Aug. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally common throughout its range; race *richardsoni* more local; nominate described as uncommon in some parts of Ecuador, though otherwise generally common. No population estimates available.
Bibliography. Clements & Shany (2001), Curson (1994a, 1994b), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Todd (1929b).

91. Pale-legged Warbler

Basileuterus signatus

French: Paruline à pattes pâles **German**: Peruwaldsänger **Spanish**: Reinita Paticlara
Other common names: Yellow-green Warbler

Taxonomy. *Basileuterus signatus* Berlepsch and Stolzmann, 1906, Idma, Santa Ana, Peru.
Closely related to *B. luteoviridis* and *B. nigrocristatus*. A specimen record from Colombia (at 3400 m) may represent an additional, undescribed, race, but the specimen apparently resembles nominate race of *B. luteoviridis* and may belong with that species. Two subspecies currently recognized.
Subspecies and Distribution.
B. s. signatus Berlepsch & Stolzmann, 1906 – Andes in SC Peru.
B. s. flavovirens Todd, 1929 – Andes from S Peru S to extreme N Argentina.



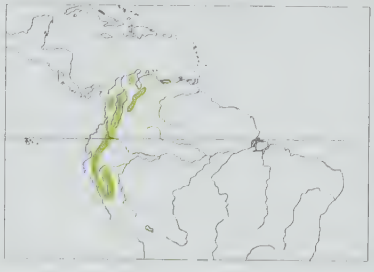
Descriptive notes. 13·5 cm; 12·1–13·4 g. Nominate race has short yellow supercilium, short blackish eyestripe, yellow lower eye-crescent; rest of head and upperparts olive-green; throat and underparts yellow, faint olive wash on side of breast and flanks; iris dark; bill blackish; legs yellowish-flesh, occasionally brownish or greyish. Distinguished from extremely similar *B. luteoviridis* mainly by distinctly yellow lower eye-crescent, also legs generally (not always) slightly paler. Sexes alike. Juvenile is mostly dark brown, with olive tones restricted to wings and tail, belly slightly paler and buffier, bill paler than that of adult and legs also slightly paler. Race *flavovirens* is similar to nominate, but has narrow blackish upper border to supercilium and is slightly brighter overall. Voice. Song a long series of fast, high-pitched, jumbled notes, first rising and then dropping in pitch while increasing in volume; similar to song of *B. luteoviridis* but slightly shorter, and usually also slower and less trilling, with individual notes clearer.
Habitat. Humid montane forest and forest edges, especially in dense undergrowth along streams, mainly at 1800–3050 m; also down to 1500 m in Argentina, where it overlaps with *B. bivittatus*. Generally at lower levels than race *striaticeps* of *B. luteoviridis*, but considerable overlap with race *euophrys* of latter species.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages mostly by gleaning at low levels inside understorey, usually less than 2 m from ground and occasionally on ground; occasionally flycatches. Generally forages at lower levels than those preferred by *B. luteoviridis*. Pairs or family parties frequently join mixed-species foraging flocks.
Breeding. Juveniles seen in Dec and Feb in C Peru; Colombian specimen possibly of this species was of a male in breeding condition in Jun. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common to common. No population estimates available. Colombian specimen, if confirmed to be of present species, could have been a vagrant or the remnant of a N Andean population; there are no other records of this species from anywhere outside its known range.
Bibliography. Barnett & Pearman (2001), Borrero & Hernández (1958), Clements & Shany (2001), Curson (1994a, 1994b), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hilty & Brown (1986), Meyer de Schauensee (1959, 1982), Ridgely & Tudor (1989), Todd (1929b).

92. Black-crested Warbler

Basileuterus nigrocristatus

French: Paruline à cimier noir **Spanish**: Reinita Crestinegra
German: Schwarzscheitel-Waldsänger

Taxonomy. *Trichas nigro-cristatus* Lafresnaye, 1840, Santa Fé de Bogotá, Colombia.
Closely related to *B. luteoviridis* and *B. signatus*; race *euophrys* of former was in the past considered a race of present species. Monotypic.
Distribution. Sierra de Perijá and Andes of Colombia and Venezuela S to C Peru; also coastal mountains of Venezuela in Aragua and Distrito Federal.



Descriptive notes. 13·5 cm; 11·1–19·8 g. Has centre of crown and short eyestripe glossy black, broad supercilium and lower eye-crescent yellow; rest of head and upperparts olive-green; throat and underparts yellow; iris dark; bill blackish; legs orange-yellow. Sexes similar. Juvenile has dusky olive-grey head and upperparts, pale buffy-olive underparts, bill paler than that of adult. Voice. Song consists of two or more "chup" notes followed by ascending and accelerating series of "chew" notes, ending very abruptly. Call a low "tchick" repeated regularly, sometimes extended into a chatter.
Habitat. Montane-forest and cloudforest edges and clearings with dense shrubby understorey, also well-developed second growth; avoids forest interior, and frequently found in *Chusquea* bamboo clumps and bracken (*Pteridium*). Mainly at 2600–3400 m, in Venezuela and Peru also down to 1500 m, and in W Ecuador to 1750 m; generally at higher altitudes than those at which *B. luteoviridis* found.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages primarily by gleaning at low levels in undergrowth, occasionally ascending to higher branches of understorey. Pairs may join mixed-species foraging flocks when not breeding.
Breeding. In Ecuador nests with eggs or young found in May and Nov–Dec and recently fledged young seen in Feb (Azuay) and May (in NW), and in Colombia birds in breeding condition in May–Jul in Perija and recently fledged young seen in Jan (Cauca), Mar (Nariño), Jun (Cundinamarca), Jul (Nariño) and Oct (Cauca); this would indicate extended breeding season; evidence of second brood (or perhaps replacement clutch) in Ecuador. Nest a relatively simple dome-shaped structure, made of grasses or bamboo leaves, no distinct lining, placed on ground or on mossy mound or bank. Clutch 2 eggs (two Ecuador nests). No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common to common throughout its range. No population estimates available.
Bibliography. Clements & Shany (2001), Curson (1994a, 1994b), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Greeney *et al.* (2005), Hilty (2002, 2003), Hilty & Brown (1986), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Todd (1929b).

93. Grey-headed Warbler

Basileuterus griseiceps

French: Paruline à tête grise **German**: Grauwangen-Waldsänger **Spanish**: Reinita Cabecigrís

Taxonomy. *Basileuterus griseiceps* P. L. Sclater and Salvin, 1868, woods of Caripe, Venezuela.
Affinities within genus uncertain; has been suggested that it is close to *B. leucoblepharus*, but the two are quite different in morphology, behaviour and habitat. Monotypic.
Distribution. Cordillera de Caripe (NE Venezuela).
Descriptive notes. 14 cm. Head is grey with white supraloral stripe, indistinct white flecking on ear-coverts; upperparts olive-green; throat and underparts yellow; iris dark; bill blackish; legs flesh-coloured. Sexes alike. Juvenile has dark grey hood extending down to breast, brownish body with paler underparts, legs paler than those of adult. Voice. Song a lively, slurred, melodic "(hu)wee-che-tseew", repeated several times. Contact call a thin "tsip"; other calls include harsher "tseek" or "chack" when excited and "tseng" in response to song.
Habitat. Recorded in cloudforest, montane forest and forest edges, and clearings, but probably reliant on undisturbed montane forest and cloudforest with intact understorey; at 1200–2440 m, mainly 1400–2100 m. Recent observations indicate that it may be a specialist of forest edges and clearings where understorey very dense, but has been seen also in forest interior at higher levels (up to 8 m in lower canopy); may be able to survive in disturbed forest if understorey intact.



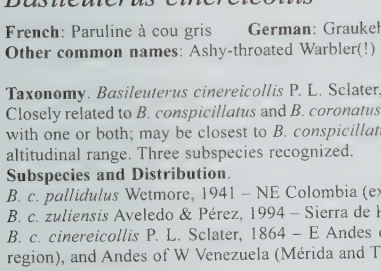
Food and Feeding. Probably feeds mainly on insects and other invertebrates. The few recent observations have been of individuals foraging at low to middle levels in the understorey and in the lower branches of the canopy; often found associating with mixed-species foraging flocks, particularly those that include some typical low-level foragers, such as brush-finches (*Atlapetes*), Stripe-breasted Spinetails (*Synallaxis cinnamomea*) and White-throated Barbtail (*Premnoplex tatei*).
Breeding. Nest only recently discovered, in late May 2006; two juveniles seen in Aug 1994; season probably May–Jul. One nest found, a domed cup with side entrance, built mostly from bamboo leaves and palm material (leaves, bract strips, bark shreds) with dry and decayed leaves, and with interwoven small twigs, bryophytes and rootlets, lined with fluffy kapok, placed 1·5 m above ground on steep forested slope adjacent to a trail, hidden among grassy vegetation beside fallen tree. Nest contained 1 egg, presumably an incomplete clutch; three days later nest empty (egg on ground outside), evidently abandoned. No other information.
Movements. Sedentary. Some possible seasonal altitudinal movement indicated by several old records at 1850–2440 m in Dec–Feb and 1400–1600 m in Aug.
Status and Conservation. ENDANGERED. Restricted-range species: present in Caripe-Paria Region EBA. Very rare and local. Has very small global range and global population, and has suffered extensive destruction of forest habitat. Has apparently always been very localized, and probably uncommon; said to have been very rare in 1860s. Recorded from only seven localities in mountains of NE Venezuela (Cordillera de Caripe), on borders of Anzoátegui, Monagas and Sucre. Vast majority of records from just two mountains, Cerro Negro and, in Serranía de Turumiquire, Cerro Macanilla. Reported irregularly from these and two other localities until 1963; from then until 1993 only one report, of a single individual on Cerro Negro in 1987. During a search for the species in 1993, two were seen near summit of Cerro Negro; in following year further searches produced five reports, including one of a family party in Aug. More recently, has been seen again in Turumiquire, in 1998 and 2001. Away from the historic localities, apparent moulting juvenile observed on two consecutive days on Los Cumbres de San Bonifacio, c. 25 km NE of Cerro Negro. Destruction of forest, mainly for coffee plantations and vegetable plots, the most serious threat to this species, and situation is critical on Cerro Negro, less so in Turumiquire Range. Within its historic range deforestation virtually complete on Cerro Negro, the only known remaining habitat (near summit) covering no more than c. 2 km²; more habitat survives in Turumiquire, and this may be the species' current stronghold. Estimated population on Cerro Negro, on basis of sightings in 1993 and 1994 and amount of habitat remaining, 2–5 pairs. Cerro Negro lies within El Guácharo National Park and nominally protected, but laws are not enforced and remaining habitat still under threat, especially from continued conversion to coffee plantation, which destroys understorey on which this species depends, and from peasant farmers who settle on slopes and burn small patches in order to cultivate vegetables. Recent sightings and estimate of suitable habitat in Turumiquire are encouraging, and every effort should be made to discover extent of population, which may number 2500 or more individuals. Sighting of juvenile at Los Cumbres de San Bonifacio should be followed up, to determine whether an undiscovered population exists in this area, although there are only two peaks above 1400 m and therefore little suitable habitat. If this species is not to become extinct, it is essential that all areas of forest in its range are effectively protected and encroachment of coffee plantation and subsistence agriculture reversed. Studies so far have concentrated on Cerro Negro, but there may be less pressure on the larger areas of remaining forest in Turumiquire Range and population here should receive same attention to determine its size, amount of habitat remaining and detailed conservation measures required.
Bibliography. Anon. (2009f), Boesman & Curson (1995), Brooks (2000), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson (1993b), Curson *et al.* (1994), Gabaldón (1992), Hernández *et al.* (2009), Hilty (2002, 2003), Meyer de Schauensee (1982), Rodríguez & Rojas-Suárez (1995), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Todd (1929b).

94. Grey-throated Warbler

Basileuterus cinereicollis

French: Paruline à cou gris **German**: Graukehl-Waldsänger **Spanish**: Reinita Gorjigrís
Other common names: Ashy-throated Warbler(!)

Taxonomy. *Basileuterus cinereicollis* P. L. Sclater, 1864, Bogotá, Colombia.
Closely related to *B. conspicillatus* and *B. coronatus*, and has in the past been considered conspecific with one or both; may be closest to *B. conspicillatus*, on basis of similarities in vocalizations and altitudinal range. Three subspecies recognized.
Subspecies and Distribution.
B. c. pallidulus Wetmore, 1941 – NE Colombia (extreme NW of Sierra de Perijá).
B. c. zuliensis Aveledo & Pérez, 1994 – Sierra de Perijá, on Colombia–Venezuela border.
B. c. cinereicollis P. L. Sclater, 1864 – E Andes of Colombia (Norte de Santander S to Bogotá region), and Andes of W Venezuela (Mérida and Táchira).



Descriptive notes. 14 cm. Nominate race has grey head with dark grey crown and yellow central crownstripe; olive-green upperparts; pale grey throat and breast, yellow lower underparts; iris dark; bill blackish-brown; legs yellowish-flesh. Sexes similar. Juvenile undescribed. Race *zuliensis* paler olive-grey on crown, sides of head and nape, paler grey on breast, darker yellow on abdomen; *pallidulus* is very similar to nominate, but on average slightly paler overall. Voice. Song infrequently given, relatively weak (easily overlooked), 3–6 or more high thin notes, variable in pattern, typically with final note stronger and somewhat higher-pitched or rising. Call a short "plip".
Habitat. Humid submontane forest and forest edges, and secondary growth with undisturbed understorey; at 800–2100 m.
Food and Feeding. Little information available. Apparently forages actively in understorey; rather a skulking species.
Breeding. Nestlings being fed in mid–Jun. Single nest reported to date was an oven-shaped structure made of bark fibres, small twigs and vines, placed on steeply sloping ground under overhang. Clutch size unknown, but two nestlings were present in single known nest. No other information available.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Colombian East Andes EBA and Cordillera de Mérida EBA. Local and uncommon to rare; no population estimates available; found to be fairly common in Torcoroma Reserve (N Colombia). Becoming increasingly scarce over its entire range through deforestation of lower montane slopes, which it favours, for agriculture. This has been particularly severe in E Andes of Colombia and in Sierra de Perijá, on Colombia–Venezuela border. If intensity of forest removal and degradation increases, this species' status may need to be upgraded to Vulnerable.
Bibliography. Anon. (2009f), Boesman (1998), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Hilty (2002, 2003), Hilty & Brown (1986), Hostos & Chincilla (1994), Meyer de Schauensee (1982), Olmstead (2009), Planqué & Vellinga (2010), Renjifo *et al.* (2002), Ridgely & Tudor (1989), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Todd (1929b).

95. White-lored Warbler

Basileuterus conspicillatus

French: Paruline à lores blancs **German**: Rotscheitel-Waldsänger **Spanish**: Reinita Embridada
Other common names: San José Warbler

Taxonomy. *Basileuterus conspicillatus* Salvin and Godman, 1880, San José, Sierra Nevada de Santa Marta, Colombia.
May form a superspecies with *B. coronatus*; has in the past been considered conspecific with both that and, especially, *B. cinereicollis*, and may be closer to latter on basis of similarities in vocalizations and altitudinal range. Monotypic.
Distribution. Santa Marta Mts, in N Colombia.



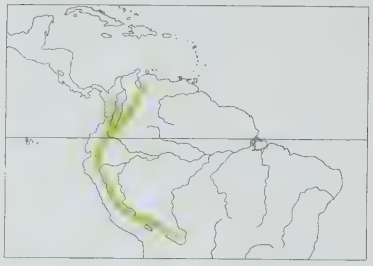
Descriptive notes. 13·5 cm. Has central crown yellowish-orange, bordered laterally with blackish-grey, lores blackish-grey, bold white supraloral stripe and eye-crescents, rest of head grey; upperparts olive-green; throat and upper breast greyish-white, rest of underparts yellow; iris dark; bill dark horn; legs dark flesh-coloured. Sexes similar. Juvenile undescribed. Voice. Song consists of a short, fast series of sharp, high-pitched notes, similar to that of *B. cinereicollis* but perhaps faster and shorter. Call is a short full "pip" or "plip".
Habitat. Inhabits humid forest, forest edge, well-developed second growth and shade coffee plantations; occurs in submontane and lower montane zones, within altitudinal range 450–2200 m.
Food and Feeding. Very little known. Presumably feeds mainly on insects and other arthropods. Forages at low to middle levels, mainly in undergrowth. Joins mixed-species foraging flocks, which may contain also *B. rufifrons* and *B. culicivorus*.
Breeding. Birds in breeding condition in Apr–Jun. Nest a domed structure placed on ground on a bank or under tree roots. Clutch 3–4 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Santa Marta Mountains EBA. Listed as "Endangered" in Colombian Red Data Book. Fairly common within its very small global range, and tolerant of a degree of habitat degradation. In survey in 2000/2001, found to be one of the most common of Santa Marta endemic birds in premontane zone of R Frío valley. Despite this, remaining forest on lower slopes of Sierra Nevada de Santa Marta, which it favours, are under continued threat from agricultural expansion, as well as illegal planting of marijuana and subsequent spraying by Colombian government. Only 15% of original vegetation in the sierra is now unaltered, lower montane slopes suffering particularly badly.
Bibliography. Anon. (2009f), Boesman (1998), Butchart & Stattersfield (2004), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hilty & Brown (1986), Meyer de Schauensee (1982), Norton (1975), Parkes (1975), Planqué & Vellinga (2010), Renjifo *et al.* (2002), Ridgely & Tudor (1989), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Strewe & Navarro (2004b), Todd (1929b).

96. Russet-crowned Warbler

Basileuterus coronatus

French: Paruline à diadème **German**: Goldscheitel-Waldsänger **Spanish**: Reinita Coronirroja
Other common names: Bay-crowned Warbler (*castaneiceps* and *chapmani*)

Taxonomy. *Myiodioctes coronatus* Tschudi, 1844, Chanchamayo Valley, Peru.
May form a superspecies with *B. conspicillatus*; has in the past been considered conspecific with both that species and *B. cinereicollis*, latter being closely related and possibly partly sympatric with present species, but separated altitudinally. Races form two groups, differing in underpart coloration, the "white-bellied group", with underparts uniformly greyish-white (*castaneiceps* and *chapmani*), and "yellow-bellied group", with yellow underparts (all other races); it has been suggested that these groups may constitute two separate species. Eight subspecies currently recognized.
Subspecies and Distribution.
B. c. regulus Todd, 1929 – Andes in Colombia (S to Cauca) and NW Venezuela.
B. c. elatus Todd, 1929 – W Andes in SW Colombia (Nariño) and N Ecuador.
B. c. orientalis Chapman, 1924 – E slope of E Andes in Ecuador (Pichincha S to Chimborazo).
B. c. castaneiceps P. L. Sclater & Salvin, 1877 – W slope of W Andes in SW Ecuador and NW Peru.
B. c. chapmani Todd, 1929 – E slope of W Andes in NW Peru (Cajamarca).
B. c. inaequalis J. T. Zimmer, 1949 – C Andes in N Peru (Amazonas and San Martín).
B. c. coronatus (Tschudi, 1844) – E Andes from C Peru S to W Bolivia (La Paz).
B. c. notius Todd, 1929 – E Andes in C Bolivia (Cochabamba).
Descriptive notes. 14 cm; 13·5–19·5 g. Nominate race has central crownstripe orange-rufous (feathers may be tipped olive in fresh plumage), bordered laterally with black, rest of head grey, with



long, narrow black eyestripe; upperparts olive-green with slight bronze tinge; throat greyish-white, underparts yellow; iris dark; bill blackish-grey; legs orange-flesh. Sexes similar. Juvenile has olive-brown head, upperparts and breast, obscure cinnamon wingbars on greater and median upperwing-coverts, with belly pale buffy yellow, flanks and undertail-coverts more olive-buff; first-year similar to adult, but olive feather tips in central crownstripe may be more extensive, more study needed. Races differ mainly in tone of upperparts and, variably, of underparts, two races distinctively paler below: *notius* is similar to nominate but smaller, with upperparts somewhat darker and lacking bronze tinge, underparts deeper yellow; *inaequalis* is slightly smaller than nominate, upperparts more olive-green (no bronze tinge); *chapmani* has rather pale bronze-olive upperparts (most prominent on edges of wing and tail feathers), is uniformly greyish-white below; *castaneiceps* resembles previous, but upperparts greyish-olive, rather than bronze-olive; *orientalis* is closest to preceding race, but slightly greener above and, below, intermediate between that race and "yellow-bellied group", having pale greyish-white throat and breast grading into pale yellowish on lower underparts; *elatus* is like nominate, but crownstripe slightly more orange, upperparts more olive-green (without bronze tinge), and less sharp contrast between grey throat and olive-yellow breast; *regulus* resembles last in crownstripe colour, but upperparts tinged bronze (similar to nominate). Voice. Song a fast series of 6–8 stuttering but musical "chee" notes, varying in pitch, and often terminating with buzzy upslurred trill or warble; pairs often duet, one partner answering the other. Calls include short, high "trilip" or "tridilip" and buzzy ascending "bzhreeep".

Habitat. Inhabits humid montane forest, cloudforest and forest borders, also well-developed second growth with dense understorey; at 1300–2500 m, occasionally to 3100 m. Where range contiguous with that of *B. cinereicollis*, occurs at higher elevations than those at which latter species found.

Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages mainly by gleaning at low to middle levels, mainly at 1–6 m, occasionally higher. Pairs or family parties often join mixed-species foraging flocks.

Breeding. Eggs laid in Sept in Ecuador (one nest); birds in breeding condition Feb–Oct (mainly May–Jun) in Colombia, and recently fledged young seen in May, Jun, Sept and Oct in W Colombia; juveniles observed in Feb and Aug in C Peru. Nest a domed structure with side entrance, made from leaves, mosses, rootlets and fine sticks, lined with fine grass and tree-fern scales, placed on or very near ground. Clutch 2 eggs. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Fairly common to common throughout its range. No population estimates available.

Bibliography. Barnett & Pearman (2001), Clements & Shany (2001), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Greeney *et al.* (2005), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Meyer de Schauensee (1982), Norton (1975), Parkes (1975), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Todd (1929b).

97. **Three-banded Warbler**

Basileuterus trifasciatus

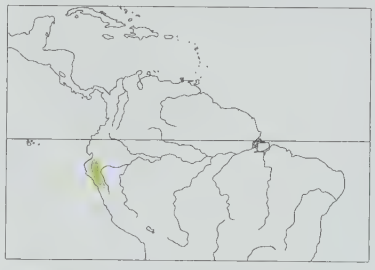
French: Paruline trifasciée **German**: Cayamarcawaldsänger **Spanish**: Reinita de Cajamarca

Taxonomy. *Basileuterus trifasciatus* Taczanowski, 1880, Callacate, Cajamarca, Peru. Forms a superspecies with *B. culicivorus*, and has been considered conspecific. Two subspecies recognized.

Subspecies and Distribution.

B. t. nitidior Chapman, 1924 – SW Ecuador (El Oro and Loja) and adjacent NW Peru (Tumbes).

B. t. trifasciatus Taczanowski, 1880 – NW Peru (Piura S to La Libertad).



Descriptive notes. 12·5 cm; 8·5–11 g. Nominate race has pale grey central crownstripe (may have faint yellowish wash in worn plumage) bordered laterally with black, broad greyish-white supercilium and lores, narrow black eyestripe; ear-coverts mid-grey with narrow blackish rear edge; nape and upper mantle mid-grey, becoming olive-grey on rest of upperparts and distinctly olive on rump and tail; throat white grading into yellow lower breast, all smudged grey, remainder of underparts pale yellow; iris dark; bill blackish-horn, paler horn lower mandible; legs flesh-coloured. Sexes similar. Juvenile undescribed. Race *nitidior* is similar to nominate, but upperparts more olive, less grey, and central crownstripe has stronger yellow wash, especially in fresh plumage. Voice. Song a warbling and pulsating trill, rising slightly in pitch; usual call a sharp "tsit", repeated regularly.

Habitat. Submontane and montane rainforest and forest edge, streamside vegetation in dry forests, riparian thickets, shrubby forest clearings and well-developed second growth with dense undergrowth; mainly at 500–2000 m, in SW Ecuador locally to almost 3000 m.

Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. At one nest, various arthropods recorded as sole food source. Forages mainly by gleaning at low to middle levels, mainly in understorey. Individuals, pairs or family groups sometimes join mixed-species foraging flocks.

Breeding. Breeds in Jan–Apr rainy season, eggs in Feb–Mar, recently fledged young seen in late Apr and early May. Nest a domed structure with side entrance, made from grass, leaves, fine sticks and rootlets, lined with moss, fine grasses or tree-fern chips, placed on ground or by boulder. Clutch 2 eggs; no information on duration of incubation and fledging periods; chicks fed by both parents, average of 15 visits per hour at one nest, and distraction display recorded at one nest.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Tumbesian Region EBA. Uncommon to locally fairly common in SW Ecuador and fairly common in NW Peru. No population estimates available.

Bibliography. Best (1992), Best & Kessler (1995), Clements & Shany (2001), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Greeney *et al.* (2005), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Tudor (1989), Stattersfield *et al.* (1998), Todd (1929b).

PLATE 59 ➤



PLATE 59

inches 3

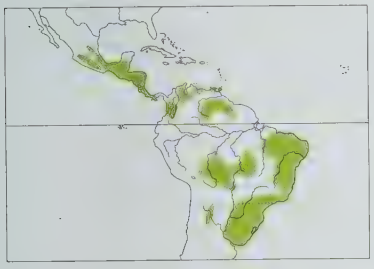
cm 8

98. Golden-crowned Warbler

Basileuterus culicivorus

French: Paruline à couronne dorée **Spanish**: Reinita Coronidorada
German: Goldhähnchen-Waldsänger
Other common names: Stripe-crowned Warbler ("*culicivorus* group"); Cabanis's Warbler ("*cabanisi* group")

Taxonomy. *Sylvia culicivora* W. Deppe, 1830, Jalapa, Veracruz, Mexico.
Forms a superspecies with *B. trifasciatus*; closely related also to *B. hypoleucus*, the two sometimes hybridizing in area of range overlap in S Brazil & NE Paraguay. Races fall into three geographically discrete groups, the "*culicivorus* group" (also with *brasierii*, *flavescens* and *godmani*) of C America, "*cabanisi* group" (including also *occultus*, *austerus* and *indignus*) of N Colombia and NW Venezuela, and "*auricapilla* group" (remaining five races) of NE & S Venezuela and CE South America; groups are sometimes regarded as three separate species. Birds of Oaxaca (S Mexico) sometimes separated as race *ridgwayi*. Race *brasierii* has sometimes been emended to "*brasherii*", but original description incorrectly spells dedicatee Brasher as "Brasier", so original spelling must stand. Thirteen subspecies currently recognized.
Subspecies and Distribution.
B. c. brasierii (Giraud, 1841) – Gulf slope of Mexico from Nuevo León and Tamaulipas S to Hidalgo and N Veracruz.
B. c. flavescens Ridgway, 1902 – W Mexico (Nayarit and Jalisco).
B. c. culicivorus (W. Deppe, 1830) – E & S Mexico S to N Costa Rica.
B. c. godmani Berlepsch, 1888 – C Costa Rica S to W Panama.
B. c. occultus J. T. Zimmer, 1949 – Colombia in W & C Andes (Antioquia S to Cauca) and E Andes (Magdalena and Santander).
B. c. austerus J. T. Zimmer, 1949 – Colombia on E slope of E Andes (Boyacá, Cundinamarca and W Meta).
B. c. indignus Todd, 1916 – Santa Marta Mts (N Colombia) and adjacent Sierra de Perijá (on Colombia–Venezuela border).
B. c. cabanisi Berlepsch, 1879 – NE Colombia and mountains of NW Venezuela.
B. c. olivascens Chapman, 1893 – NE Venezuela (Sucre, Monagas and Anzoátegui) and Trinidad.
B. c. segrex J. T. Zimmer & Phelps, Sr, 1949 – tepuis of S Venezuela, W Guyana and N Brazil.
B. c. auricapilla (Swainson, 1838) – C & E Brazil.
B. c. viridescens Todd, 1913 – E Bolivia (Santa Cruz).
B. c. azarae J. T. Zimmer, 1949 – Paraguay, NW & NE Argentina, S & SE Brazil and Uruguay.



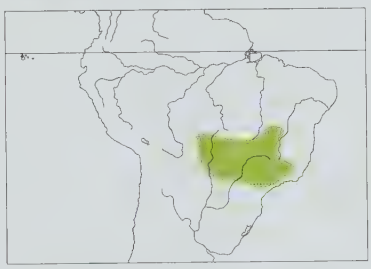
Descriptive notes. 12·5 cm; 9·5–12 g. Nominate race has central crownstripe yellow to pale orange-rufous (feathers may be tipped olive in fresh plumage), bordered laterally with blackish-grey; broad supercilium olive-yellow, becoming yellower in front of eye; lores blackish-grey, ear-coverts, nape and upperparts olive-grey; throat and underparts yellow; iris dark; bill dark horn, mid-flesh lower mandible; legs pale orange-flesh. Sexes similar. Juvenile has dull brownish-olive head and upperparts, obscure brownish-buff wingbars on greater and median upperwing-coverts, and buffy-olive throat and breast, becoming yellowish on lower underparts; first-year like adult, but olive feather tips in central crownstripe may be more extensive, more study needed. Race *brasierii* is slightly larger than nominate, a little more olive above, somewhat brighter yellow below, with black lateral crownstripe generally narrower; *flavescens* resembles previous, but central crownstripe pale yellow and never with olive tips, lateral crownstripe broader, supercilium paler and yellower, upperparts more strongly olive, even brighter yellow below; *godmani* is like nominate, but a little more olive (especially on head), has supercilium darker, more olive-green, contrasting less with ear-coverts; *cabanisi* has crownstripe yellowish to pale orange-rufous, supercilium pale grey, dark eyestripe fairly distinct, upperparts medium grey (lacking olive tones), underparts faintly washed olive, undertail-coverts whitish; *indignus* is very like previous, but crownstripe paler yellow; *occultus* also is like *cabanisi*, but crownstripe more obscure, ear-coverts darker (merging with dark eyestripe); *austerus* is darker and browner above than preceding races, crownstripe more rufous even than *cabanisi*; *olivascens* has crownstripe orange-rufous, supercilium broad and greyish-white (whiter anteriorly), upperparts greyish-olive with contrasting paler grey nape; *segrex* is like previous, but supercilium tinged yellow, ear-coverts a shade darker, and upperparts slightly darker and greener; *auricapilla* also is like *olivascens*, but more olive above, with grey limited to faint tinge on head and mantle; *viridescens* resembles last, but paler and tinged yellowish above, paler below; *azarae* is intermediate between *auricapilla* and *olivascens* in tone of upperparts. Voice. Song a variable series of 5–6 musical whistled notes, becoming gradually louder: in "*culicivorus* group" penultimate note usually lower in pitch; in "*auricapilla* group" penultimate note usually higher in pitch, and delivery faster; in "*cabanisi* group" last two notes strongly upslurred, giving song a querying tone. Calls include low soft "tchuck", generally repeated regularly and often accelerated into chatter (Mexico), sharp, high "tsip", often repeated as disyllabic or trisyllabic "tsip-l-it" (Venezuela), and loud sharp "chip" (Trinidad).
Habitat. Inhabits humid submontane forest and forest edge; also well-developed second growth where dense undergrowth is present, and sometimes in coffee plantations. Race *cabanisi* occurs also in dry forest in coastal N Venezuela; *brasierii* also in gallery forest in coastal plains of NE Mexico. From lowlands up to 2150 m, mostly in subtropical zone of foothills and lower slopes below 1800 m.
Food and Feeding. Feeds mainly on insects and other arthropods; sometimes takes berries. In SE Brazil, most consumed groups were Coleoptera (beetles), Araneae (spiders) and non-formicid hymenopterans, which together made up c. 80% of items; most items were over 4 mm long. In NE Argentina, main groups were Curculionidae (weevils), Bruchidae (bean weevils) and Lepidoptera (caterpillars, butterflies, moths). Forages mainly by gleaning at low to middle levels, but mostly in undergrowth; also flycatches, and probes leaf tangles. Pairs or family parties observed as part of mixed-species foraging flocks, in which they often act as flock-leaders.
Breeding. Eggs laid in Apr in Costa Rica (one nest) and Mar–Jun (mainly May) in Trinidad; birds in breeding condition in Mar–Jun in Colombia, where recently fledged young seen in Mar. Nest a dome-shaped structure with side entrance, made from rootlets, strips of palm leaves, fibres and mosses, lined with finer plant fibres, well hidden on ground under fallen leaves. Clutch 2–4 eggs; no information on incubation and nestling periods; adults will feign injury to distract attention from nest.
Movements. Generally sedentary. N race *brasierii* has occurred as vagrant in lower Rio Grande Valley in Texas (S USA), mainly in autumn and winter.
Status and Conservation. Not globally threatened. Fairly common to common throughout its range. No population estimates available.
Bibliography. Arvin (1980), Barnett & Pearman (2001), Buskirk (1972), Chatellenaz (2008), Clements & Shany (2001), Coffey & Coffey (1990), Curson *et al.* (1994), Davies (1946), Dunn & Garrett (1997), ffrench (1991), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Howell & Webb (1995), Langham (1980), de Mendonca-Lima *et al.* (2004), Meyer de Schauensee (1982), Phillips (1966a), Pomara *et al.* (2003), Restall *et al.* (2005), Ridgely & Greenwood (2001), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Robbins *et al.* (1999), Sick (1993), Stiles & Skutch (1989), Todd (1929b).

99. White-bellied Warbler

Basileuterus hypoleucus

French: Paruline à ventre blanc **German**: Weißbauch-Waldsänger **Spanish**: Reinita Ventriblanca

Taxonomy. *Basileuterus hypoleucus* Bonaparte, 1850, Brazil.
Closely related to the superspecies formed by *B. trifasciatus* and *B. culicivorus*, occasionally hybridizing with latter in area of range overlap in S Brazil & NE Paraguay. Monotypic.
Distribution. S Brazil (S Mato Grosso E to W Minas Gerais and E São Paulo) and NE Paraguay; possibly also SE Bolivia.



Descriptive notes. 12·5 cm; 9·5–13 g. Has orange-rufous central crownstripe bordered laterally with black, broad greyish-white supercilium, narrow dark grey eyestripe, blackish in front of eye; ear-coverts and side of neck pale grey; upperparts greyish-olive, more olive on rump; throat and underparts whitish, flanks faintly washed olive-grey, belly and undertail-coverts faintly washed pale yellow; iris dark; bill blackish; legs orange-flesh. Sexes similar. Juvenile undescribed. Voice. Song fast, variable and quite musical, transcribed as "cheetitty-chee-chee-chee-chee-cheé-chu"; call "chip", given frequently.
Habitat. Dry deciduous forest, riparian forest, open dry woodland and forest edge with dense understorey; lowlands, mainly below 1000 m. In area of range overlap with *B. culicivorus*, latter generally found in more humid forests and woodlands, the two seldom occurring together.
Food and Feeding. Probably feeds mainly on insects and other arthropods. Forages mainly at low levels in undergrowth; however, in riparian forest of Brazilian *cerrado*, where co-exists with *B. leucophrys* and *B. flaveolus*, present species foraged mainly in high understorey and low canopy, probably due to competitive exclusion. Pairs or small flocks frequently join mixed-species foraging flocks.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally fairly common. No population estimates and species not well known.
Bibliography. Curson *et al.* (1994), Marini & Cavalcanti (1993), Meyer de Schauensee (1982), Remsen & Traylor (1983), Ridgely & Tudor (1989), Robbins *et al.* (1999), Sick (1993), Todd (1929b).

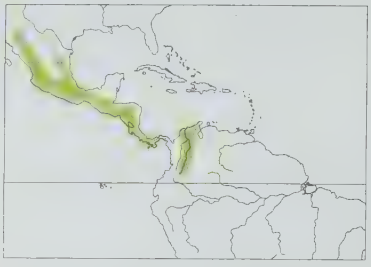
100. Rufous-capped Warbler

Basileuterus rufifrons

French: Paruline à calotte rousse **German**: Rotkappen-Waldsänger **Spanish**: Reinita Coronirrufa
Other common names: Chestnut-capped/Delattre's Warbler ("yellow-bellied group"); Salvin's Warbler (*salvini*)

Taxonomy. *Setophaga rufifrons* Swainson, 1838, Mexico.
Races form two groups, the "yellow-bellied group" group (*delattrii*, *mesochrysus* and *actuosus*), occurring S from S Guatemala, and "white-bellied group" (remaining five races), from Mexico to C Guatemala and Belize. Groups sometimes treated as two separate species, with some vocal differences, but they apparently interbreed extensively in Guatemala, and possibly also in extreme S Mexico (SE Chiapas), El Salvador and Honduras; further, race *salvini* intermediate in plumage between the two groups, also linking them geographically. Eight subspecies recognized.
Subspecies and Distribution.
B. r. caudatus Nelson, 1899 – NW Mexico (Sonora and W Chihuahua S to N Durango).
B. r. dugesi Ridgway, 1892 – C Mexico (S Sinaloa and W Durango S to S Puebla and W Oaxaca).
B. r. jouyi Ridgway, 1892 – NE Mexico (Nuevo León and W Tamaulipas S to E Hidalgo and C Veracruz).
B. r. rufifrons (Swainson, 1838) – highlands of S Mexico and C Guatemala.
B. r. salvini Cherrie, 1891 – S Gulf slope in S Mexico (S Veracruz, N Oaxaca), N Guatemala and S Belize.
B. r. delattrii Bonaparte, 1854 – S Guatemala (probably also extreme SE Chiapas, in adjacent Mexico) S to C Costa Rica.
B. r. mesochrysus P. L. Sclater, 1860 – S Costa Rica S to N Colombia and extreme W Venezuela.
B. r. actuosus Wetmore, 1957 – Coiba I, off S Panama.
Descriptive notes. 13 cm; 7–16 g. Has characteristic habit of cocking tail and flicking wings. Nominate race has crown and ear-coverts rufous (crown feathers narrowly tipped grey in fresh

On following pages: 101. Golden-browed Warbler (*Basileuterus belli*); 102. Black-cheeked Warbler (*Basileuterus melanogenys*); 103. Pirre Warbler (*Basileuterus ignotus*); 104. Three-striped Warbler (*Basileuterus tristriatus*); 105. Santa Marta Warbler (*Basileuterus basilicus*); 106. Flavescent Warbler (*Basileuterus flaveolus*); 107. White-browed Warbler (*Basileuterus leucoblepharus*); 108. White-striped Warbler (*Basileuterus leucophrys*); 109. Buff-rumped Warbler (*Basileuterus fulvicauda*); 110. Riverbank Warbler (*Basileuterus rivularis*).



plumage), separated by long white supercilium, lores black; nape greyish, upperparts olive-green; chin and submoustachial area white, throat and breast yellow, rest of underparts white, washed olive-buff on flanks, vent and undertail-coverts; iris dark; bill blackish; legs flesh-coloured. Sexes similar. Juvenile has olive-brown head and upperparts (warmer brown on crown) with sooty feather fringes, buff wingbars on greater and median upperwing-coverts, pale olive-buff underparts becoming yellowish-white on belly and undertail-coverts. Race *caudatus* is longer-tailed than others (except *dugesi*), has rufous on head paler than nominate, upperparts duller and greyer; *dugesi* differs from previous only in having slightly more olive tone in upperparts; *jouyi* has greyer upperparts than nominate, no greyish collar on nape; *salvini* has yellow of breast merging into yellowish-white on lower underparts; *delattrii* lacks grey collar on nape and white submoustachial stripe, has brighter olive upperparts, uniformly yellow underparts, relatively shorter tail than preceding races; *mesochrysus* differs from previous in having greyish on side of neck and across upper mantle, paler crown, small area of white at top of submoustachial area; *actuosus* is similar to last, but darker above and duller below. VOICE. A fast, dry series of jumbled notes on various pitches and often running into a trill; rather variable, usually starts with chirping notes and (at least in "yellow-bellied group") ends with accented whistle. Call of "white-bellied group" a hard "tcheck", usually extended into harsh chatter in agitation; call of "yellow-bellied group" an emphatic, metallic "plik" or "chink", also often extended into a chatter when bird agitated.

Habitat. Scrub, brushy ravines, open woodland and young second growth, forest edges and coffee plantations; tends to avoid forest, but "yellow-bellied group" occurs more often in wooded areas and is found inside tropical dry forest in Costa Rica. From lowlands to 2500 m, locally to 3000 m in at least Mexico.

Food and Feeding. Feeds mainly on insects and other invertebrates; some berries also taken. Forages mainly by gleaning at low to middle levels; actions slow and deliberate.

Breeding. Eggs usually laid in Apr–Jun in Middle America; birds in breeding condition in Jan on Coiba I and in Nov in Colombia. Pair remains on territory and also sings throughout year, at least in Costa Rica. Nest a dome-shaped structure with side entrance, made from various plant fibres and thickly lined, often with shredded bast fibres, hidden on ground, on steep bank or under boulders or logs. Clutch 2–3 eggs; no information on incubation and nestling periods. Brood parasitism (of race *dugesi*) by Bronzed Cowbird (*Molothrus aeneus*) recorded at least once.

Movements. Generally sedentary. Individuals of N "white-bellied group" have occurred as vagrants in S USA (Arizona and Texas).

Status and Conservation. Not globally threatened. Common over most of its range; no population estimates available. Has made at least one breeding attempt in S USA (Arizona). This species' preference for scrubby habitats and second growth means that habitat loss is not a serious problem.

Bibliography. Arnold (1980), Coffey & Coffey (1990), Curson *et al.* (1994), Dunn & Garrett (1997), Hilty (2002, 2003), Hilty & Brown (1986), Howell & Webb (1995), Meyer de Schauensee (1982), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Stiles & Skutch (1989), Todd (1929b).

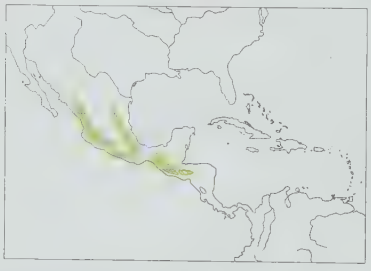
101. Golden-browed Warbler

Basileuterus belli

French: Paruline à sourcils dorés **German**: Goldstreif-Waldsänger **Spanish**: Reinita Cejidorada
Other common names: Bell's Warbler

Taxonomy. *Muscicapa belli* Giraud, 1841, "Texas"; error = Mount Orizaba, Veracruz, Mexico.
Affinities uncertain; probably closest to *B. rufifrons*. Races intergrade. Geographical variation to some extent clinal, upperparts tending to become duller and extent and width of black upper border to supercilium (lateral crownstripe) decreasing from N to S. Five subspecies recognized.

Subspecies and Distribution.
B. b. bateli R. T. Moore, 1946 – W Mexico (SE Sinaloa and W Durango S to Michoacán and México).
B. b. belli (Giraud, 1841) – E Mexico (SW Tamaulipas and E San Luis Potosí S to N Oaxaca and C Veracruz).
B. b. clarus Ridgway, 1902 – S Mexico (S Morelos, S Michoacán, Guerrero and extreme W Oaxaca).
B. b. scitulus Nelson, 1900 – SE Mexico (E Veracruz, E Oaxaca and Chiapas) S to W Honduras and NW El Salvador.
B. b. subobscurus Wetmore, 1940 – C Honduras.



Descriptive notes. 13 cm; 7–13 g. Nominate race has rufous crown and ear-coverts divided by long bright yellow supercilium which is narrowly bordered above with black, lores blackish; nape and upperparts bright olive-green; throat and underparts bright yellow, washed olive on side of breast and flanks; iris dark; bill blackish; legs flesh-coloured. Sexes similar. Juvenile has olive-brown head and upperparts, cinnamon-buff wingbars on greater and median upperwing-coverts, throat and breast paler olive-brown, becoming pale yellowish on lower underparts, tawny-olive wash on flanks. Races vary minimally, mainly in extent and width of black upper border of supercilium, tone of rufous on head and colour of lores: *bateli* has upperparts paler and yellower than nominate, lores normally rufous (not black), paler yellow below; *clarus* is paler and more yellowish-olive above than nominate, crown and cheek paler rufous, lores dark chestnut (concolorous with ear-coverts), lateral crownstripe shorter, thinner and indistinct, underside brighter yellow; *scitulus* resembles previous, but darker and duller olive above, lateral crownstripe even shorter and fainter; *subobscurus* is darker and greyer than last. VOICE. Song a rapid series of high-pitched notes on various pitches, but often upslurred at end. Most common call a high, drawn-out "bzweeech" with slight upward inflection.

Habitat. Humid submontane and montane pine–oak (*Pinus–Quercus*) forest and cloudforest with dense understorey, at 1200–3500 m. Much more a denizen of humid forests than is *B. rufifrons*.

Food and Feeding. Probably feeds mainly on insects and other arthropods. Forages by gleaning, mainly low in undergrowth. Seldom joins mixed-species foraging flocks.

Breeding. Season mainly Mar–Jul. Pair remains on territory throughout year. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Fairly common to common; not well known. No population estimates available.

Bibliography. Curson *et al.* (1994), Howell & Webb (1995), Ridgely & Gwynne (1989), Todd (1929b), Wetmore (1940, 1941b).

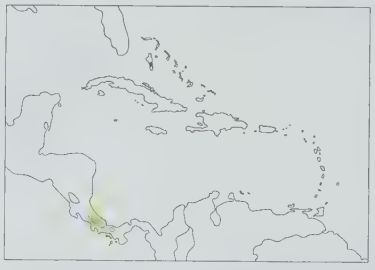
102. Black-cheeked Warbler

Basileuterus melanogenys

French: Paruline sombre **German**: Schwarzwangen-Waldsänger **Spanish**: Reinita Carinegra

Taxonomy. *Basileuterus melanogenys* S. F. Baird, 1865, Costa Rica.
Forms a superspecies with *B. ignotus*, and sometimes considered conspecific. Three subspecies recognized.

Subspecies and Distribution.
B. m. melanogenys S. F. Baird, 1865 – C & S Costa Rica.
B. m. eximius Nelson, 1912 – W Panama in vicinity of Boquette (Chiriquí).
B. m. bensoni Griscom, 1927 – W Panama in vicinity of Chitrá (Veraguas).



Descriptive notes. 13·5 cm; 11·8 g. Nominate race has rufous crown separated from long white supercilium by narrow black lateral crownstripe, face black; nape and upperparts olive-grey; throat pale greyish-white, breast-band and flanks olive-grey, lower underparts pale buffy yellow; iris dark; bill flesh-horn, blackish culmen; legs yellowish-flesh to grey-brown. Sexes similar. Juvenile has sooty-brown head with blackish lores and ear-coverts, pale olive supercilium behind eye, upperparts olive-brown, cinnamon-buff wingbars on greater and median upperwing-coverts, greyish-olive throat and breast, brownish flanks, and pale buffy-yellow belly and undertail-coverts. Race *eximius* is whiter on lower underparts than nominate; *bensoni* has lower underparts whiter still, lacking yellow wash, also purer grey upperparts. VOICE. Song a spluttering and lisping jumble of notes, transcribed as "tsi tsi wee tsi tsi wu tsi wee". Calls include thin, high "tsit", often repeated rapidly when agitated, and high "pit-tew".

Habitat. Montane oak (*Quercus*) forest with dense bamboo understorey, and sometimes in shrubby *páramo* above tree-line, but generally avoids clearings and other open areas; mainly from 2500 m to tree-line, occasionally down to 1600 m.

Food and Feeding. Feeds mainly on insects and other arthropods, especially spiders (Araneae); also takes some berries. Forages mainly by gleaning at low levels, mainly in undergrowth; also hangs upside-down to inspect terminal bamboo tufts, and flits up to take prey from undersides of leaves. Outside breeding season generally in pairs or small groups, which frequently join mixed-species foraging flocks, especially those led by Sooty-capped Bush-tanagers (*Chlorospingus pileatus*).

Breeding. Egg-laying in Apr–Jun, and food-carrying adults observed in Jun. Nest a bulky domed structure made from bamboo and other leaves, fern fronds, roots and rhizomes, thickly lined with brown tree-fern scales and other vegetable fibres, hidden on ground on mossy bank or steep-sided ravine. Clutch 2 eggs; no information on incubation and fledging periods.

Movements. Resident; groups wander widely outside breeding season.

Status and Conservation. Not globally threatened. Restricted-range species: present in Costa Rica and Panama Highlands EBA. Uncommon to fairly common. No population estimates available.

Bibliography. Curson *et al.* (1994), Ridgely & Gwynne (1989), Stattersfield *et al.* (1998), Stiles & Skutch (1989), Todd (1929b).

103. Pirre Warbler

Basileuterus ignotus

French: Paruline du Pirré **German**: Pirrewaldsänger **Spanish**: Reinita del Pirre

Taxonomy. *Basileuterus melanogenys ignotus* Nelson, 1912, Mount Pirri, 5200 feet [c. 1585 m], near head of Río Limón, Darién, Panama.
Forms a superspecies with *B. melanogenys*; and originally described as an isolated race of latter. The two are still sometimes considered conspecific, but races of *B. melanogenys* become greyer above and whiter below towards SE, whereas present species, farther to SE, is distinctly olive above and yellowish below. Monotypic.

Distribution. Cerro Pirre, in extreme E Panama, and Cerro Tacarcuna, on Panama–Colombia border.

Descriptive notes. 13 cm; 9·5–12·5 g. Has rufous crown separated from pale greenish-yellow supercilium by narrow black stripe; ear-coverts mottled olive and blackish; nape and upperparts dull olive-green; throat and underparts pale creamy yellow, tinged olive on side of breast and flanks; iris dark; bill flesh-horn, blackish culmen; legs flesh-coloured. Sexes similar. Juvenile undescribed. VOICE. Song undescribed; call a distinctive, penetrating "tseeut" or "tseeit".

Habitat. Montane forest, especially elfin forest, above 1200 m, mainly above 1400 m.

Food and Feeding. Feeds mainly on insects and probably other arthropods. Forages mainly by gleaning at low to middle levels, 2–10 m above ground, at slightly higher levels than those preferred by *B. melanogenys*. Frequently in pairs or small groups, these sometimes associating with Pirre Bush-tanagers (*Chlorospingus inornatus*) and other species.

Breeding. Adults feeding recently fledged young in Jul. No other information.

Movements. Sedentary.

Status and Conservation. VULNERABLE. Restricted-range species: present in Darién Highlands EBA. Generally uncommon. Restricted to two mountains in Panama–Colombia border region, where

estimated total range c. 180 km², of which it is thought to occupy less than 100 km² of suitable habitat; in 1985, found to be fairly common above 1400 m on Alturas de Nique (in S part of Pirre). Although no systematic surveys made, global population thought to number fewer than 2500 individuals. Having such a small range, this species would be seriously affected by any habitat alteration within this area. Habitat degradation has occurred in the region, for mining, agriculture and coca cultivation, but not yet within altitudinal range occupied by this species. Most of its range lies within Darién National Park, but completion of the Pan American Highway through this area would lead to further damage and destruction of forests.

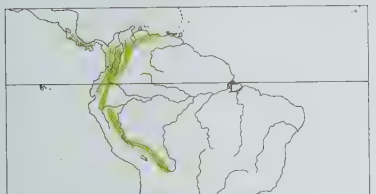
Bibliography. Alvarez-Cordero *et al.* (1994), Anon. (2009f), Butchart & Stattersfield (2004), Collar *et al.* (1992), Curson *et al.* (1994), Hilty & Brown (1986), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Robbins *et al.* (1985), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Todd (1929b), Wege (1996).

104. Three-striped Warbler

Basileuterus tristriatus

French: Paruline triligne **German**: Dreistreifen-Waldsänger **Spanish**: Reinita Cabecilistada

Taxonomy. *Myiodioctes tristriatus* Tschudi, 1844, valley of Vitoc, Junín, Peru.
Affinities within genus uncertain; resembles *B. basilicus* in head pattern. Proposed race *melanotis* (described from Costa Rica) is treated as synonym of *chitrensis*, and *perijanus* (from Sierra de Perijá, in Venezuela) synonymized with *auricularis*. Recently described population in Serranía de San Lucas area of Colombian Andes may represent an undescribed race, being brighter and more extensively yellow on underparts than *auricularis*. Twelve subspecies currently recognized.
Subspecies and Distribution.
B. t. chitrensis Griscom, 1927 – Costa Rica and W Panama.
B. t. tacarcunae Chapman, 1924 – vicinity of Cerro Tacarcuna, on Panama–Colombia border.
B. t. daedalus Bangs, 1908 – W Andes and W slope of C Andes in Colombia (S from Antioquia) and Ecuador (S to Canar).
B. t. auricularis Sharpe, 1885 – E Andes and E slope of C Andes in Colombia and adjacent SW Venezuela (Zulia and Táchira).
B. t. meridanus Sharpe, 1885 – Andes of W Venezuela (Lara S to Táchira).
B. t. bessereri Hellmayr, 1922 – mountains of N Venezuela (Yaracuy E to Miranda).
B. t. pariae Phelps, Sr & Phelps, Jr, 1949 – Paria Peninsula (Cerro Azul and Cerro Humo), in NE Venezuela.
B. t. baezae Chapman, 1924 – E slope of Andes in Ecuador (S to E Chimborazo and W Morona-Santiago).
B. t. tristriatus (Tschudi, 1844) – Andes from S Ecuador (Loja and Zamora-Chinchipe) S to C Peru (Cuzco).
B. t. inconspicuus J. T. Zimmer, 1949 – Andes from SE Peru (Puno) S to NW Bolivia (La Paz).
B. t. punctipectus Chapman, 1924 – Andes of C Bolivia (E La Paz and Cochabamba).
B. t. canens J. T. Zimmer, 1949 – Andes of SC Bolivia (W Santa Cruz).



Descriptive notes. 13 cm; 10·4–12·8 g (*bessereri*). Nominate race has buffy-yellow central crownstripe bordered laterally with long, broad black stripe; long supercilium (extending to nape side) buff-tinged pale greyish-white, lores and ear-coverts blackish, pale buffy-white patch below eye, ear-coverts bordered below and behind with pale yellow; upperparts olive, washed with grey; throat whitish, underparts pale yellow, brightest on belly, washed olive-grey on side of breast and flanks; iris dark; bill horn-coloured, darker culmen; legs flesh-coloured. Sexes similar. Juvenile has dusky olive-brown head and upperparts with faint trace of adult head pattern, and faint buff wingbars on greater and median upperwing-coverts, throat and underparts dusky brown, paler buffish-brown on belly. Races vary mainly in colour and tone of underparts, amount of black on cheek, and crown colour: *punctipectus* is like nominate but duller and paler yellow below, upper breast with distinct olive spots; *inconspicuus* resembles previous, but throat paler, breast mottling less distinct; *canens* also is similar, but greyer above, whiter below, central crownstripe paler (whitish); *chitrensis* is greyer above and brighter on belly than nominate, central crownstripe brighter buff-orange, anterior supercilium buffish, underparts pale olive-buff; *tacarcunae* has more orange central crownstripe than previous, supercilium olive-toned, ear-coverts mostly olive, narrow black eyestripe, upperparts brighter, throat yellower; *daedalus* is like nominate, but central crownstripe more buff, heavier greyish-olive wash on breast and flanks; *auricularis* also has heavier greyish-olive wash on breast and flanks, and ear-coverts are more solidly black; *meridanus* has olive-ear-coverts with narrow blackish eyestripe, similar to *tacarcunae*, but central crownstripe and supercilium pale buffy olive and upperparts duller and browner; *bessereri* is similar to last, but brighter olive above, paler yellow below, with slightly smaller bill; *pariae* likewise is similar, but darker and browner above; *bazae* is like nominate, but has paler yellow underparts with richer buffy-olive flanks. Voice. Song a mixture of agitated trills, twitters, warbles and buzzy notes (in Ecuador, at least, rising in pitch and accelerating to crescendo at end); rather reminiscent of a siskin (*Carduelis*). Calls include sharp "tchp", repeated regularly, and often extended into staccato chatter when agitated, and husky, high-pitched "che-weep".
Habitat. Submontane and lower montane humid forests in subtropical zone, also forest edges and well-developed second growth, at 300–2700 m, mostly 1000–2000 m; race *punctipectus* may occur to 3000 m. One record of individual at just 30 m altitude in N Venezuela in Feb.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages mainly by gleaning actively in understorey; also makes short flycatching sallies. Outside breeding season pairs, small parties and sometimes groups of up to 30 frequently join mixed-species foraging flocks, often acting as flock-leaders.
Breeding. Nest with eggs found in late Apr in Colombia and another in May in Ecuador; recently fledged young seen in Jan–Jul, Sept and Oct in Colombia and Nov in SE Peru (Puno); birds in breeding condition in May–Jul in Colombia and in Aug and Oct in Bolivia. Nest a domed structure with side entrance, comprising three distinct layers and made of moss, leaves and a few sticks, lined with tree-fern fibres, placed on or just above ground. Clutch 2 eggs (two nests). No other information available.
Movements. Resident. May rove widely with foraging flocks outside breeding season. Venezuelan record of single individual at elevation as low as 30 m in Feb may be indicative of altitudinal movements in non-breeding season.
Status and Conservation. Not globally threatened. Fairly common to common throughout its range. No population estimates available.

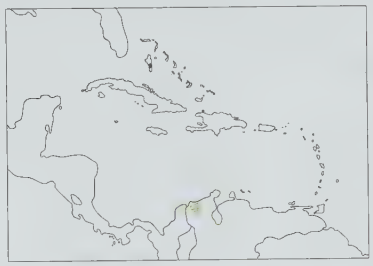
Bibliography. Clements & Shany (2001), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Greeney *et al.* (2005), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Salaman *et al.* (2002), Stiles & Skutch (1989), Todd (1929b), Verea *et al.* (2005), Wenny (1998).

105. Santa Marta Warbler

Basileuterus basilicus

French: Paruline des Santa Marta **Spanish**: Reinita de Santa Marta
German: Santa-Marta-Waldsänger

Taxonomy. *Hemispingus basilicus* Todd, 1913, San Lorenzo, Santa Marta, Colombia.
No obvious close affinities; originally described as a *Hemispingus* tanager (Thraupidae). Resembles *B. tristriatus*, particularly in head pattern, and some authors consider it closest to that species. Monotypic.
Distribution. Santa Marta Mts, in N Colombia.



Descriptive notes. 14 cm. One of the most distinctive members of genus, with striking black-and-white head pattern. Head is mostly black, with white central crownstripe, broad white supercilium (from bill base to nape side), white crescentic patch below eye and white crescentic band at rear of ear-coverts; upperparts olive-green; throat white, underparts yellow; iris dark; bill blackish; legs flesh-coloured. Sexes similar. Full juvenile plumage undescribed, but moulting juvenile had black and white head colours replaced with dusky blackish and buff, respectively, throat and body like adult, bill paler than that of adult and with flesh-coloured lower mandible; first-year similar to adult, but in fresh plumage white head feathers have narrow olive tips (which possibly a feature also of freshly moulted adult). Voice. Song apparently undescribed; call a short weak trill.
Habitat. Humid stunted forest and forest borders with dense undergrowth or scrub, especially where dense stands of *Chusquea* bamboo present; also in second growth with *Chusquea* stands. Occurs at 2100–3000 m, usually above 2300 m.
Food and Feeding. Probably feeds mainly, if not entirely, on insects and other invertebrates. Forages by gleaning low in undergrowth and scrub, mainly below 4 m; actions slow, deliberate. Pairs or small groups often join mixed-species foraging flocks.
Breeding. A bird in breeding condition in Mar and begging juveniles seen in Aug and Sept. No other information.
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Santa Marta Mountains EBA. Locally common to rare. Global population not known, but thought to number fewer than 2500 individuals. In survey in 2000/2001, 2–4 individuals found in association with mixed-species flocks in R Frío valley. Distribution fragmented owing to forest clearance, and range declining in extent because of continuing deforestation, mainly for development of cattle ranches and commercial pine (*Pinus*) plantations. More than one-fifth of montane forest already lost, and most of original vegetation has been greatly modified by various illegal activities, e.g. agricultural expansion, logging and burning. Most degraded area is N slope of Santa Marta Mts, which is where majority of this species' population lives; possibly persists also in scrubby habitat above tree-line, suggesting that it may possess some tolerance of deforestation. This species was formerly considered Near-threatened, but was adjusted to Vulnerable mainly because of continuing loss of habitat; if found able to thrive in scrubby high-montane habitats, it could perhaps be returned to its former status category.

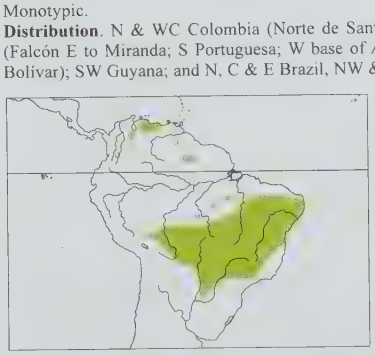
Bibliography. Anon. (2009f), Butchart & Stattersfield (2004), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hilty & Brown (1986), Meyer de Schauensee (1982), Planqué & Vellinga (2010), Renjifo *et al.* (2002), Ridgely & Tudor (1989), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Strewe & Navarro (2004b), Todd (1929b).

106. Flavescent Warbler

Basileuterus flaveolus

French: Paruline flavescente **German**: Gilbwaldsänger **Spanish**: Reinita Amarillenta

Taxonomy. *Myiothlypis flaveolus* S. F. Baird, 1865, "Paraguay" (probably = Paraguay River).
Often placed together with *B. leucoblepharus*, *B. leucophrys*, *B. fulvicauda* and *B. rivularis* in a separate genus, *Phaeothlypis*; differs from those four, however, in having no particular affinity for water and having quite different plumage. Formerly included within the "citrine" group of Andean species (*B. luteoviridis*, *B. signatus* and *B. nigrocristatus*), which it resembles in plumage. Appears to represent closest link between the *Phaeothlypis* group and the rest of present genus. Widely remote populations in NE Colombia and N Venezuela perhaps separable as race *pallidirostris*. Monotypic.
Distribution. N & WC Colombia (Norte de Santander; Cauca Valley); N, W & SE Venezuela (Falcón E to Miranda; S Portuguesa; W base of Andes in Trujillo and Táchira; isolated area in Bolívar); SW Guyana; and N, C & E Brazil, NW & E Bolivia and E Paraguay.



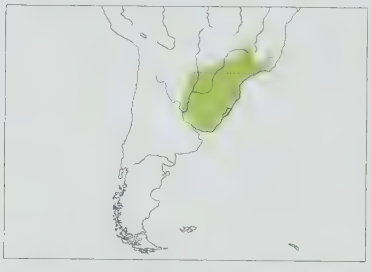
Descriptive notes. 14·5 cm; 9–16 g. Continuously pumps tail up and down, as do others in "*Phaeothlypis* group", but, unlike the other members of the group, does not move it from side to side. Has crown, nape and upperparts olive-green, yellow supercilium becoming olive-yellow behind eye; eyestripe dusky olive, yellow eye-crescents, lower one with olive surround; rest of face and underparts yellow; iris dark; bill blackish; legs orange-flesh. Sexes similar. Juvenile undescribed. Differs from dull first-year individuals of superficially similar *Oporornis formosus* mainly in having longer supercilium, paler olive crown and yellowish lower ear-coverts. Voice. Song is loud and musical, in Brazil consisting of a fairly fast series of rolling notes ending with 3 clear notes, e.g. as "titi teetee teetee chew chew chew", in Colombia

and Venezuela reportedly similar but somewhat thinner and softer. Call "tschick"; occasional short chatter in alarm.
Habitat. Dry deciduous lowland forest and gallery forest, also overgrown clearings; generally below 1000 m, but has been seen in cloudforest at 1350 m in N Venezuela.
Food and Feeding. Feeds on insects and other arthropods. Forages on ground or low in undergrowth, hopping through leaf litter and flicking over leaves with its bill in search of prey. Does not join mixed-species foraging flocks, generally remaining alone or in pairs throughout year.
Breeding. Males in breeding condition and an incubating female found in late Oct in NE Colombia, and nest-building observed once in Sept in Brazil. Nest a domed structure with side entrance, made from grass, leaves and other vegetable fibres, placed on or very close to ground. Clutch 3 eggs (one nest in Colombia). No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally common. No population estimates available. In forest fragment of 50 ha in SE Brazil, mean territory size was 1·9 ha during breeding season, 2·2 ha in non-breeding season. Record in upper Cauca Valley (WC Colombia) probably represents a small remnant population.
Bibliography. Curson *et al.* (1994), Duca & Marini (2005), Fortabat *et al.* (1995), Hennessey *et al.* (2003), Hilty (2002, 2003), Hilty & Brown (1986), Marini & Cavalcanti (1993), Mees & Mees-Balchin (1990), Meyer de Schauensee (1982), Oren (1985), Piratelli *et al.* (2000), Ridgely & Tudor (1989), Sick (1993), Todd (1929b).

107. White-browed Warbler
Basileuterus leucoblepharus

French: Paruline à paupières blanches **Spanish**: Reinita Silbona
German: Olivflanken-Waldsänger
Other common names: White-rimmed Warbler

Taxonomy. *Sylvia leucoblephara* Vieillot, 1817, Paraguay.
Often placed together with *B. flaveolus*, *B. leucophrys*, *B. fulvicauda* and *B. rivularis* in a separate genus, *Phaeothlypis*; this species and *B. leucophrys* appear to bridge the gap between *B. flaveolus* and the "classic" *Phaeothlypis* superspecies (*fulvicauda* and *rivularis*). Two subspecies recognized.
Subspecies and Distribution.
B. l. leucoblepharus (Vieillot, 1817) – SE Brazil (S from São Paulo and S Minas Gerais), S Paraguay and NE Argentina.
B. l. lemurum Olson, 1975 – Uruguay.

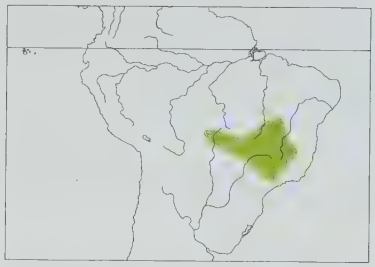


Descriptive notes. 14·5 cm; 14–21 g. Like most others in "*Phaeothlypis* group", constantly spreads and raises tail, lowering it slowly, and frequently moves it from side to side. Nominate race has grey head with blackish-grey lateral crownstripe and narrow eyestripe, and white supraloral stripe and prominent eye-crescents; upperparts olive-green; malar area and throat and underparts whitish, narrow greyish malar stripe, grey wash on side of breast, olive wash on upper flanks, light olivaceous-yellow undertail-coverts; iris dark; bill blackish; legs orange-flesh. Differs from *B. leucophrys* in lack of prominent white supercilium, less pronounced dark eyestripe, grey (not buff) ear-coverts, greener upperparts. Sexes similar. Juvenile undescribed. Race *lemurum* is noticeably darker than nominate, especially on underparts (which mid-grey with whitish median line), and undertail-coverts are grey with pale yellow feather fringes. Voice. Song a series of descending musical whistled notes, accelerating towards end; usual call a sharp penetrating "pseeyk".
Habitat. Dense forest, especially gallery forest, and well-developed second growth with dense understorey, to 1600 m. Often found near rivers or pools, but not so closely associated with water as are *B. leucophrys*, *B. fulvicauda* and *B. rivularis*.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates; main items recorded in NE Argentina were Cuculiondiae (weevils) and other Coleoptera. Forages by gleaning, on or near ground, frequently in dense undergrowth, but also in the open. Seldom joins mixed-species foraging flocks.
Breeding. Pair generally remains on territory throughout year. Few nests found, most a domed structure; recently, one found in Brazil was described as an open cup, and suggested that situation of this nest (on a bank and partially concealed by vegetation) may have prompted this variation in shape (this is the only non-domed nest of this genus so far discovered). Clutch 3–4 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common to common. No population estimates available.
Bibliography. Barnett & Pearman (2001), Boscolo *et al.* (2006), Chatellenaz (2008), Curson *et al.* (1994), Firme *et al.* (2009), de Mendonca-Lima *et al.* (2004), Meyer de Schauensee (1982), Olson (1975), Ridgely & Tudor (1989), Sick (1993), Todd (1929b).

108. White-striped Warbler
Basileuterus leucophrys

French: Paruline bridée **German**: Goldflanken-Waldsänger **Spanish**: Reinita Cejiblanca

Taxonomy. *Basileuterus leucophrys* Pelzeln, 1868, Rio Manso, Mato Grosso, Brazil.
Often placed together with *B. flaveolus*, *B. leucoblepharus*, *B. fulvicauda* and *B. rivularis* in a separate genus, *Phaeothlypis*; this species and *B. leucoblepharus* appear to bridge the gap between *B. flaveolus* and the "classic" *Phaeothlypis* superspecies (*fulvicauda* and *rivularis*). Monotypic.
Distribution. SC Brazil (S Mato Grosso, S Goiás, Brasília, extreme W Bahia, W Minas Gerais and extreme N São Paulo).
Descriptive notes. 14 cm; 15–22 g. Like most others in "*Phaeothlypis* group", constantly spreads and raises tail, lowering it slowly, and frequently moves it from side to side. Has centre of crown grey, bordered by long blackish lateral stripes, with long and broad white supercilium, blackish eyestripe, pale buff ear-coverts, grey nape and side of neck; upperparts brownish-olive; malar area, throat and underparts white, with grey side of breast, greyish-buff rear flanks and yellowish-buff undertail-coverts; iris dark; bill blackish; legs yellowish-flesh. Differs from *B. leucoblepharus* most notably in having more strongly patterned head and duller, less green, upperparts. Sexes similar. Juvenile

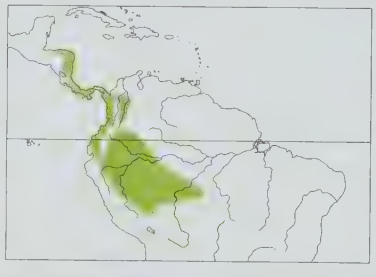


undescribed. Voice. Song is described as beautiful, loud and tinkling, with individual notes very pure and melodic; call is apparently undescribed.
Habitat. Riparian forest, usually with dense undergrowth, and almost always by water; to 1000 m.
Food and Feeding. Probably feeds mainly, if not entirely, on invertebrates. Forages on or near ground, while hopping and walking, generally in dense undergrowth. Seldom joins mixed-species foraging flocks.
Breeding. Apparently Sept–Jan. Pair generally remains on territory throughout year. Nest globular with side entrance (6·5 cm wide, 5·5 cm high), built of fine roots and twigs, with outer layer of leaves over bottom and sides, outer dimensions 14 cm in diameter and 8·5 cm high; placed on ground, on small hummock, sometimes close to water. Few recorded clutches 2–4 eggs. No other information available. Reported to be parasitized on occasion by Shiny Cowbird (*Molothrus bonariensis*).
Movements. Sedentary.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common. No population estimates available. Although not currently considered at risk, its riparian habitat is rapidly being cleared and the situation should be closely monitored.
Bibliography. Curson *et al.* (1994), Marini & Cavalcanti (1993, 1995), Marini *et al.* (1997), Meyer de Schauensee (1982), Naumberg (1930), Ridgely & Tudor (1989), Sick (1993), Todd (1929b).

109. Buff-rumped Warbler
Basileuterus fulvicauda

French: Paruline à croupion fauve **Spanish**: Reinita Culiparda
German: Schmätzerwaldsänger

Taxonomy. *Muscicapa fulvicauda* Spix, 1825, no locality = São Paulo de Olivença, River Solimões, Brazil.
Often placed together with *B. flaveolus*, *B. leucoblepharus*, *B. leucophrys* and *B. rivularis* in a separate genus, *Phaeothlypis*. Forms a superspecies with *B. rivularis*; sometimes considered conspecific, but songs differ and it seems likely that obvious buff rump and tail of present species (which is continuously signalled) would prevent interbreeding should the two ever come into contact. Six subspecies recognized.
Subspecies and Distribution.
B. f. leucopygius P. L. Sclater & Salvin, 1873 – NC Honduras S to Caribbean slope of W Panama.
B. f. veraguensis Sharpe, 1885 – Pacific slope from SW Costa Rica S to C Panama.
B. f. semicervinus P. L. Sclater, 1860 – E Panama and adjacent W Colombia S in W Andes foothills to NW Peru.
B. f. motacilla A. H. Miller, 1952 – upper Magdalena Valley, in Colombia.
B. f. fulvicauda (Spix, 1825) – W Amazonian Basin in SE Colombia, E Ecuador, NE Peru, W Brazil and N Bolivia.
B. f. significans J. T. Zimmer, 1949 – Amazonian Basin in SE Peru.



Descriptive notes. 13·5 cm; 14·9 g. Like most others in "*Phaeothlypis* group", constantly pumps tail up and down, and swings it from side to side. Nominate race has crown slate-grey (feathers with narrow blackish fringes in fresh plumage), nape and ear-coverts olive-grey, supercilium buff, eyestripe blackish, side of face pale olive-grey and buff, buffier on malar area; upperparts greyish-olive, contrasting pale tawny-buff lower rump and basal half of tail (prominent during tail-swinging action); distal half of tail dark olive-brown; throat and underparts whitish, washed buff on breast and flanks, with richer buff on undertail-coverts; iris dark; bill blackish; legs pale yellowish-flesh. Sexes similar. Juvenile has head, upperparts (including rump), throat and breast dark brown, olive mottling on breast, obscure dull olive wingbars on greater and median upperwing-coverts, tail pattern as adult, pale buff lower underparts, bill mostly pale flesh-coloured. Race *leucopygius* has browner crown and upperparts than nominate, also paler straw-buff rump and upper tail, distinct olive spotting across breast, and darker cheeks and legs; *veraguensis* is similar to previous, but pale areas on rump and tail slightly darker and more extensive (over basal two-thirds of tail), spotting on breast less distinct; *semicervinus* has more extensive pale colour on rump and tail, only distal quarter being dark, the buff richer than on nominate and underparts also more buff; *motacilla* has rump–tail pattern similar to last, but paler, more straw/yellow, also upperparts paler and greener, underparts whiter; *significans* has less pale on rump and tail than other races, only basal quarter of tail being pale buff, also is more greenish on upperparts than nominate (in these respects appears to approach race *bolivianus* of *B. rivularis*). Voice. Song a short warble which runs into a series of 8–9 loud ringing "chew" notes; female occasionally gives short warble in reply to male's song. Usual call an emphatic "tschick".
Habitat. Forest areas along rivers and streams and in swamps; closely associated with water at all times, mainly rivers and streams in foothills and forest swamps in lowlands. To 1500 m, but mainly below 1000 m, at least in South America.
Food and Feeding. Feeds mainly on insects and other arthropods. Forages by hopping (rarely walking) on ground or on fallen logs, gleaning along stream edges and damp areas of forest floor, and occasionally performing short flycatching sallies from ground; in rainy season often feeds by temporary puddles on wet forest tracks.
Breeding. Egg-laying in Apr–Aug in Costa Rica, and birds in breeding condition as early as Feb in Colombia; single-brooded. Pair remains on territory (which generally linear and following a watercourse) all year. Nest a bulky domed structure with side entrance, built by both sexes from various vegetable fibres, lined with finer material, placed on sloping bank by stream or path. Clutch 2 eggs; incubation period 16–17 days, occasionally 19 days; nestling period 13–14 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common to common throughout most of its range; less common in lowlands and foothills of E Ecuador. No population estimates available. Relies largely on intact forest.

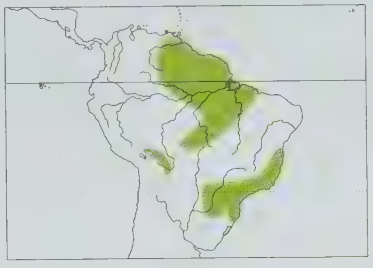
Bibliography. Clements & Shany (2001), Curson *et al.* (1994), Fjeldså & Krabbe (1990), Hennessey *et al.* (2003), Hilty & Brown (1986), Howell & Webb (1995), Lovette (2004), Meyer de Schauensee (1982), Ridgely & Greenfield (2001b), Ridgely & Gwynne (1989), Ridgely & Tudor (1989), Salaman *et al.* (2002), Sick (1993), Stiles & Skutch (1989), Todd (1929b).

110. **Riverbank Warbler**

Basileuterus rivularis

French: Paruline des rives **German**: Flusswaldsänger **Spanish**: Reinita Ribereña
Other common names: Neotropic/Neotropical/American River Warbler, Riverside Warbler

Taxonomy. *Muscicapa rivularis* Wied, 1821, Villa dos Ilhéos, Bahia, Brazil.
Often placed together with *B. flaveolus*, *B. leucoblepharus*, *B. leucophrys* and *B. fulvicauda* in a separate genus, *Phaeothlypis*. Forms a superspecies with *B. fulvicauda*; sometimes considered conspecific, but songs differ and it seems likely that the obvious buff rump and tail of the latter species would prevent interbreeding should the two ever come into contact. Three subspecies recognized.
Subspecies and Distribution.
B. r. mesoleucus P. L. Sclater, 1865 – E Venezuela, the Guianas and N Brazil.
B. r. bolivianus Sharpe, 1885 – E foothills of Andes in Bolivia.
B. r. rivularis (Wied, 1821) – SE Brazil, E Paraguay and extreme NE Argentina.
Descriptive notes. 13·5 cm; 11·5–16·5 g. Like most others in "*Phaeothlypis* group", constantly pumps tail up and down, and swings it from side to side. Nominate race has crown, nape and neck side slate-grey (crown feathers narrowly fringed darker in fresh plumage), crown bordered with narrow black stripes which separate it from whitish supercilium; eyestripe blackish, lower eye crescent buff, ear-coverts olive-brown, streaked buff; upperparts dark olive; throat and underparts whitish, buff wash on breast, flanks, belly and undertail-coverts; iris dark; bill blackish; legs pale flesh-coloured. Sexes similar. Juvenile has head, upperparts, throat and breast dark brown, olive mottling on breast, obscure dull olive wingbars on greater and median upperwing-coverts, lower underparts pale buff, bill mostly pale flesh-coloured. Race *bolivianus* lacks black lateral crownstripe, has shorter, buffier supercilium and whiter underparts; *mesoleucus* also lacks black lateral crownstripe, cinnamon tinged buff on supercilium, and on cheek and ear-coverts, more buff on underparts and paler, browner upperparts than other races. Voice. Song loud, consisting of 2 short notes followed by rapid, slightly ascending, crescendo; call an emphatic "tshick", very similar to that of *B. fulvicauda*.



Habitat. Swampy areas and along rivers and streams in lowland rainforest and forest edge; from sea-level to 1000 m, locally to 1400 m in foothills in Bolivia.
Food and Feeding. Feeds mainly on insects and other arthropods. Forages mostly on ground and on fallen logs, hopping along water's edge in search of prey, sometimes performing short flycatching sallies from ground.
Breeding. Heard to sing in Feb in Venezuela, and recently fledged young seen in Mar, Apr and Jul in Brazil. Pair probably remains on territory throughout year. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common throughout its range; described as fairly common in Venezuela. No population estimates available. Relies largely on intact forest.
Bibliography. Barnett & Pearman (2001), Curson *et al.* (1994), Hennessey *et al.* (2003), Hilty (2002, 2003), Lovette (2004), Meyer de Schauensee (1982), Ridgely & Tudor (1989), Sick (1993), Todd (1929b).



Genus *ZELEDONIA* Ridgway, 1889

111. Wrenthrush
Zeledonia coronata

French: Paruline de Zeledon **German**: Zeledonwaldsänger **Spanish**: Reinita de Zeledón
Other common names: Zeledonia

Taxonomy. *Zeledonia coronata* Ridgway, 1889, Laguna del Volcán de Póas, Costa Rica.
Formerly placed in its own family (Zeledoniidae) and thought most closely related to wrens (Troglodytidae) or thrushes (Turdidae); later transferred to present family, within which believed probably closest to *Basileuterus*. Recent research, however, indicates that this species appears not to form part of a monophyletic parulid family. Further research required. Monotypic.
Distribution. N Costa Rica S to WC Panama.



Descriptive notes. 12 cm; 21 g. Distinctive species, plump and short-tailed, somewhat resembling an antpitta (*Grallaricula*), with very dark overall appearance. Has orange-rufous central crownstripe bordered with black; nape and upperparts dark olive, side of head and underparts slate-grey; iris dark; bill blackish; legs brown. Sexes similar. Juvenile lacks crownstripes, has brownish underparts with sooty feather edges (giving scaled effect). VOICE. Song a variable but short series of piercing whistles, transcribed as "see-see-suu seep"; both sexes sing, often duetting. Commonest call a high, thin, drawn-out "psee" or "psss", rising slightly in pitch.
Habitat. Dense bamboo thickets in humid montane forest, also dense second growth and *páramo* vegetation; from 1500 m to tree-line, most frequently at c. 2500 m.
Food and Feeding. Feeds mainly on insects and other arthropods, especially spiders (Araneae). Forages mostly on ground in dense cover; also gleans low down in bamboo thickets.
Breeding. Egg-laying in Apr–Jun. Nest a hollow ball of tightly packed mosses with side entrance, hidden on ground, usually on steep mossy bank. Clutch 2 eggs; no information on incubation period; nestling period at least 17 days.
Movements. Sedentary; little or no altitudinal movement.
Status and Conservation. Not globally threatened. Restricted-range species: present in Costa Rica and Panama Highlands EBA. Locally common. No population estimates available. Largely reliant on bamboo clumps in primary forest, but its specialized high-altitude habitat seems not to be presently under threat.
Bibliography. Curson *et al.* (1994), Hunt (1971, 1983), Lovette & Bermingham (2002), Morse (1966a), Pycraft (1905), Ridgely & Tudor (1989), Sibley (1968), Stattersfield *et al.* (1998), Stiles & Skutch (1989).

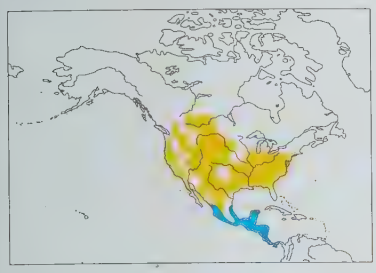
Genus *ICTERIA* Vieillot, 1808

112. Yellow-breasted Chat
Icteria virens

French: Paruline polyglotte **German**: Gelbbrust-Waldsänger **Spanish**: Reinita Grande

Taxonomy. *Turdus virens* Linnaeus, 1758, America = South Carolina, USA.
Taxonomic affiliations of this species have for long been debated, but most authorities now accept its placement in present family, on basis largely of molecular studies. Relationships within family uncertain; seems to share some morphological features with *Granatellus* and also with *Geothlypis poliocephala* (has been suggested that latter may link present genus with the more typical *Geothlypis* species). Recent research indicates, however, that it appears not to form part of a monophyletic parulid family, and recent studies of its song and vocal repertoire support this finding. Further research required. Proposed races *longicauda* (NW of range) and *tropicalis* (NW Mexico) are treated as synonyms of *auricollis*, and *danotia* (S Texas and N Mexico) is synonymized with nominate.

Two subspecies currently recognized.
Subspecies and Distribution.
I. v. auricollis (W. Deppe, 1830) – breeds locally from SW Canada (S British Columbia and Saskatchewan) S through W USA to C Mexico; winters mainly in Mexico and Guatemala.
I. v. virens (Linnaeus, 1758) – breeds extreme SE Canada (extreme SE Ontario) and locally E USA (from North Dakota and S Great Lakes S to Texas and N Florida) and NE Mexico; winters mainly E Mexico S to W Panama.



Descriptive notes. 19 cm; 20·2–33·8 g. Large warbler with relatively stout bill and long tail. Male nominate race breeding has crown, nape and upperparts dark olive-green with faint grey wash; lores black, short white supercilium, white eye-crescents and white moustachial stripe, ear-coverts greyish; throat and breast bright yellow, contrasting white lower underparts; iris dark; bill black; legs greyish-black. Non-breeding plumage very similar but very slightly duller, and bill becomes dark brown. Female is similar to male but slightly duller, in particular on head, with greyish lores, and browner bill with flesh-coloured base of lower mandible. Juvenile has head and upperparts greyish olive-brown, greyer on ear-coverts, lores dusky, throat and underparts ashy grey, washed olive on throat and side of breast; first-year resembles adult, but on average marginally duller. Race *auricollis* has greyer head and upperparts than nominate (grey tone of upperparts increasing clinally from N to SW), also brighter yellow throat and breast, broader white moustachial stripe, longer tail. Voice. Song a highly varied and loud jumble of cackles, rattles, mews, whistles and squeals, very different from other parulid songs, often given in brief song flight. Calls include harsh grating "chack", a mew reminiscent of call of Grey Catbird (*Dumetella carolinensis*) and a sharp "kuk-luk-kuk"; many calls similar to notes used in song.
Habitat. In breeding season dense thickets and scrub, typically on edge of deciduous woodland, preferring isolated taller trees for songposts; in arid parts of W breeding range mainly in riparian thickets and scrub, and in SW may also use stands of salt cedar (*Tamarix*) where mixed with honey mesquite (*Prosopis glandulosa*) and understorey of honeyweed (*Leonurus sibiricus*); in prairies, utilizes isolated dense thickets. Breeds from lowlands to c. 1200 m. Similar scrub and early-successional habitats used on migration and in winter, when occur also in pine (*Pinus*) savanna in Belize, riparian forest, and mangroves in W Mexico.
Food and Feeding. Feeds on insects and other invertebrates; also berries, wild grapes and other fruits, especially in autumn. Forages mainly by gleaning low in dense understorey; also on ground at times. Will hold food items with its feet while eating them.
Breeding. Season May to early Aug, egg-laying Apr (in S of range) to Jul; occasionally double-brooded in S. Nest a coarse cup of weed stalks, straw, leaves and bark shreds, lined with fine grasses, placed 0·3–1·7 m up in dense shrub or small tree. Clutch 3–5 eggs, occasionally 6; incubation period 10·5–12 days; nestling period 7–10 days. Nests frequently parasitized by Brown-headed Cowbird (*Molothrus ater*), occasionally by Bronzed Cowbird (*Molothrus aeneus*), and one record of parasitism by Black-billed Cuckoo (*Coccyzus erythrophthalmus*); rates of recorded parasitism by Brown-headed Cowbird vary from 5% (of 104 nests) in Maryland to 91% (of eleven nests) in Michigan.
Movements. Short-distance to medium-distance migrant; some overwinter in S USA and N Mexico, within breeding range, but not known whether these are residents or are migrants from farther N. More N breeders leave breeding grounds mainly in late Aug and Sept, moving S on broad front, most of those from E part of range crossing Gulf of Mexico; arrival on wintering grounds generally from late Sept. Spring migration begins in Mar and follows much the same route in reverse, with arrival on breeding grounds from early Apr in S, early May in N. Casual in S & SE North America in winter, and in NE North America, Caribbean and Bermuda on migration and in winter. Vagrant in Greenland.
Status and Conservation. Not globally threatened. Fairly common over most of range. No evidence of long-term changes in population. Estimated breeding densities (per km² in suitable habitat) include 47 males in West Virginia, 35–37 in Delaware, 20–90 in various habitats in Maryland, and 60 in E Tennessee/W North Carolina; in a clear-felled area in Tennessee, densities were 20 males/km² in the year after cutting, reaching peak of 78 after seven years, then declining to 44 after eight years and 23 after nine years. Significant declines recorded between 1960s and 1980s in E and mid-W of breeding range; reasons for local decline unclear, but probably include development on scrubby areas (used for breeding) and succession of scrubby areas to woodland, and may be due in part to natural fluctuations of a species which exploits short-lived, early-successional habitats. Brood parasitism by Brown-headed Cowbirds may have played a part in some areas.
Bibliography. Behrstock & Eubanks (1997), Burhans & Freeman (1997), Burhans & Thompson (1999), Dennis (1958, 1967), Dussourd & Ritchison (2003), Eckerle & Thompson (2001), Eisenmann (1962a), Ficken & Ficken (1962b), Ford (1992), Lovette & Bermingham (2002), Nolan (1965), Petrides (1938), Ricketts & Ritchison (2000), Ritchison (1988), Schadd & Ritchison (1998), Sibley & Ahlquist (1982a), Thomas (1995), Thompson (1977), Thompson & Nolan (1973).

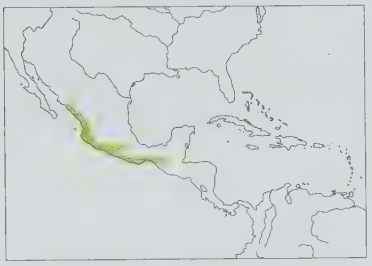
Genus *GRANATELLUS* Bonaparte, 1850

113. **Red-breasted Chat**

Granatellus venustus

French: Granatelle multicolore **German**: Weißkehl-Waldsänger **Spanish**: Reinita Mejicana
Other common names: Red-breasted Warbler; Tres Marias Chat (*francescae*)

Taxonomy. *Granatellus venustus* Bonaparte, 1850, Comitán, Chiapas, Mexico.
Placement of genus in present family has been questioned; in particular, recent research indicates that it appears not to form part of a monophyletic parulid family, and a more recent study suggests that it may belong with the cardinals (Cardinalidae). This species forms a superspecies with *G. sallaei* and *G. pelzelni*. Race *francescae* sometimes treated as a separate species on grounds of its geographical isolation and plumage differences. Additional proposed race *melanotis* (described from San Blas, in Nayarit) regarded as a synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
G. v. venustus Bonaparte, 1850 – W Mexico from Sinaloa S to Chiapas.
G. v. francescae S. F. Baird, 1865 – Tres Marias Is, off Nayarit (W Mexico).



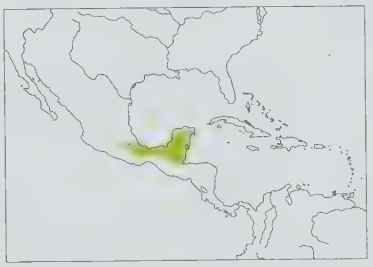
Descriptive notes. 15 cm; 9·6–11·4 g. Long tail frequently cocked and fanned. Male nominate race has black head and breastband isolating white throat, with broad white supercilium starting behind eye, blue-grey crown patch; upperparts and upperwing blue-grey, tail blackish-grey, extensive white in outer tail; lower breast and undertail-coverts rose-red, connected by narrow red line along centre of belly which isolates broad white flank patch; iris dark; bill dark grey; legs blackish-brown. Female has upperparts, wing and tail like those of male but slightly duller, and with slightly less white in tail; crown blue-grey, concolorous with upperparts and merging into buff forehead, supercilium buff, ear-coverts grey with buff mottling; white below, with buff malar area, breast, flanks and vent, pinkish undertail-coverts, breast often tinged pink. Full juvenile plumage evidently undescribed; moulting juvenile male appears intermediate between male and female, has browner, more worn wings than either. Race *francescae* lacks black breastband, has more extensive blue-grey on crown and side of neck, is also longer-tailed, more white in tail. Voice. Song a variable series of 4–5 melancholy whistled notes, delivered quite slowly; usual call a smacking "tchk" or "plik".
Habitat. Dense scrub, scrubby deciduous woodland, chaparral, semi-arid thorn-forest and second growth with dense understorey in dry areas, mainly in lower foothills. Less common in semi-deciduous woodland than in deciduous.
Food and Feeding. Diet little known; presumably mainly insects and other arthropods. Forages mainly by gleaning low in undergrowth, generally in dense cover.
Breeding. Season Jun–Sept, egg-laying Jun–Jul. Pair appears to remain on breeding territory throughout year. Nest an open cup (outer diameter 7 cm, inner diameter 5 cm, depth 5 cm), made of stems, leaf petioles and vines, etc.; placed low down (below 1 m) in small sapling. Clutch 2–4 eggs; incubation by female alone, period 14 days; estimated nestling period 8–10 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally fairly common. No population estimates.
Bibliography. Anon. (2009g), Curson *et al.* (1994), Grant (1964b), Grayson (1949), Howell & Webb (1995), Klicka *et al.* (2007), Lovette & Bermingham (2002), Rivera *et al.* (2004), van Rossem (1940), Schaldach (1973).

114. **Grey-throated Chat**

Granatellus sallaei

French: Granatelle à plastron **German**: Weißbrauen-Waldsänger **Spanish**: Reinita Yucateca
Other common names: Grey-throated Warbler(!)

Taxonomy. *Setophaga sallaei* Bonaparte, 1856, Córdoba, Veracruz, Mexico.
Placement of genus in present family has been questioned; in particular, recent research indicates that it appears not to form part of a monophyletic parulid family, and a more recent study suggests that it may belong with the cardinals (Cardinalidae). This species forms a superspecies with *G. venustus* and *G. pelzelni*. Proposed race *griscomi* (described from Cobán, in C Guatemala), is synonymized with *boucardi*. Two subspecies recognized.
Subspecies and Distribution.
G. s. sallaei (Bonaparte, 1856) – Atlantic slope of S Mexico (S Veracruz, Tabasco, E Oaxaca and N Chiapas).
G. s. boucardi Ridgway, 1885 – Yucatán Peninsula S to C Guatemala and Belize.



Descriptive notes. 13 cm; 8·8–11 g. Male nominate race has grey head to throat and upper breast and upperparts (including wing); white supercilium behind eye, bordered above by narrow black line; tail blackish-grey, white outer webs of outer two feathers; lower breast, upper belly and undertail-coverts rose-red, flanks grey, lower belly white; iris dark; bill dark grey; legs greyish-flesh. Female has grey crown, nape and upperparts (duller than on male), blackish-grey tail, buff supercilium, face, breast, flanks, vent and undertail-coverts, and white throat and belly. Full juvenile plumage apparently undescribed; moulting juvenile male appears intermediate between male and female, and has browner, more worn wings than either. Race *boucardi* male is slightly paler grey above than nominate, female is more brownish-grey above and paler, more creamy buff, on face and underparts. Voice. Song a variable series of 4–5 whistled notes, similar to that of *G. venustus* but less melancholy and faster; calls include loud, fairly harsh "chwit", also softer "chwit" as contact between mated partners.
Habitat. Lowland dry and semi-humid forests, forest edge and adjacent dense scrub; avoids humid forest, but is much more of a forest-dweller than is *G. venustus* and occurs in thickets in evergreen forest.
Food and Feeding. Feeds on insects and other arthropods. Forages mainly by gleaning low in undergrowth and on forest floor. Frequently follows swarms of army ants (Ecitoninae) to feed on insects disturbed by them.
Breeding. Pair remains on territory throughout year. Nest cup-shaped, placed low in understorey; clutch 2 eggs (one nest with eggs found). No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common. Perhaps more numerous in E of range; rather local in W. No population estimates.
Bibliography. Anon. (2009g), Curson *et al.* (1994), Howell & Webb (1995), Klicka *et al.* (2007), Lovette & Bermingham (2002), Salgado-Ortiz *et al.* (2001).

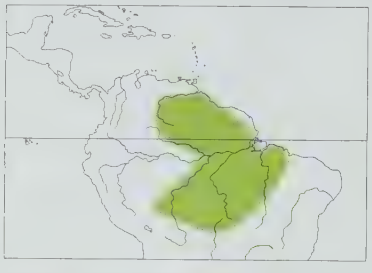
On following page: 115. Rose-breasted Chat (*Granatellus pelzelni*); 116. White-winged Warbler (*Xenoligea montana*).

115. **Rose-breasted Chat**

Granatellus pelzelni

French: Granatelle de Pelzeln **German**: Rosenbauch-Waldsänger **Spanish**: Reinita Pechirroja
Other common names: Rose-breasted Warbler

Taxonomy. *Granatellus pelzelni* P. L. Sclater, 1865, Destaramento de Ribierão, River Madeira, Brazil.
Placement of genus in present family has been questioned; in particular, recent research indicates that it appears not to form part of a monophyletic parulid family, and a more recent study suggests that it may belong with the cardinals (Cardinalidae). This species forms a superspecies with *G. venustus* and *G. sallaei*. Two subspecies recognized.
Subspecies and Distribution.
G. p. pelzelni P. L. Sclater, 1865 – S & SE Venezuela, Guyana, Suriname, C & E Amazonian Brazil and extreme N Bolivia; probably also French Guiana and extreme E Colombia.
G. p. paraensis Rothschild, 1906 – extreme E Amazonian Brazil S of R Amazon (E of R Tocantins).



Descriptive notes. 12–12·5 cm; 10–12·5 g. Long tail frequently cocked and fanned. Male nominate race has black head, white supercilium behind eye; upperparts and upperwing blue-grey, tail black; throat white with very narrow (often broken) black lower border; underparts rose-red, contrasting broad white flanks; iris dark; bill blackish, grey base of lower mandible; legs dark grey. Female has blue-grey crown, nape and upperparts, including wings, black tail (as in male), rich buff forehead, side of head, breast, flanks and vent, white throat and belly, and rose-pink undertail-coverts. Full juvenile apparently undescribed; moulting juvenile male resembled dull adult, with black on head restricted to forehead, buffy-white supercilium, and buff-tinged underparts with less red than on adult. Race *paraensis* male has more extensive red on underparts, lacking conspicuous white flanks, and crown mostly blue-grey, with black restricted to forecrown. Voice. Song a series of 5–6 clear, sweet notes on one pitch, transcribed as "sweet, sweet, tuwee-tuwee-tuwee-tuwee"; calls include sharp, dry "jrrt", often repeated regularly, and nasal "tank".
Habitat. Tropical rainforest and forest edge, drier deciduous forest and well-developed second growth, often by rivers or lagoons in forest interior; mostly at very low altitudes, but to 850 m in S Venezuela.
Food and Feeding. Probably feeds mostly, if not entirely, on insects and other invertebrates. Forages mainly at middle to high levels, in canopy and in dense viny tangles, but also low in understorey at times; actively gleans from foliage, and makes short flycatching sallies after insects. Outside breeding season single individuals or pairs may join mixed-species foraging flocks.
Breeding. Moulting juvenile recorded in early May. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally uncommon throughout much of range; locally fairly common in Venezuela. No population estimates available.
Bibliography. Anon. (2009g), Curson *et al.* (1994), Hilty (2002, 2003), Klicka *et al.* (2007), Lovette & Bermingham (2002), Meyer de Schauensee (1982), Ridgely & Tudor (1989), Sick (1993).

Genus *XENOLIGEA* Bond, 1967

116. **White-winged Warbler**

Xenoligea montana

French: Petit Quatre-yeux **German**: Spiegelwaldsänger **Spanish**: Reinita Montana
Other common names: Hispaniolan Highland-tanager, White-winged Ground Warbler, Chapman's Warbler

Taxonomy. *Microligea montana* Chapman, 1917, Mount Tina, Azua, Dominican Republic.
Affinities uncertain. Differs morphologically from other members of family, and often thought to be better placed with the tanagers (Thraupidae); in particular, recent research indicates that it appears not to form part of a monophyletic parulid family. Species formerly included in genus *Microligea*, but now thought not to be particularly closely related to latter, despite some superficial plumage similarities; the two probably reached Hispaniola independently, rather than evolving from a common ancestor on the island. Monotypic.
Distribution. Mountains of Hispaniola.



Descriptive notes. 14·5 cm. Distinctive. Head and upper mantle are grey, with blackish lores, narrow white eye-crescents and whitish supraloral stripe; remainder of upperparts bright green, alula, primary coverts and outer primaries blackish with narrow dark grey (rather than broad green) edges, and with broad white edges on four of outer primaries (long white stripe visible on closed wing); tail grey, white spots at tips of outer feathers; throat and underparts whitish, pale grey wash on side of breast and flanks; iris dark; bill quite stout, bluish-grey with blackish culmen; legs bluish-grey to dark grey. Sexes similar. Juvenile has brownish-grey head, greyish upperparts tinged olive-brown, flight-feathers darker grey, secondaries edged greenish orange-brown, greater coverts mostly of this colour, and underparts off-white with some brown tones, bill greyish-flesh, legs pale greyish. Voice. Song a short series of high-pitched squeaky notes, sometimes accelerating at end; calls include low chattering and thin "tseep".
Habitat. Undisturbed humid, montane broadleaf forest with dense understorey, forest edge, clearings and adjacent dense scrub; sometimes in pine (*Pinus*) forests with dense understorey, and can apparently survive in deforested areas provided that a dense scrub layer remains. At 1200–1800 m, mostly above 1300 m.
Food and Feeding. Feeds on insects and other arthropods; also eats more seeds than do most members of this family, seeds of Jamaican nettletree (*Trema micrantha*) being particularly important in diet. Forages mainly at middle levels, in top of understorey and shrub layer. Often occurs in groups, usually of 4–6 individuals, but one record of a flock of 30; these usually with roving mixed-species flocks, especially those containing *Microligea palustris* and Flat-billed Vireos (*Vireo nanus*). In Haiti (where numbers critically low), most often found singly, associating with foraging flocks.
Breeding. Largely unknown. One nest found, in Jun 2004, and moulting juvenile seen in late Jun; thought to breed in Apr–Jun, possibly mainly in May. Single known nest was an open cup of leaves, herb stems, moss and lichens, lined with hair-like plant fibres and some herb stems, placed c. 2·5 m above ground in dense vine tangle in broadleaf forest; contained one egg and one nestling.
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Hispaniola EBA. Locally fairly common to rare. Estimated global population c. 3300 adults in 2004. In Haiti, where once fairly common in suitable habitat, now considered to be the most endangered bird species in the country; records concentrated in two areas, Massif de la Hotte, in SW, and Massif de la Selle, near Dominican Republic border, but may already be extirpated on Massif de la Selle (last recorded in 1975); in Massif de la Hotte, single individuals in 1982 and 1984 thought to have been the last until recent observations at Pic Macaya National Park, where the species appears to be fairly common in wet karst limestone forest. Haiti is severely overpopulated, and apparently little is done to enforce the nominal protection measures for tiny areas of surviving forest. Situation less serious in Dominican Republic, where this species occurs in up to four protected forest areas and may still be locally common; nevertheless, it has declined notably, mainly as a result of habitat destruction. Another reason for its decline throughout Hispaniola may be nest predation by small Indian mongooses (*Herpestes auropunctatus*), introduced on the island in 1934; this is a very difficult problem to address, but proper protection of remaining habitat and, if possible, an increase in area of protected forest, would help.
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Baird, S.F. (1860). In: Baird, Cassin & Lawrence, *Birds North Amer., Atlas*: plate 79, fig. 1 [*Vermivora virginiae*].

Baird, S.F. (1864). *Rev. Amer. Birds Mus. Smithsonian Inst.* **1(11)**: 169 [*Parula pitiayumi inornata*].

Baird, S.F. (1865). *Rev. Amer. Birds Mus. Smithsonian Inst.* **1(13)**: 194 [*Dendroica petechia gundlachi*]; **1(14)**: 210 [*Dendroica graciae*], 212 [*Dendroica adelaidae*], 219 [*Geothlypis trichas melanops*], 220 [*Geothlypis poliocephala*]; **1(15)**: 231 [*Granatellus venustus francescae*], 237 [*Ergaticus, Myioborus*]; **1(16)**: 247 [*Basileuterus melanogenys*], 252, footnote [*Basileuterus flaveolus*], 254 [*Myioborus miniatus aurantiacus*], 255 [*Myioborus torquatus*].

Baird, S.F. (1866). *Rev. Amer. Birds Mus. Smithsonian Inst.* **1(22)**: 352 [*Vireo carmioli, Vireo latimeri*]; **1(25)**: 391 [*Cyclarhis gujanensis cearensis*], 396 [*Vireolanius eximius*].

Baird, S.F. (1869). *Trans. Chicago Acad. Sci.* **1**: 316 [*Pyrrhula pyrrhula cassinii*], 318, plate 28, fig. 1 [*Leucosticte tephrocotis littoralis*].

Baird, S.F. (1871). *Ann. Lyc. Nat. Hist.* **10**: 20 [*Vireo magister*].

Baird, S.F. (1873). *Amer. Naturalist* **7**: 606 [*Dendroica dominica albilora*].

Baker, N.E. & Baker, E.M. (1990). *Bull. Brit. Orn. Club* **110(1)**: 52 [*Ploceus burnieri*].

Bangs (1898). *Proc. Biol. Soc. Washington* **12**: 142 [*Cyclarhis gujanensis cantica*].

Bangs (1900). *Auk* **17**: 292 [*Dendroica pinus achrustera*].

Bangs (1908). *Proc. Biol. Soc. Washington* **21**: 160 [*Basileuterus tristriatus daedalus*].

Bangs (1913). *Bull. Mus. Comp. Zool. Harvard* **54**: 472 [*Pinicola enucleator pacata*].

Bangs (1918). *Proc. New England Zool. Club* **6**: 94 [*Dendroica virens waynei*].

Bangs (1919). *Bull. Mus. Comp. Zool. Harvard* **62**: 494 [*Dendroica vitellina nelsoni*].

Bangs & Bradlee (1901). *Auk* **18**: 252 [*Vireo griseus bermudianus*].

Bannerman (1913). *Bull. Brit. Orn. Club* **33(2)**: 39 [*Carduelis cannabina harterti*].

Bannerman (1921). *Bull. Brit. Orn. Club* **41(8)**: 126 [*Nigrita canicapillus angolensis*].

Bannerman (1923). *Bull. Brit. Orn. Club* **43(10)**: 165 [*Ploceus baglafecht neumanni*]; **44(1)**: 3 [*Nesocharis shelleyi bansoensis*]; **44(2)**: 27 [*Serinus gularis montium*].

Batchelder (1918). *Proc. New England Zool. Club* **6**: 81 [*Seiurus aurocapilla furvior*], 82 [*Dendroica petechia amnicola*].

Bates (1930). *Bull. Brit. Orn. Club* **51(3)**: 54 [*Estrilda astrild kempi*].

Bates (1932). *Bull. Brit. Orn. Club* **53(1)**: 7 [*Lagonosticta virata*].

Behle & Aldrich (1947). *Proc. Biol. Soc. Washington* **60**: 69 [*Geothlypis trichas campicola*].

Benson (1938). *Bull. Brit. Orn. Club* **58(8)**: 112 [*Ploceus baglafecht nyikae*].

Benson (1955). *Bull. Brit. Orn. Club* **75(8)**: 106 [*Ortygospiza atricollis smithersi*].

Berger (1908). *J. Orn.* **56**: 487 [*Euplectes macroura conradsi*].

Berlepsch (1879). *Orn. Centralbl.* **4**: 63 [*Basileuterus culicivorus cabanisi*].

Berlepsch (1888). *Auk* **5**: 450 [*Basileuterus culicivorus godmani*].

Berlepsch (1901). *J. Orn.* **49**: 82 [*Vireolanius leucotis bolivianus*].

Berlepsch (1907). *Ornis* **14**: 347 [*Basileuterus chrysogaster chlorophrys*].

Berlepsch (1912). *Orn. Monatsber.* **20**: 18 [*Vireolanius leucotis simplex*].

Berlepsch & Hartert, E.J.O. (1902). *Novit. Zool.* **9**: 11 [*Hylophilus thoracicus griseiventris*].

Berlepsch & Stolzmann (1894). *Ibis* **Ser. 6, no. 6**: 387 [*Carduelis olivacea*].

Berlepsch & Stolzmann (1896). *Proc. Zool. Soc. London* **1896(2)**: 352 [*Carduelis magellanica peruana*].

Berlepsch & Stolzmann (1906). *Ornis* **13**: 74 [*Basileuterus signatus*].

Berlepsch & Taczanowski (1884). *Proc. Zool. Soc. London* **1883(4)**: 541 [*Vireo olivaceus griseobarbatus*], 542 [*Hylophilus decurtatus minor*], 551, plate 50 [*Carduelis siemiradzkii*].

Berlepsch & Taczanowski (1885). *Proc. Zool. Soc. London* **1884(3)**: 286 [*Parula pitiayumi pacifica*].

Berlioz (1929). *Bull. Mus. Natl. Hist. Nat. Paris* **Ser. 2, no. 1**: 131 [*Carpodacus pulcherrimus argyrophrys*].

Bianchi (1907). *Aves Exp. Kozlowi, Trudy Eksp. Russk. Geogr. Obsht.* **5**: 19 [*Kozlowia*].

Bianchi (1908). *Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersbourg* **13(1/2)**: 45 [*Leucosticte brandti pallidior*].

Biddulph (1882). *Ibis* **Ser. 4, no. 6**: 283, plate 9 [*Carpodacus thura blythi*].

Blanford (1869). *Ann. Mag. Nat. Hist.* **Ser. 4, no. 4**: 330 [*Serinus flavivertex*].

Blanford (1872). *Proc. Zool. Soc. London* **1871(3)**: 694, plate 74 [*Carpodacus rubescens*].

Bloxam (1827). *Voy. H.M.S. Blonde (Byron)* (1826), App. **3**: 249 [*Chlorodrepanis flava*].

Blyth (1836). In: White, *Nat. Hist. Selborne*: 44, footnote [*Amandava*].

Blyth (1842). *J. Asiatic Soc. Bengal* **11**: 461 [*Carpodacus erythrinus roseatus*].

Blyth (1845). *J. Asiatic Soc. Bengal* **13** (1844): 950 [*Haematospiza*], 952 [*Loxia curvirostra himalayensis*], 953 [*Pyrrhospiza, Pyrrhospiza punicea*].

Blyth (1846). *J. Asiatic Soc. Bengal* **15**: 286 [*Lonchura leucogastra*].

Blyth (1847). *J. Asiatic Soc. Bengal* **16**: 476 [*Bucanetes githagineus crassirostris*].

Blyth (1849). *J. Asiatic Soc. Bengal* **18**: 810 [*Carpodacus rhodochlamys grandis*].

Blyth (1852). *Cat. Birds Mus. Asiatic. Soc.*: 337 [*Lonchura atricapilla sinensis*].

Blyth (1855). *J. Asiatic Soc. Bengal* **24**: 179 [*Mycerobas affinis*].

Blyth (1862). *Ibis* **Ser. 1, no. 4**: 389 [*Pyrrhula erythaca*].

Bocage (1876). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 5**: 247 [*Ploceus albinucha*].

Bocage (1878). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 6**: 258 [*Notiospiza angolensis*], 259 [*Euplectes hartlaubi*].

Bocage (1880). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 7**: 244 [*Ploceus temporalis*].

Bocage (1888). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 12**: 148 [*Serinus rufobrunneus thomensis*], 229 [= 299] [*Neospiza concolor*].

Boddaert (1783). *Table Planches Enlum.*: 39 [*Euplectes ardens, Euplectes progne*], 41 [*Wilsonia citrina*], 44 [*Protonotaria citrea*], 45 [*Vireo griseus*].

Boissonneau (1840). *Rev. Zool.* **Ser. 1, no. 3**: 70 [*Myioborus ornatus*].

Bonaparte (1838). *Geograph. Comp. List Birds Europe North Amer.*: 20 [*Parula*], 23 [*Wilsonia*].

Bonaparte (1838). *Proc. Zool. Soc. London* **1837(5)**, no. 59: 118 [*Hylophilus decurtatus*].

Bonaparte (1841). *Rev. Zool.* **Ser. 1, no. 4**: 146 [*Fringilla coelebs spodiogenys*].

Bonaparte (1845). *Atti Soc. Ital. Sci. Nat. Milano* **1844**: 405 [*Basileuterus luteoviridis*].

Bonaparte (1850). *Compt. Rend. Acad. Sci. Paris* **31**: 424 [*Hesperiphona*].

Bonaparte (1850). *Consp. Gen. Avium* **1**: 310 [*Parula superciliosa mexicana*], 312 [*Cardellina, Granatellus, Granatellus venustus*], 313 [*Basileuterus hypoleucus*], 314 [*Euthlypis lachrymosa*], 330 [*Vireolanius, Vireolanius melitophrys*], 439 [*Ploceus princeps*], 444 [*Pseudonigrita arnaudi*], 446 [*Foudia eminentissima*], 451 [*Amblyospiza albifrons capitalba*], 461 [*Coccopygia quartinia*], 507 [*Callacanthis*], 511 [*Serinus gularis humilis*], 514 [*Carduelis chloris chlorotica*], 515 [*Carduelis pinus macroptera*], 517 [*Carduelis spinescens*], 519 [*Alario*], 523 [*Serinus syriacus*], 537 [*Leucosticte brandti*].

Bonaparte (1854). *Compt. Rend. Acad. Sci. Paris* **38**: 383 [*Basileuterus rufifrons delattrii*].

Bonaparte (1855). *Compt. Rend. Acad. Sci. Paris* **41**: 658 [*Carduelis flavirostris brevirostris*].

Bonaparte (1856). *Compt. Rend. Acad. Sci. Paris* **42**: 957 [*Granatellus sallaei*].

Bonaparte & Schlegel (1850). *Monogr. Loxiens*: 21, plate 23 [*Carpodacus thura*].

Bond (1927). *Auk* **44**: 571 [*Dendroica petechia babad*].

Bond (1936). *Auk* **53**: 458 [*Vireo nelsoni*].

Bond (1953). *Notulae Naturae* **255**: 9 [*Hylophilus hypoxanthus ictericus*].

Bond (1967). *Check-list Birds West Indies, Suppl.* **12**: 20 [*Xenoligea*].

Bond & Meyer de Schauensee (1942). *Notulae Naturae* **96**: 1 [*Vireo caribaeus*]; **105**: 2 [*Cyclarhis gujanensis tarijae*], 3 [*Cyclarhis gujanensis pax*].

Borkhausen (1793). *Rheinisches Magazin* **1**: 139 [*Loxia pytyopsittacus*].

Brandt, H.W. (1938). *Auk* **55**: 269 [*Vireo huttoni carolinae*].

Brandt, J.F. (1841). *Bull. Acad. Imp. Sci. St. Pétersb.* **9(1)**: col. 11 [*Mycerobas carnipes speculigerus*].

Brandt, J.F. (1842). *Bull. Acad. Imp. Sci. St. Pétersb.* **10(14–16)**: col. 252 [*Leucosticte arctoa brunneonucha, Leucosticte tephrocotis griseonucha*].

Brandt, J.F. (1843). *Bull. Acad. Imp. Sci. St. Pétersb. (Cl. Phys.-Math.)* **1**: col. 363 [*Carpodacus rhodochlamys*].

Brehm, C.L. (1827). *Isis (Oken)* **20**: col. 714 [*Loxia leucoptera bifasciata*].

Brehm, C.L. (1845). *Isis (Oken)* **38**: col. 348 [*Carduelis cannabina bella*].

Brehm, C.L. (1846). *Allgem. Deutsche Naturhist. Zeitung* **1(6)**: 532, note [*Loxia curvirostra minor*].

Brewster (1882). *Bull. Nuttall Orn. Club* **7**: 142 [*Vireo huttoni stephensi*].

Brewster (1883). In: Allen & Brewster, *Bull. Nuttall Orn. Club* **8**: 159 [*Geothlypis trichas occidentalis*].

Brewster (1886). *Auk* **3**: 111 [*Vireo solitarius alticola*].

Brewster (1887). *Auk* **4**: 148 [*Vireo griseus maynardi*].

Brewster (1888). *Auk* **5**: 137 [*Dendroica petechia sonorana*].

Brewster (1889). *Auk* **6**: 93 [*Parula pitiayumi pulchra*], 94 [*Dendroica coronata nigrifrons*].

Brewster (1891). *Auk* **8**: 147 [*Vireo cassinii lucasanus*].

Brisson (1760). *Ornithologia Syn. Meth. Sist. Avium (quarto)* **1**: 36 [*Carduelis, Coccothraustes, Pyrrhula*].

Brooks, A.C. (1922). *Condor* **24**: 86 [*Pinicola enucleator carlottae*].

Browning (1988). *Bull. Brit. Orn. Club* **108(4)**: 177 [*Carpodacus roseus portenkoi*].

Browning (1994). *Proc. Biol. Soc. Washington* **107(1)**: 29 [*Dendroica petechia banksi*], 31 [*Dendroica petechia parkesi*], 39 [*Dendroica petechia chlora*], 45 [*Dendroica petechia phillipsi*].

Bryan (1917). *Auk* **34**: 71 [*Telespiza ultima*].

Bryant, H. (1859). *Proc. Boston Soc. Nat. Hist.* **7**: 112 [*Vireo crassirostris*].

Bryant, H. (1867). *Proc. Boston Soc. Nat. Hist.* **11** (1866): 67 [*Geothlypis rostrata*], 93 [*Carduelis dominicensis*].

Buden (1985). *Proc. Biol. Soc. Washington* **98(3)**: 595 [*Vireo crassirostris stalagmium*].

Burleigh (1934). *Proc. Biol. Soc. Washington* **47(1)**: 21 [*Geothlypis trichas typhicola*].

du Bus de Gisignies (1847). *Bull. Acad. Roy. Sci. Bruxelles* **Ser. 1, no. 14**: 104 [*Peucedramus taeniatus*], 106 [*Carduelis notata*].

du Bus de Gisignies (1855). *Bull. Acad. Roy. Sci. Bruxelles* **Ser. 1, no. 22**: 151 [*Serinus gularis canicapilla*], 152 [*Carduelis xanthogastra*].

Büttikofer (1888). *Notes Mus. Leyden* **10**: 238, plate 9 [*Plocepasser rufoscapulatus*].

Buturlin (1906). *Ibis* **Ser. 8, no. 6**: 424 [*Carduelis carduelis volgensis*].

Buturlin (1908). *Nascha Okhota* **1908(9)**: 7 [*Coccothraustes coccothraustes nigricans*].

Buturlin (1915). *Mess. Orn.* **6**: 128 [*Uragus sibiricus ussuriensis*], 129 [*Pinicola enucleator sakhalinensis*].
Cabanis (1847). *Arch. Naturges.* **13(1)**: 316 [*Geothlypis*], 330 [*Loxops*], 332 [*Sporopipes*], 350 [*Mycerobas*].
Cabanis (1848). In: Schomburgk, *Reisen Brit.-Guiana* **3**: 666 [*Basileuterus*], 667 [*Myioborus castaneocapilla*].
Cabanis (1851). In: Cabanis & Heine, *Mus. Hein.* **1**: 18 [*Euthlypis*], 99 [*Himatione*], 100 [*Paroreomyza maculata*], 157 [*Rhodopechys*], 158 [*Carduelis chloris aurantiiventris*], 164 [*Bucanetes*], 169 [*Estrilda rufibarba*], 171 [*Lagonosticta*, *Uraeginthus*], 177 [*Euplectes capensis approximans*].
Cabanis (1855). *J. Orn.* **3**: 467 [*Vireo altiloquus barbatulus*], 476 [*Teretistris*].
Cabanis (1861). *J. Orn.* **8** (1860): 329 [*Parula gutturalis*], 405 [*Cyclarhis gujanensis subflavescans*].
Cabanis (1862). *J. Orn.* **10**: 259 [*Coccothraustes coccothraustes buvryi*].
Cabanis (1866). *J. Orn.* **14**: 160 [*Carduelis magellanica capitalis*].
Cabanis (1868). *J. Orn.* **16**: 412 [*Anomalospiza imberbis*], 413 [*Bubalornis niger intermedius*].
Cabanis (1869). In: Pless, *von der Decken's Reisen Ost-Afr.* **3(1)**: 32 [*Ploceus bojeri*].
Cabanis (1872). *J. Orn.* **20**: 316 [*Pyrrhula pyrrhula cineracea*].
Cabanis (1873). *J. Orn.* **21**: 64 [*Hylophilus hypoxanthus flaviventris*], 316 [*Basileuterus luteoviridis striaticeps*].
Cabanis (1876). *J. Orn.* **24**: 92 [*Ploceus subpersonatus*].
Cabanis (1878). *J. Orn.* **26**: 205 [*Ploceus nigricollis melanoxanthus*], 229 [*Estrilda astrild minor*].
Cabanis (1880). *J. Orn.* **28**: 106 [*Euplectes gierowii*], 349 [*Ploceus bicolor amaurocephalus*].
Cabanis (1882). *J. Orn.* **30**: 462 [*Lonchura striata swinhoei*].
Cabanis (1884). *J. Orn.* **32**: 240 [*Ploceus xanthopterus castaneigula*].
Campbell, A.J. (1901). *Nests and Eggs Austr. Birds* **1**: 492 [*Neochmia temporalis minor*].
Casey & Jacobi (1974). *Bishop Mus. Occas. Papers* **24(2)**: 217 [*Melamprosops*], 219 [*Melamprosops phaeosoma*].
Cassin (1848). *Proc. Acad. Nat. Sci. Philadelphia* **4(1848) (6)**: 65 [*Euplectes albonotatus*], 66 [*Euplectes nigroventris*].
Cassin (1849). *Proc. Acad. Nat. Sci. Philadelphia* **4(1849) (2)**: 157 [*Malimbus scutatus*].
Cassin (1850). *Proc. Acad. Nat. Sci. Philadelphia* **5(1850) (6)**: 57 [*Ploceus badius*]; **5(1850) (10)** (1850): 105 [*Carduelis lawrencei*].
Cassin (1851). *Proc. Acad. Nat. Sci. Philadelphia* **5(1851) (2)**: 150 [*Vireo huttoni*], 152 [*Vireo flavoviridis*], 153 [*Vireo philadelphicus*].
Cassin (1852). *Proc. Acad. Nat. Sci. Philadelphia* **6(1852) (10)**: 185 [*Lonchura fuscans*, *Spermestes bicolor nigriceps*].
Cassin (1857). *Proc. Acad. Nat. Sci. Philadelphia* **9(1857) (2)**: 36 [*Malimbus racheliae*].
Cassin (1859). *Proc. Acad. Nat. Sci. Philadelphia* **11(1859) (1)**: 40 [*Parmoptila*, *Parmoptila woodhousei*].
Chapin (1916). *Bull. Amer. Mus. Nat. Hist.* **35**: 24, fig. 2 [*Paludipasser locustella uelensis*], 27 [*Ploceus flavipes*].
Chapin (1922). *Amer. Mus. Novit.* **43**: 6 [*Vidua obtusa*].
Chapin (1928). *Amer. Mus. Novit.* **308**: 1 [*Estrilda astrild nigriloris*].
Chapin (1932). *Amer. Mus. Novit.* **570**: 17 [*Ploceus bannermani*].
Chapin (1950). *Bull. Brit. Orn. Club* **70(3)**: 23 [*Estrilda paludicola ruthae*].
Chapman (1890). *Auk* **7**: 11 [*Geothlypis trichas ignota*].
Chapman (1892). *Bull. Amer. Mus. Nat. Hist.* **4**: 310 [*Dendroica petechia flaviceps*].
Chapman (1893). *Auk* **10**: 343 [*Basileuterus culicivorus olivascens*].
Chapman (1899). *Bull. Amer. Mus. Nat. Hist.* **12**: 153 [*Myioborus miniatus pallidiventris*].
Chapman (1912). *Bull. Amer. Mus. Nat. Hist.* **31**: 159 [*Vireo olivaceus caucae*], 160 [*Basileuterus luteoviridis richardsoni*, *Carduelis spinescens nigricauda*].
Chapman (1917). *Bull. Amer. Mus. Nat. Hist.* **36**: 541 [*Cyclarhis gujanensis parva*]; **37**: 330 [*Xenoligea montana*].
Chapman (1919). *Proc. Biol. Soc. Washington* **32**: 265 [*Myioborus melanocephalus bolivianus*].
Chapman (1921). *Amer. Mus. Novit.* **18**: 11 [*Basileuterus fraseri ochraceicrista*, *Hylophilus hypoxanthus albigula*].
Chapman (1924). *Amer. Mus. Novit.* **143**: 2 [*Parula pitiayumi alarum*], 5 [*Basileuterus tristriatus baezae*, *Basileuterus tristriatus punctipectus*], 6 [*Basileuterus tristriatus tacarcunae*], 8 [*Basileuterus coronatus orientalis*, *Basileuterus trifasciatus nitidior*].
Chapman (1927). *Amer. Mus. Novit.* **250**: 5 [*Myioborus melanocephalus griseonuchus*].
Chapman (1929). *Amer. Mus. Novit.* **341**: 4 [*Parula pitiayumi roraimae*]; **380**: 24 [*Myioborus castaneocapilla duidae*].
Chasen (1940). *Treubia* **17**: 263 [*Serinus estherae orientalis*].
Chasen & Kloss (1929). *Bull. Raffles Mus. Singapore* **2**: 23 [*Lonchura atricapilla batakana*].
Cherrie (1891). *Proc. US Natl. Mus.* **14**: 342 [*Basileuterus rufifrons salvini*].
Chubb, E.C. (1908). *Bull. Brit. Orn. Club* **21(5)**: 62 [*Serinus mennelli*].
Clancey (1940). *Ibis* **Ser. 14, no. 4**: 92 [*Carduelis chloris harrisoni*].
Clancey (1946). *Bull. Brit. Orn. Club* **66(8)**: 84 [*Carduelis cannabina autochthona*].
Clancey (1952). *Bonn. Zool. Beitr.* **3**: 20 [*Serinus gularis endemion*].
Clancey (1957). *Bull. Brit. Orn. Club* **77(4)**: 60 [*Serinus mozambicus granti*].
Clancey (1957). *Durban Mus. Novit.* **5(1)**: 14 [*Estrilda astrild tenebridorsa*].
Clancey (1958). *Durban Mus. Novit.* **5(10)**: 141 [*Ortygospiza atricollis digressa*].
Clancey (1959). *Durban Mus. Novit* **5(18)**: 258 [*Serinus atrogularis impiger*].
Clancey (1964). *Durban Mus. Novit.* **7(7)**: 184 [*Serinus scotops umbrosus*].
Clancey (1966). *Durban Mus. Novit.* **7(11)**: 612 [*Serinus gularis mendosus*].
Clancey (1967). *Durban Mus. Novit.* **8(10)**: 112 [*Serinus canicollis griseitergum*].
Clancey (1969). *Durban Mus. Novit.* **8(15)**: 272 [*Coccopygia quartinia stuartirwini*].
Clancey (1970). *Zool. Abhandl. Staatl. Mus. Tierkd. Dresden* **31(5)**: 53 [*Amadina fasciata contigua*].
Clancey & Lawson (1960). *Durban Mus. Novit.* **6(4)**: 62 [*Serinus citrinipectus*].
Clarke, S.R. (1913). *Bull. Brit. Orn. Club* **31(4)**: 32 [*Ploceus golandi*].
Clarke, S.R. (1919). *Bull. Brit. Orn. Club* **40(2)**: 48 [*Carduelis johannis*].
Coale (1887). *Bull. Ridgway Orn. Club* **2**: 82 [*Dendroica petechia morcomi*], 83 [*Dendroica petechia dugesi*].
Cooper, J.G. (1861). *Proc. Calif. Acad. Sci.* **Ser. 1, no. 2**: 120 [*Vermivora luciae*].
Cooper, W. (1825). *Ann. Lyc. Nat. Hist. New York* **1(2)**: 220 [*Hesperiphona vespertina*].
Cory (1884). *Auk* **1**: 1, plate 1 [*Microligea palustris*], 290 [*Microligea*].
Cory (1886). *Auk* **3**: 497 [*Dendroica vitellina*], 500 [*Vireo crassirostris alleni*].
Cory (1887). *Auk* **4**: 7 [*Vireo magister caymanensis*], 178 [*Vireo altiloquus canescens*], 179 [*Dendroica petechia flavida*].
Cory (1909). *Field Mus. Nat. Hist. (Orn. Ser.)* **1(5)**: 217 [*Dendroica petechia obscura*].
Coues (1862). *Proc. Acad. Nat. Sci. Philadelphia* **13** (1861): 378 [*Carduelis flammea rostrata*], 385 [*Carduelis hornemanni exilipes*].
Coues (1866). *Proc. Acad. Nat. Sci. Philadelphia* **18**: 74 [*Vireo plumbeus*], 75 [*Vireo vicinior*], 76 [*Vireo bellii pusillus*].
Coues (1878). *Bull. US Geol. & Geogr. Survey Territ.* **4**: 11 [*Parula pitiayumi nigrilora*].
Coues (1897). *Auk* **14**: 96 [*Dendroica caerulescens cairnsi*].
Cretzschmar (1827). *Atlas Reise nördl. Afrika Rüppell (Vögel)*, Part **2**: 24, plate 15 [*Plocepasser superciliosus*].
Cuvier (1816). *Règne Animal* **1**: 383 [*Ploceus*], 388 [*Vidua*].
D'Albertis & Salvadori (1879). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 14(6)**: 88 [*Lonchura tristissima leucosticta*], 89 [*Neochmia phaeton evangelinae*].
Daudin (1800). *Traité Élément. Compl. d'Orn.* **2**: 445 [*Sporopipes frontalis*].
Daudin (1802). *Ann. Mus. Hist. Nat. Paris* **1**: 151 [*Malimbus malimbicus*].
Daudin (1802). In: Lacépède, *Hist. Nat., Quad. Paris (Buffon)* **14**: 245 [*Ploceus baglafecht*].
David & Oustalet (1877). *Oiseaux de la Chine*: 355 [*Carpodacus rodopeplus verreauxii*], 359, plate 98 [*Uragus sibiricus lepidus*].
De Vis (1897). *Ibis* **Ser. 7, no. 3**: 387 [*Lonchura monticola*], 389 [*Erythrura trichroa sigillifera*, *Oreostruthus fuliginosus*].
De Vis (1898). *Ibis* **Ser. 7, no. 4**: 175 [*Oreostruthus*].
Deignan (1947). *Auk* **64**: 305 [*Ploceus hypoxanthus hymenaicus*].
Deignan (1956). *Proc. Biol. Soc. Washington* **69**: 211 [*Ploceus philippinus angelorum*].
Delacour (1926). *Bull. Brit. Orn. Club* **47(1)**: 20 [*Carduelis monguilloti*].
Delacour (1943). *Zoologica* **28**: 84 [*Lonchura castaneothorax ramsayi*].
Delacour & Berlioz (1931). *Oiseau et RFO (Nouv. Sér.)* **1**: 4 [*Ploceus sakalava minor*].
Deppe, W. (1830). *Preis-Verz. Säug. Vögel etc., Mexico*: 2 [*Basileuterus culicivorus*, *Icteria virens auricollis*].
Derjugin & Bianchi (1900). *Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersb.* **5**: 285 [*Pyrrhula pyrrhula rossikowi*].
Dickerman (1970). *Condor* **72(1)**: 95 [*Geothlypis speciosa limnatis*].
Dickey & van Rossem (1928). *Proc. Biol. Soc. Washington* **41**: 189 [*Myioborus miniatus connectens*].
Diggles (1876). *Trans. Philos. Soc. Queensland* **2**: 11 [*Poephila cincta atropygialis*].
Dubois, A.J.C. (1900). *Orn. Monatsber.* **8**: 69 [*Ploceus weynsi*].
Dybowski (1883). *Bull. Soc. Zool. France* **8**: 367 [*Pinicola enucleator kamtschatkensis*].
Elgood (1958). *Ibis* **100**: 622 [*Malimbus ibadanensis*].
Elliot (1859). *Ibis* **Ser. 1, no. 1**: 392 [*Malimbus cassini*].
Eversmann (1848). *Bull. Soc. Imp. Nat. Moscou* **21**: 223 [*Leucosticte nemoricola altaica*].
Finsch (1870). In: Hartlaub & Finsch, in: Pless, *von der Decken's Reisen Ost-Afr.* **4** *(Vögel Ost-Afr.)*: 458 [*Serinus capistratus*].
Finsch (1878). *Proc. Zool. Soc. London* **1878(2)**: 440, plate 29 [*Erythrura kleinschmidti*].
Finsch (1886). *Ibis* **Ser. 5, no. 4**: 1, plate 1 [*Lonchura hunsteini*].
Finsch (1902). *Notes Mus. Leyden* **23**: 151 [*Serinus estherae*].
Fischer, G.A. (1884). *J. Orn.* **32**: 180 [*Ploceus baglafecht reichenowi*].
Fischer, G.A. & Reichenow (1878). *Orn. Centralbl.* **1**: 88 [*Amblyospiza albifrons unicolor*], **3**: 88 [*Euplectes diadematus*].
Fischer, G.A. & Reichenow (1884). *J. Orn.* **32**: 54 [*Euplectes gierowii friederichseni*, *Pseudonigrita cabanisi*].
Fischer, G.A. & Reichenow (1885). *J. Orn.* **33**: 373 [*Ploceus bicolor stictifrons*].
Forster, G. (1781). *Götting. Mag. Wissenschaft. Litteratur* **1(6)** (1780): 346 [*Drepanis coccinea*].
Forster, J.R. (1772). *Phil. Trans. Roy. Soc. London* **62**: 406 [*Dendroica striata*].
Fraser (1843). *Proc. Zool. Soc. London* **1842(10)**, no. 117: 144 [*Linurgus olivaceus*], 145 [*Nigrita fusconotus*, *Spermestes bicolor*, *Spermestes bicolor poensis*], **1843(11)**, no. 121: 27 [*Lagonosticta rufopicta*].
Friedmann (1927). *Proc. New England Zool. Club* **10**: 7 [*Spermophaga ruficapilla cana*].
Friedmann (1932). *Proc. Biol. Soc. Washington* **45**: 65 [*Serinus albogularis sordahlae*].
Garrido (1971). *Poeyana* **81**: 2 [*Vireo gundlachii magnus*].
Garrido (1973). *Poeyana* **119**: 31 [*Vireo gundlachii sanfelipensis*].
George (1964). *Condor* **66**: 249 [*Carduelis crassirostris amadoni*].
Giraud (1841). *Descr. Sixteen New Spec. North Amer. Birds*: 13, plate 3 and text [*Dendroica nigrescens halseii*], plate 4, fig. 2 and text [*Basileuterus belli*], plate 6, fig. 2 and text [*Basileuterus culicivorus brasierii*], plate 7, fig. 1 and text [*Cardellina rubrifrons*].
Giraud (1851). *Ann. Lyc. Nat. Hist. New York* **5(2)** (1852): 40, plate 3, fig. 1 [*Hylophilus decurtatus brevipennis*].
Gloger (1833). *Abändern Vögel durch Einfluss des Klima's*: 153 [*Carduelis carduelis subulata*].
Gloger (1834). *Vollst. Handb. Naturg. Vögel Europas* **1**: 356 [*Loxia curvirostra pusilla*].
Gmelin, J.F. (1788). *Syst. Nat.* **1(1)**: 479 [*Chlorodrepanis virens*, *Himatione sanguinea*].
Gmelin, J.F. (1789). *Syst. Nat.* **1(2)**: 844 [*Loxia leucoptera*, *Psittirostra psittacea*], 845 [*Euplectes macroura*], 846 [*Euplectes aureus*], 856 [*Serinus flaviventris*], 857 [*Euplectes afer*], 859 [*Amadina fasciata*, *Euodice cantans*], 860 [*Ploceus cucullatus abyssinicus*], 877 [*Foudia rubra*], 893 [*Cyclarhis gujanensis*], 903 [*Erythrura psittacea*], 905 [*Pytilia afra*], 921 [*Loxops coccineus*], 923 [*Carpodacus purpureus*], 927 [*Vidua chalybeata ultramarina*], 947 [*Vireo griseus noveboracensis*], 951 [*Dendroica palmarum*, *Helmitheros vermivorum*], 958 [*Seiurus noveboracensis*], 960 [*Dendroica caerulescens*], 971 [*Dendroica petechia ruficapilla*], 972 [*Geothlypis aequinoctialis*], 983 [*Dendroica petechia albicollis*], 985 [*Dendroica tigrina*, *Dendroica virens*], 996 [*Dendroica petechia aestiva*].
Godman (1866). *Ibis* **Ser. 2, no. 2**: 97 [*Pyrrhula murina*].
Godwin-Austen (1874). *Proc. Zool. Soc. London* **1872(1)**: 48 [*Lonchura punctulata subundulata*].
Gosse (1847). *Birds Jamaica*: 158 [*Dendroica petechia eoa*], 163 [*Dendroica pharetra*].
Gould (1837). *Proc. Zool. Soc. London* **1836(4)**, no. 46: 105 [*Poephila cincta*].
Gould (1837). *Synop. Birds Australia*, Part **1**: plate 10, fig. 1 and text [*Taeniopygia castanotis*], plate 10, fig. 2 and text [*Neochmia ruficauda*], plate 10, fig. 3 and text [*Neochmia modesta*]; Part **2**: plate 21, fig. 2 and text [*Lonchura castaneothorax*].
Gould (1838). *Proc. Zool. Soc. London* **1837(5)**, no. 57: 90 [*Callacanthis burtoni*]; **1837(5)**, no. 59: 127 [*Rhodopechys sanguineus*].
Gould (1839). In: Darwin, *Zool. Voy. Beagle* **9**, *Birds* **3(3)**: plate 28 [*Dendroica petechia aureola*].
Gould (1840). *Proc. Zool. Soc. London* **1839(7)**, no. 82: 143 [*Poephila acuticauda*, *Taeniopygia bichenovii annulosa*].
Gould (1841). *Proc. Zool. Soc. London* **1840(8)**, no. 93: 127 [*Heteromunia pectoralis*].
Gould (1842). *Birds Austr.*, Part **6** (later bound in vol. **2**): plate 91 and text [*Poephila personata*], plate 93 and text [*Poephila*]; Part **7** (later bound in vol. **1**): L [*Emblema*]; Part **7** (later bound in vol. **3**): plate 97 and text [*Emblema pictum*].
Gould (1844). *Birds Austr.*, Part **15** (later bound in vol. **3**): plate 88 and text [*Erythrura gouldiae*].
Gould (1845). *Proc. Zool. Soc. London* **1845(13)**, no. 149: 80 [*Lonchura flaviprymna*].
Gould (1847). *Proc. Zool. Soc. London* **1846(14)**, no. 165: 106 [*Poephila personata leucotis*].
Gould (1851). *Birds Asia*, Part **3** (later bound in vol. **5**): plates 18 and text [*Eophona*].
Gould (1853). *Proc. Zool. Soc. London* **1851(19)**, no. 226: 115 [*Leucosticte brandti haematopygia*].
Gould (1858). *Proc. Zool. Soc. London* **1857(25)**, no. 340: 222 [*Pyrrhula aurantiaca*].
Grant, C.H.B. & Mackworth-Praed (1945). *Bull. Brit. Orn. Club* **66(2)**: 18 [*Serinus mozambicus gommaensis*].
Grant, C.H.B. & Mackworth-Praed (1947). *Bull. Brit. Orn. Club* **68(1)**: 7 [*Ploceus spekeoides*].
Grant, C.H.B. & Mackworth-Praed (1952). *Bull. Brit. Orn. Club* **72(1)**: 1 [*Serinus koliensis*].
Grant, C.H.B. & Mackworth-Praed (1956). *Bull. Brit. Orn. Club* **76(2)**: 33 [*Ploceus bicolor kigomaensis*].
Grant, P.R. (1964). *Condor* **66**: 512 [*Carduelis psaltria witti*].
Granvik (1923). *J. Orn.* **71** (Suppl.): 191 [*Serinus burtoni tanganjicae*].
Gray, G.R. (1842). *App. List. Gen. Birds*: 8 [*Dendroica*].
Gray, G.R. (1844). *Gen. Birds*, Part **1** (later bound in vol. **2**): 351 [*Ploceus grandis*].
Gray, G.R. (1849). *Gen. Birds*, Part **49** (later bound in vol. **2**): 369 [*Neochmia*].
Gray, G.R. (1862). *Ann. Mag. Nat. Hist.* **Ser. 3, no. 10**: 44 [*Euplectes capensis phoenicomerus*], 444 [*Serinus rufobrunneus*], 445 [*Serinus burtoni*].
Gray, J.E. (1831). *Zool. Misc.* **1**: 7 [*Malimbus nitens*].
Greenway (1933). *Bull. Mus. Comp. Zool. Harvard* **74**: 163 [*Carpodacus edwardsii rubicundus*].
Greenway (1933). *Proc. New England Zool. Club* **13**: 63 [= 69] [*Dendroica petechia armouri*].
Grinnell (1897). *Auk* **14**: 397 [*Carduelis tristis salicamans*].
Grinnell (1901). *Condor* **3**: 65 [*Geothlypis trichas scirpicola*, *Geothlypis trichas sinuosa*].
Grinnell (1903). *Condor* **5**: 72 [*Dendroica petechia brewsteri*].

Grinnell (1909). *Univ. Calif. Publ. Zool.* **5**: 223 [*Loxia curvirostra sitkensis*].
Grinnell (1913). *Condor* **15**: 77 [*Leucosticte tephrocotis dawsoni*].
Grinnell (1917). *Condor* **19**: 20 [*Hesperiphona vespertina brooksi*].
Griscom (1923). *Amer. Mus. Novit.* **71**: 5 [*Dendroica pinus chrysoleuca*].
Griscom (1927). *Amer. Mus. Novit.* **280**: 12 [*Basileuterus melanogenys bensoni*], 13 [*Basileuterus tristriatus chitrensis*]; **282**: 7 [*Hylophilus decurtatus darienensis*], 8 [*Parula pitiayumi nana*].
Griscom (1928). *Amer. Mus. Novit.* **293**: 5 [*Carpodacus mexicanus potosinus*].
Griscom (1930). *Amer. Mus. Novit.* **438**: 3 [*Vireo huttoni vulcani*].
Griscom (1930). *Proc. New England Zool. Club* **12**: 7 [*Geothlypis poliocephala ridgwayi*].
Griscom (1932). *Proc. New England Zool. Club* **13**: 61 [*Carduelis notata oleacea*].
Griscom (1935). *Ibis* **Ser. 13, no. 5**: 548 [*Dendroica graciae remota*], 551 [*Vireolanius melitophrys quercinus*].
Griscom (1937). *Proc. Boston Soc. Nat. Hist.* **41**: 129 [*Loxia curvirostra benti*], 132 [*Loxia curvirostra grinnelli*], 136 [*Loxia curvirostra mesamericana*].
Grote (1922). *J. Orn.* **70**: 398 [*Vidua camerunensis*], 402 [*Vidua interjecta*].
Grote (1923). *Orn. Monatsber.* **31**: 43 [*Vidua togoensis*].
Güldenstädt (1775). *Nov. Comm. Acad. Sci. Imp. Petrop.* **19**: 464, plate 12 [*Carpodacus rubicilla*].
Gundlach (1855). *Ann. Lyc. Nat. Hist.* **6(11)**: 160 [*Dendroica pityophila*].
Gundlach (1858). *Ann. Lyc. Nat. Hist.* **6(19)**: 274 [*Teretistris fornsi*].
Gyldenstolpe (1941). *Ark. Zool.* **Ser. 1, no. 33(B)**: 3 [*Hylophilus semicinereus juruanus*].
Hachisuka & Delacour (1937). *Bull. Brit. Orn. Club* **57(3)**: 66 [*Erythrura viridifacies*].
Hall, B.P. (1957). *Bull. Brit. Orn. Club* **77(3)**: 46 [*Ploceus manyar williamsoni*].
Harrison (1945). *Bull. Brit. Orn. Club* **66(1)**: 5 [*Fringilla coelebs syriaca*].
Hartert, E.J.O. (1896). *Bull. Brit. Orn. Club* **5(7)**: 38 [*Eophona personata magnirostris*].
Hartert, E.J.O. (1896). *Novit. Zool.* **3**: 558 [*Erythrura hyperythra intermedia*].
Hartert, E.J.O. (1898). *Novit. Zool.* **5**: 72 [*Lagonosticta senegala rendalli*].
Hartert, E.J.O. (1899). *Bull. Brit. Orn. Club* **10(3)**: 26 [*Nesocharis ansorgei*].
Hartert, E.J.O. (1899). In: Ansorge, *Under African Sun*: 344 [*Euplectes gierowii ansorgei*].
Hartert, E.J.O. (1899). *Novit. Zool.* **6**: 413 [*Pytilia phoenicoptera emini*], 427 [*Neochmia ruficauda clarescens*].
Hartert, E.J.O. (1900). *Bull. Brit. Orn. Club* **11(3)**: 38 [*Vireolanius leucotis mikettae*].
Hartert, E.J.O. (1900). *Novit. Zool.* **7**: 7 [*Erythrura papuana, Erythrura trichroa woodfordi*].
Hartert, E.J.O. (1901). *Bull. Brit. Orn. Club* **12(3)**: 33 [*Cyclarhis gujanensis coibae*].
Hartert, E.J.O. (1901). *Novit. Zool.* **8**: 323 [*Carduelis cannabina meadewaldoi*], 342 [*Vidua wilsoni*].
Hartert, E.J.O. (1902). *Bull. Brit. Orn. Club* **12(8)**: 69 [*Pyrrhula nipalensis waterstradti*].
Hartert, E.J.O. (1902). *Novit. Zool.* **9**: 577 [*Ploceus philippinus infortunatus*], 617 [*Hylophilus ochraceiceps bulunensis*].
Hartert, E.J.O. (1903). *Vögel Pal. Fauna* **1(1)**: 59 [*Eophona migratoria*], 64 [*Carduelis sinica ussuriensis*], 68 [*Carduelis carduelis britannica*], 89 [*Bucanetes githagineus amantum*].
Hartert, E.J.O. (1904). *Bull. Brit. Orn. Club* **14(7)**: 72 [*Parmoptila woodhousei ansorgei*].
Hartert, E.J.O. (1904). *Vögel Pal. Fauna* **1(2)**: 120 [*Loxia scotica*].
Hartert, E.J.O. (1905). *Orn. Monatsber.* **13**: 164 [*Fringilla teydea polatzeki*].
Hartert, E.J.O. (1907). *Bull. Brit. Orn. Club* **19(8)**: 84 [*Serinus striolatus graueri*].
Hartert, E.J.O. (1907). *Novit. Zool.* **14**: 487 [*Plocepasser mahali ansorgei*].
Hartert, E.J.O. (1911). *Bull. Brit. Orn. Club* **27(4)**: 47 [*Lonchura caniceps kumusii*].
Hartert, E.J.O. (1912). *Bull. Brit. Orn. Club* **29(4)**: 63 [*Serinus atrogularis somereni*].
Hartert, E.J.O. (1913). *Bull. Brit. Orn. Club* **33(4)**: 78 [*Fringilla coelebs ombriosa*].
Hartert, E.J.O. (1917). *Bull. Brit. Orn. Club* **37(5)**: 32 [*Vireo leucophrys mirandae*].
Hartert, E.J.O. (1919). *Bull. Brit. Orn. Club* **39(4)**: 50 [*Serinus buchanani*].
Hartert, E.J.O. (1919). *Novit. Zool.* **26**: 140 [*Malimbus malimbicus crassirostris*], 147 [*Mandingoa*].
Hartert, E.J.O. (1924). *Novit. Zool.* **31**: 274 [*Erythrura trichroa eichhorni*].
Hartert, E.J.O. (1930). *Novit. Zool.* **36**: 42 [*Lonchura grandis destructa, Lonchura spectabilis mayri, Lonchura vana*].
Hartert, E.J.O. (1932). *Nova Guinea, Zool.* **15**: 476 [*Lonchura grandis heurni*].
Hartert, E.J.O. & Rothschild (1907). *Bull. Brit. Orn. Club* **21(1)**: 9 [*Pyrrhula erythaca owstoni*].
Hartlaub (1844). *Rev. Zool.* **Ser. 1, no. 7**: 215 [*Parula superciliosa*].
Hartlaub (1844). *Syst. Verz. Naturhist. Samml. Ges. Mus. (Bremen)* **1**: 76 [*Nigrita bicolor*].
Hartlaub (1848). *Rev. Zool.* **Ser. 1, no. 11**: 109 [*Ploceus sanctithomae, Quelea erythrops*].
Hartlaub (1852). *Arch. Naturges.* **18(1)**: 104 [*Erythrura cyaneovirens pealii*].
Hartlaub (1852). *Rev. Mag. Zool.* **Ser. 2, no. 4**: 5 [*Myioborus miniatus intermedius*].
Hartlaub (1854). *J. Orn.* **2**: 110 [*Ploceus tricolor*].
Hartlaub (1855). *J. Orn.* **3**: 356 [*Malimbus malimbicus nigrifrons*].
Hartlaub (1857). *Syst. Orn. Westafr.*: 129 [*Euplectes afer strictus*], 143 [*Lagonosticta larvata vinacea*].
Hartlaub (1860). *Proc. Zool. Soc. London* **1860(1)**: 111, plate 161 [*Clytospiza monteiri*].
Hartlaub (1861). *Beitr. Fauna Madag.*: 54 [*Ploceus sakalava*].
Hartlaub (1861). *J. Orn.* **9**: 259 [*Nesocharis capistrata*].
Hartlaub (1862). *Ibis* **Ser. 1, no. 4**: 342 [*Ploceus xanthops*].
Hartlaub (1863). *Proc. Zool. Soc. London* **1863(2)**: 106 [*Euplectes albonotatus eques*].
Hartlaub (1865). In: Gurney, *Ibis* **Ser. 2, no. 1**: 269 [*Mandingoa nitidula*].
Hartlaub (1874). *Ibis* **Ser. 3, no. 4**: 166 [*Cryptospiza reichenovii*].
Hartlaub (1880). *J. Orn.* **28**: 325 [*Quelea cardinalis*].
Hartlaub (1881). *Abh. Naturwiss. Ver. Bremen* **7**: 100 [*Ploceus ocularis crocatus*].
Hartlaub (1882). *Orn. Centralbl.* **7**: 92 [*Ploceus baglafecht emini*].
Hartlaub (1883). *J. Orn.* **31**: 425 [*Estrilda nonnula*].
Hartlaub (1886). *Bull. Mus. Hist. Nat. Belg.* **4**: 144 [*Ploceus melanocephalus duboisi*], 145, plate 4, fig. 2 [*Lagonosticta nitidula*].
Hartlaub (1887). *Zool. Jb.* **2**: 320 [*Ploceus baglafecht eremobius*], 343 [*Ploceus pelzelni*].
Hartlaub (1891). *J. Orn.* **39**: 314 [*Ploceus bicolor mentalis*].
Hartlaub & Finsch (1870). In: Pless, *von der Decken's Reisen Ost-Afr.* **4** *(Vögel Ost-Afr.)*: 399 [*Ploceus xanthopterus*], 404 [*Ploceus bicolor kersteni*].
Heinroth (1900). *Orn. Monatsber.* **8**: 22 [*Poephila acuticauda hecki*].
Hellmayr (1906). *Novit. Zool.* **13**: 12 [*Hylophilus aurantiifrons saturatus*].
Hellmayr (1920). *Anz. Orn. Ges. Bayern* **1(3)**: 15 [*Hylophilus thoracicus aemulus*].
Hellmayr (1922). *Anz. Orn. Ges. Bayern* **1(6)**: 44 [*Basileuterus tristriatus bessereri*].
Hellmayr (1935). *Field Mus. Nat. Hist. (Zool. Ser.)* **13(8)**: 144 [*Vireo olivaceus tobagensis*].
Hellmayr & Seilern (1913). *Verh. Orn. Ges. Bayern* **11**: 315 [*Vireo olivaceus vividior*].
Henshaw (1875). *Ann. Rep. Geogr. Expl. Weat 100th Merid.*: 201 [*Peucedramus*].
Heuglin (1861). In: Petermann, *Mitt. Perthes' Geogr. Anstalt neue Erfosch. Geogr.* **7**: 24 [*Ploceus spekei*].
Heuglin (1862). *J. Orn.* **10**: 304 [*Euplectes axillaris phoeniceus*].
Heuglin (1863). *J. Orn.* **11**: 17 [*Pytilia lineata*], 18 [*Ortygospiza atricollis fuscocrissa, Spermestes cucullata scutata*], 21 [*Amblyospiza albifrons melanota*], 166 [*Estrilda paludicola, Lagonosticta senegala rhodopsis*], 273 [*Lagonosticta larvata nigricollis*].
Heuglin (1864). *J. Orn.* **12**: 248 [*Serinus mozambicus barbatus*], 251 [*Lagonosticta rufopicta lateritia*].
Heuglin (1868). *J. Orn.* **16**: 16 [*Lagonosticta rhodopareia*].
Heuglin (1870). *Orn. Nordost-Afr.* **1(2) (16/17)**: 583 [*Vidua orientalis*].
Hodgson (1836). *Asiatic Researches* **19**: 150 [*Mycerobas melanozanthos*], 151 [*Haematospiza sipahi, Mycerobas carnipes*], 152 [*Propyrrhula subhimachala*], 153 [*Lonchura atricapilla rubronigra, Lonchura striata acuticauda*], 155 [*Pyrrhula nipalensis*], 156 [*Pyrrhoplectes epauletta*], 157 [*Carpodacus nipalensis*], 158 [*Leucosticte nemoricola*].
Hodgson (1844). In: Gray, *Zool. Misc.* **3**: 85 [*Propyrrhula, Pyrrhoplectes*].
Holboell (1843). *Naturhist. Tidsskr.* **4**: 398 [*Carduelis hornemanni*].
Hombron & Jacquinot (1841). *Ann. Sci. Nat. (Zool.)* **Ser. 2, no. 16(20)**: 314 [*Neochmia phaeton*].
Homeyer (1862). *J. Orn.* **10**: 256 [*Loxia curvirostra balearica*].
Homeyer (1880). *J. Orn.* **28**: 156 [*Pinicola enucleator flammula*].
Hoogerwerf (1963). *Bull. Brit. Orn. Club* **83(2)**: 38 [*Lonchura punctulata baweana*].
Horsfield (1821). *Trans. Linn. Soc. London* **13**: 160 [*Amandava amandava punicea, Ploceus manyar*].
Howell, A.H. (1930). *Auk* **47**: 41 [*Dendroica discolor paludicola*].
Hume (1869). *Ibis* **Ser. 2, no. 5**: 356 [*Ploceus megarhynchus*].
Hume (1872). *Ibis* **Ser. 3, no. 2**: 107 [*Carduelis thibetana*].
Hume (1873). In: Henderson & Hume, *Lahore to Yarkand*: 261, plate 26 [*Carduelis flavirostris montanella*].
Hume (1873). *Nests, Eggs Indian Birds* **2**: 448 [*Lonchura kelaarti jerdoni*].
Hume (1874). *Stray Feathers* **2(1–3)**: 257 [*Lonchura striata semistriata*], **2(6)**: 523 [*Carpodacus synoicus stoliczkae*].
Irwin & Benson (1967). *Arnoldia* **3(8)**: 21 [*Pytilia melba hygrophila*].
Isert (1789). *Schrift. Ges. Nat. Freunde Berlin* **19**: 332 [*Euplectes franciscanus*].
Jacobi (1923). *Abh. Ber. Mus. Dresden* **16(1)**: 25 [*Carduelis flavirostris miniakensis*].
Jardine & Fraser (1851). In: Jardine, *Contr. Orn.* **1851**: 156 [*Estrilda astrild occidentalis*].
Jerdon (1863). *Birds India* **2**: 356 [*Lonchura kelaarti*].
Johansen, H. (1944). *J. Orn.* **92**: 32 [*Coccothraustes coccothraustes schulpini*].
Junge (1939). *Nova Guinea Rés. Exp. Sci. Néerl. (Nouv. .Sér.)* **3**: 67 [*Lonchura montana*].
Junge (1952). *Zool. Meded. Leiden* **31(22)**: 249 [*Lonchura castaneothorax boschmai*].
Kaup (1829). *Skizz. Entw.-Gesch. nat. Syst. Europ. Thierw.* **1**: 161 [*Carpodacus*].
Kaup (1852). *Proc. Zool. Soc. London* **1851(19)**, no. 222: 49 [*Myioborus melanocephalus ruficoronatus*].
Kepler & Parkes (1972). *Auk* **89(1)**: 3 [*Dendroica angelae*].
Keyserling & Blasius, J.H. (1840). *Wirbelth. Europa's*: xl [=40] [*Uragus*].
Kinnear (1939). *Ibis* **Ser. 14, no. 3(4)**: 752 [*Carduelis ambigua taylori*].
Kirkconnell & Garrido (2000). *Cotinga* **14**: 80 [*Vireo crassirostris cubensis*].
Kirwan & Gregory (2005). *Bull. Brit. Orn. Club* **125(1)**: 78 [*Eremopsaltria*].
Kittlitz (1833). *Mém. Acad. Imp. Sci. St. Pétersbourg (Sav. Etrang.)* **Ser. 2, no. 2(1)**: 8, plate 10 [*Erythrura trichroa*].
Kleinschmidt, O. (1909). *Falco* **5**: 13 [*Fringilla coelebs gengleri*].
Kloss (1931). *Treubia* **13**: 363 [*Lonchura punctulata fretensis*].
Koch (1816). *Syst. baier. Zool.* **1**: 228, plate 6A, fig. 50 [*Serinus*].
Koelz (1939). *Proc. Biol. Soc. Washington* **52**: 75 [*Carpodacus rubicilla diabolicus*].
Koelz (1949). *Auk* **66**: 209 [*Carduelis carduelis ultima*].
Koenig, A.F. (1899). *Orn. Monatsber.* **7**: 120 [*Carduelis corsicana*].
Kollibay (1910). *Orn. Monatsber.* **18**: 148 [*Carduelis carduelis paropanisi*].
König, C. (1981). *Stuttgarter Beitr. Naturk.* **350**: 3 [*Carduelis magellanica hoyi*].
Kothe (1911). *Orn. Monatsber.* **19**: 70 [*Estrilda rhodopyga centralis*].
Koudashev (1915). *Mess. Orn.* **6(4)**: 313 [*Carduelis carduelis colchica*].
Kozlova (1939). *Bull. Soc. Imp. Nat. Moscou (Nouv. Sér.)* **48(2/3)**: 63 [*Carpodacus erythrinus ferghanensis*].
Kuroda, Nagamichi (1916). *Dôbuts. Zasshi* **28**: 265 [*Pyrrhula nipalensis uchidai*].
Kuroda, Nagamichi (1922). In: Momiyama, *Birds Micron.*: 27 [*Erythrura trichroa pelewensis*].
La Touche (1905). *Bull. Brit. Orn. Club* **16(1)**: 21 [*Pyrrhula nipalensis ricketti*].
Lafresnaye (1835). *Mag. Zool.* **5** (Classe 2): plate 48 [*Spermestes fringilloides*].
Lafresnaye (1840). *Rev. Zool.* **Ser. 1, no. 3**: 230 [*Basileuterus nigrocristatus*].
Lafresnaye (1841). *Rev. Zool.* **Ser. 1, no. 4**: 241 [*Pyrrhula pyrrhula griseiventris*].
Lafresnaye (1842). *Rev. Zool.* **Ser. 1, no. 5**: 133 [*Cyclarhis gujanensis flaviventris, Cyclarhis nigrirostris*].
Lafresnaye (1843). *Rev. Zool.* **Ser. 1, no. 6**: 292 [*Carduelis psaltria colombiana*].
Lafresnaye (1844). *Rev. Zool.* **Ser. 1, no. 7**: 81 [*Vireo leucophrys*].
Lafresnaye (1845). *Rev. Zool.* **Ser. 1, no. 8**: 341 [*Hylophilus semibrunneus*], 342 [*Hylophilus flavipes*].
Landbeck (1877). *Zool. Garten* **18**: 254 [*Carduelis crassirostris*].
Latham (1787). *Gen. Synop. Birds, Suppl.*: 286 [*Carduelis flavirostris pipilans*].
Latham (1790). *Index Orn.* **1**: 381 [*Philetairus socius*], 432 [*Ploceus melanocephalus capitalis*], 441 [*Amandava formosa*].
Latham (1801). *Suppl. Index Orn.*: 44 [*Stagonopleura bella*], 48 [*Neochmia temporalis*].
Laubmann (1915). *Verh. Orn. Ges. Bayern* **12**: 93 [*Carpodacus erythrinus kubanensis*].
Laubmann (1927). *Verh. Orn. Ges. Bayern* **17**: 235 [*Loxia curvirostra tianschanica*].
Lawrence (1862). *Ann. Lyc. Nat. Hist.* **7** (1861): 324 [*Hylophilus aurantiifrons, Hylophilus flavipes viridiflavus*].
Lawrence (1865). *Proc. Acad. Nat. Sci. Philadelphia* **17**: 37 [*Hylophilus flavipes acuticaudata*].
Lawrence (1871). *Ann. Lyc. Nat. Hist.* **10**: 4 [*Parula pitiayumi insularis*].
Lawrence (1875). *Ibis* **Ser. 3, no. 5(2)**: 386 [*Vireo nanus*].
Lawrence (1877). *Ann. New York Acad. Sci.* **1(1/2)**: 47 [*Dendroica plumbea*].
Lawrence (1878). *Ann. New York Acad. Sci.* **1(5/6)**: 151 [*Catharopeza bishopi*].
Lawrence (1879). *Proc. US Natl. Mus.* **1** (1878): 453 [*Dendroica petechia melanoptera*].
Layard, E.L. (1867). *Birds South Africa Descr. Cat.*: 180 [*Ploceus cucullatus nigriceps*].
Layard, E.L. (1878). *Ann. Mag. Nat. Hist.* **Ser. 5, no. 1**: 375 [*Erythrura trichroa cyanofrons*].
Lembeye (1850). *Aves Isla Cuba*: 29, plate 5, fig. 1 [*Vireo gundlachii*], 66, plate 5, fig. 2 [*Teretistris fernandinae*].
Lesson (1831). *Traité d'Orn.*, Livr. **6**: 435 [*Ploceus manyar flaviceps*].
Lesson (1839). *Rev. Zool.* **Ser. 1, no. 2**: 41 [*Hesperiphona abeillei*].
Lesson (1840). *Rev. Zool.* **Ser. 1, no. 3**: 99 [*Ploceus nigerrimus castaneofuscus*].
Levaillant (1850). *Expl. Sci. Algerie. Ois., Atlas*: plate 7, figs. 1–1a [*Fringilla coelebs africana*].
Lichtenstein, M.H.C. (1823). In: Eversmann, *Reise von Orenburg nach Buchara*: 132 [*Rhodospiza obsoleta*].
Lichtenstein, M.H.C. (1823). *Verz. Doubl. Zool. Mus. Berlin*: 23 [*Ploceus luteolus, Ploceus vitellinus*], 24 [*Bucanetes githagineus, Euplectes ardens laticauda, Euplectes macroura macrocercus*], 26 [*Carduelis magellanica icterica, Estrilda troglodytes*], 27 [*Lagonosticta rubricata*], 49 [*Vireo olivaceus agilis*].
Lichtenstein, M.H.C. (1839). *Abh. K. Akad. Wiss., Berlin, Phys.-Math. Kl.* (1838): 449 [*Hemignathus*].
Linnaeus (1758). *Syst. Nat.*, 10th edition, **1**: 171 [*Coccothraustes coccothraustes, Icteria virens, Loxia, Loxia curvirostra, Pinicola enucleator, Pyrrhula pyrrhula*], 172 [*Amadina erythrocephala*], 173 [*Estrilda astrild, Euplectes hordeaceus, Lonchura oryzivora, Lonchura punctulata*], 174 [*Carduelis chloris*], 175 [*Euodice malabarica, Ploceus melanocephalus*], 177 [*Euplectes orix, Quelea quelea*], 178 [*Vidua paradisaea*], 179 [*Alario alario, Fringilla, Fringilla coelebs, Fringilla montifringilla*], 180 [*Amandava amandava, Carduelis carduelis, Pytilia melba*], 181 [*Carduelis spinus, Carduelis tristis, Serinus canaria*], 182 [*Carduelis cannabina, Carduelis flammea, Carduelis flavirostris, Uraeginthus angolensis*], 186 [*Setophaga ruticilla*], 190 [*Parula americana*], 305 [*Ploceus benghalensis*].
Linnaeus (1766). *Syst. Nat.*, 12th edition, **1**: 163 [*Ploceus capensis*], 187 [*Dendroica pinus*], 293 [*Geothlypis trichas*], 300 [*Foudia madagascariensis*], 301 [*Lonchura maja*], 302 [*Lonchura malacca, Lonchura molucca*], 305 [*Ploceus philippinus, Serinus sulphuratus*], 306 [*Euplectes capensis, Lonchura striata*], 313 [*Vidua regia*], 319 [*Granatina granatina*], 320 [*Lagonosticta senegala, Serinus serinus*], 321 [*Carduelis sinica*], 323 [*Uraeginthus bengalus*], 327 [*Vireo olivaceus, Wilsonia canadensis*], 333 [*Dendroica coronata, Dendroica pensylvanica, Mniotilta varia, Vermivora chrysoptera*], 334 [*Dendroica dominica, Dendroica petechia, Seiurus aurocapilla*].
Lorenz von Liburnau & Hellmayr (1901). *Orn. Monatsber.* **9(3)**: 39 [*Euodice cantans orientalis*].
Louette & Benson (1982). *Bull. Brit. Orn. Club* **102(1)**: 26 [*Ploceus ruweti*].
Lynes (1914). *Bull. Brit. Orn. Club* **33(9)**: 131 [*Ortygospiza atricollis gabonensis*].

MacGillivray, W. (1837). *Hist. Brit. Birds* **1**: 407 [*Pyrrhula pyrrhula pileata*].
Madarász (1885). *Termés. Füzetek* **9**: 85, plate 6 [*Vireo flavoviridis forreri*].
Madarász (1894). *Bull. Brit. Orn. Club* **3(9)**: 47 [*Lonchura castaneothorax sharpii*].
Madarász (1903). *Orn. Monatsber.* **11**: 5 [*Loxia curvirostra guillemardi*].
Madarász (1904). *Orn. Monatsber.* **12**: 196 [*Leucosticte brandti margaritacea*].
Madarász (1909). *Ann. Hist.-Nat. Mus. Nat. Hungarici* **7**: 176 [*Leucosticte arctoa cognata*].
Martens, C.E. (1866). *J. Orn.* **14**: 14 [*Lonchura atricapilla jagori*].
Mathews (1913). *Austral Avian Rec.* **2(2/3)**: 60 [*Heteromunia*].
Mathews (1925). *Bull. Brit. Orn. Club* **45(7)**: 93 [*Magumma*].
Maynard (1906). *Directory Birds East North Amer.*: 244 [*Dendroica pinus florida*].
Mayr (1938). *Bull. Raffles Mus. Singapore* **14**: 45 [*Lonchura leucogastra castanonota*].
Mayr (1944). *Bull. Amer. Mus. Nat. Hist.* **83**: 169 [*Lonchura punctulata sumbae*].
Mayr & Gilliard (1952). *Amer. Mus. Novit.* **1577**: 7 [*Lonchura spectabilis wahgiensis*].
Mayr & Gilliard (1954). *Bull. Amer. Mus. Nat. Hist.* **103**: 372 [*Oreostruthus fuliginosus hagenensis*].
McCabe & Miller, A.H. (1933). *Condor* **35**: 196 [*Seiurus noveboracensis limnaeus*].
McGregor (1899). *Bull. Cooper Orn. Club* **1**: 32 [*Dendroica coronata hooveri*].
Mearns (1890). *Auk* **7**: 244 [*Carduelis tristis pallida*].
Mearns (1898). *Auk* **15**: 258 [*Carpodacus mexicanus clementis*].
Mearns (1909). *Proc. US Natl. Mus.* **36**: 445 [*Pyrrhula leucogenis steerei*].
Mearns (1911). *Smithsonian Misc. Coll.* **56(20)**: 6 [*Uraeginthus bengalus brunneigularis*].
Mearns (1913). *Smithsonian Misc. Coll.* **61(14)**: 2 [*Hypargos niveoguttatus macrospilotus*].
Mearns (1915). *Proc. US Natl. Mus.* **48**: 390 [*Estrilda kandti keniensis*].
Meinertzhagen, R. (1938). *Bull. Brit. Orn. Club* **58(7)**: 95 [*Carpodacus synoicus salimalii*].
Meinertzhagen, R. & Meinertzhagen, A. (1926). *Bull. Brit. Orn. Club* **46(6)**: 83 [*Carpodacus rubicilloides lucifer*].
Menzbier & Sushkin (1913). *Orn. Monatsber.* **21**: 192 [*Fringilla coelebs solomkoi*].
Meyer de Schauensee (1939). *Notulae Naturae* **18**: 2 [*Serinus estherae vanderbilti*].
Meyer de Schauensee (1946). *Notulae Naturae* **167**: 8 [*Basileuterus luteoviridis quindianus*].
Miller, A.H. (1939). *Condor* **41**: 34 [*Leucosticte tephrocotis wallowa*].
Miller, A.H. (1942). *Condor* **44**: 185 [*Seiurus aurocapilla cinereus*].
Miller, A.H. (1952). *Proc. Biol. Soc. Washington* **65**: 16 [*Basileuterus fulvicauda motacilla*].
Miller, A.H. & Ray (1944). *Condor* **46**: 42 [*Vireo brevipennis browni*].
Miller, W. deW. & Griscom (1925). *Amer. Mus. Novit.* **183**: 6 [*Cyclarhis gujanensis nicaraguae*], 7 [*Parula superciliosa parva*], 9 [*Peucedramus taeniatus jaliscensis*], 10 [*Peucedramus taeniatus arizonae*, *Peucedramus taeniatus micrus*].
Milne-Edwards, A. (1865). *Nouv. Arch. Mus. Hist. Nat. Paris (Bull.)* **Ser. 1, no. 1**: 19, plate 2, figs. 2–3 [*Carpodacus pulcherrimus davidianus*].
Milne-Edwards, A. & Oustalet (1885). *Compt. Rend. Acad. Sci. Paris* **101**: 222 [*Foudia eminentissima consobrina*].
Milne-Edwards, A. & Oustalet (1888). *Nouv. Arch. Mus. Hist. Nat. Paris* **Ser. 2, no. 10**: 271 [*Foudia eminentissima anjuanensis*].
Molina (1782). *Saggio Stor. Nat. Chile*: 247 [345] [*Carduelis barbata*].
Moore, F. (1856). *Proc. Zool. Soc. London* **1855(23)**, no. 297: 216 [*Carpodacus pulcherrimus*].
Moore, F. (1858). In: Horsfield & Moore, *Cat. Birds Mus. East India Co.* **2**: 510 [*Lonchura leucogastroides*].
Moore, R.T. (1936). *Condor* **38**: 203 [*Carpodacus mexicanus rhodopnus*].
Moore, R.T. (1937). *Condor* **39**: 204 [*Carpodacus mexicanus centralis*].
Moore, R.T. (1937). *Proc. Biol. Soc. Washington* **50**: 100 [*Ergaticus ruber melanauris*].
Moore, R.T. (1938). *Proc. Biol. Soc. Washington* **51**: 69 [*Vireo pallens paluster*].
Moore, R.T. (1939). *Condor* **41**: 202 [*Carpodacus mexicanus griscomi*].
Moore, R.T. (1939). *Proc. Biol. Soc. Washington* **52**: 128 [*Carpodacus mexicanus coccineus*].
Moore, R.T. (1941). *Proc. Biol. Soc. Washington* **54**: 37 [*Parula superciliosa sodalis*].
Moore, R.T. (1946). *Proc. Biol. Soc. Washington* **59**: 99 [*Geothlypis nelsoni karlenae*], 100 [*Basileuterus belli bateli*].
Moreau (1942). *Bull. Brit. Orn. Club* **62(3)**: 43 [*Nigrita canicapillus candidus*].
Moreau & Sclater, W.L. (1934). *Bull. Brit. Orn. Club* **55(1)**: 13 [*Cryptospiza salvadorii kilimensis*].
Müller, J.W. von (1851). *Naumannia* **1(4)**: 28 [*Anaplectes rubriceps leuconotos*].
Murie (1944). *Condor* **46**: 122 [*Leucosticte tephrocotis umbrina*].
de Naurois (1975). *Ardeola* **21(2)**: 924 [*Serinus rufobrunneus fradei*].
Neave (1907). *Mem. Lit. Phil. Soc. Manchester* **51(10)**: 94 [*Vidua codringtoni*].
Neave (1909). *Bull. Brit. Orn. Club* **25(2)**: 25 [*Paludipasser*, *Paludipasser locustella*].
Nelson (1897). *Auk* **14(1)**: 66 [*Dendroica coronata goldmani*].
Nelson (1898). *Proc. Biol. Soc. Washington* **12**: 10 [*Vireo hypochryseus sordidus*].
Nelson (1899). *Auk* **16**: 30 [*Vireo griseus micrus*].
Nelson (1899). *Proc. Biol. Soc. Washington* **13**: 29 [*Basileuterus rufifrons caudatus*].
Nelson (1900). *Auk* **17**: 267 [*Vireo griseus perquisitor*], 268 [*Basileuterus belli scitulus*, *Vireo leucophrys strenuus*], 269 [*Geothlypis trichas modesta*].
Nelson (1903). *Proc. Biol. Soc. Washington* **16**: 156 [*Geothlypis trichas chapalensis*].
Nelson (1912). *Smithsonian Misc. Coll.* **60(3)**: 20 [*Vireolanius eximius mutabilis*], 21 [*Basileuterus ignotus*], 22 [*Basileuterus melanogenys eximius*].
Nelson (1928). *Proc. Biol. Soc. Washington* **41**: 155 [*Hesperiphona abeillei pallida*, *Hesperiphona abeillei cobanensis*].
Neumann (1900). *J. Orn.* **48**: 283 [*Sporopipes frontalis emini*], 287 [*Serinus sulphuratus sharpii*].
Neumann (1905). *J. Orn.* **53**: 339 [*Ploceus ocularis suahelicus*], 356 [*Serinus citrinelloides kikuyensis*].
Neumann (1907). *J. Orn.* **55**: 596 [*Estrilda astrild massaica*, *Estrilda astrild nyansae*].
Neumann (1907). *Orn. Monatsber.* **15**: 145 [*Bucanetes githagineus zedlitzi*], 168 [*Lagonosticta rubricata haematocephala*].
Neumann (1908). *Bull. Brit. Orn. Club* **21(4)**: 43 [*Vidua orientalis aucupum*], 44 [*Serinus leucopygius riggenbachi*]; **21(5)**: 58 [*Lagonosticta rara forbesi*, *Lagonosticta rhodopareia ansorgei*]; **21(8)**: 96 [*Estrilda paludicola benguellensis*]; **23(1)**: 12 [*Ploceus aurantius rex*]; **23(3)**: 43 [*Amadina fasciata alexanderi*].
Neumann (1910). *J. Orn.* **58**: 523 [*Spermophaga haematina togoensis*].
Neumann (1922). *Orn. Monatsber.* **30(1)**: 13 [*Serinus flavivertex sassii*].
Neunzig (1910). *J. Orn.* **58**: 198 [*Amadina fasciata meridionalis*].
Neunzig (1928). *Zool. Anz.* **78**: 113 [*Vidua chalybeata centralis*], 115 [*Euplectes capensis angolensis*].
Newton, A. (1865). *Proc. Zool. Soc. London* **1865(1)**: 47 [*Foudia flavicans*].
Newton, E. (1867). *Proc. Zool. Soc. London* **1867(2)**: 346 [*Foudia sechellarum*].
Nicoll (1904). *Bull. Brit. Orn. Club* **14(9)**: 95 [*Dendroica vitellina crawfordi*].
Nordmann (1835). In: Erdman, *Reise um die Erde, Atlas*: 14 [*Hylophilus amaurocephalus*].
Oberholser (1899). *Auk* **16**: 257 [*Geothlypis trichas arizela*].
Oberholser (1903). *Proc. Biol. Soc. Washington* **16**: 17 [*Vireo bellii medius*], 116 [*Carduelis psaltria hesperophila*].
Oberholser (1905). *Auk* **22**: 243 [*Vermivora celata orestera*].
Oberholser (1905). *Smithsonian Misc. Coll.* **48**: 64 [*Notiospiza*].
Oberholser (1917). *Condor* **19**: 183 [*Geothlypis beldingi goldmani*].
Ogilvie-Grant (1894). *Bull. Brit. Orn. Club* **3(9)**: 50 [*Erythrura hyperythra brunneiventris*], 51 [*Loxia curvirostra luzoniensis*].
Ogilvie-Grant (1895). *Bull. Brit. Orn. Club* **4(9)**: 41 [*Pyrrhula leucogenis*].
Ogilvie-Grant (1900). *Bull. Brit. Orn. Club* **11(2)**: 30 [*Rhynchostruthus percivali*].
Ogilvie-Grant (1902). *Bull. Brit. Orn. Club* **13(2)**: 21 [*Serinus rothschildi*].
Ogilvie-Grant (1906). *Bull. Brit. Orn. Club* **19(3)**: 32 [*Spermophaga poliogenys*].
Ogilvie-Grant (1907). *Bull. Brit. Orn. Club* **19(9)**: 108 [*Estrilda astrild macmillani*]; **21(1)**: 14 [*Euplectes capensis crassirostris*, *Pytilia melba belli*], 16 [*Nigrita luteifrons alexanderi*].
Ogilvie-Grant (1910). *Bull. Brit. Orn. Club* **25(6)**: 84 [*Ortygospiza atricollis ansorgei*].
Ogilvie-Grant (1911). *Bull. Brit. Orn. Club* **27(4)**: 51 [*Carpodacus vinaceus formosanus*].
Ogilvie-Grant (1912). *Bull. Brit. Orn. Club* **29(4)**: 64 [*Mandingoa nitidula chubbi*]; **31(2)**: 17 [*Serinus gularis elgonensis*].
Ogilvie-Grant (1913). *Bull. Brit. Orn. Club* **31(8)**: 89 [*Carduelis yemenensis*], 90 [*Serinus menachensis*].
Olson (1975). *Bull. Brit. Orn. Club* **95(3)**: 102 [*Basileuterus leucoblepharus lemurum*].
Olson (1980). *Proc. Biol. Soc. Washington* **93**: 474 [*Dendroica petechia aithocorys*], 475 [*Dendroica petechia iguanae*], 478 [*Dendroica petechia juharis*].
Olson & Reveal (2009). *Wilson J. Orn.* **121(3)**: 620 [*Vermivora cyanoptera*].
d'Orbigny (1839). In: Sagra, *Hist. Phys. Pol. Nat. Cuba, Orn.*: 107, plate 16 [*Serinus mozambicus caniceps*].
d'Orbigny & Lafresnaye (1837). *Mag. Zool.* **7** (Classe 2): 50 [*Myioborus miniatus verticalis*, *Myioborus brunniceps*], 51 [*Basileuterus bivittatus*], 83 [*Carduelis atrata*].
Orr & Webster (1968). *Proc. Biol. Soc. Washington* **81**: 39 [*Ergaticus ruber rowleyi*].
Oustalet (1877). *Bull. Soc. Philom. Paris* **Ser. 7, no. 1**: 99 [*Loxioides*], 100 [*Loxioides bailleui*].
Oustalet (1892). *Ann. Sci. Nat. (Zool.)* **Ser. 7, no. 12(18)** (1891): 291, plate 10, fig. 2 [*Uragus sibiricus henrici*].
Oustalet (1892). *Naturaliste (Paris)* **Ser. 2, no. 6(134)** [vol. 14]: 231 [*Euschistospiza dybowskii*].
Oustalet (1896). *Bull. Mus. Natl. Hist. Nat. Paris* **2**: 186 [*Carduelis ambigua*].
Pallas (1764). In: Vroeg, *Cat. Raison. Coll. Supér. Ois., Adumbratiunculae*: 3 [*Carduelis citrinella*, *Vidua macroura*].
Pallas (1770). *Nov. Comm. Acad. Sci. Imp. Petrop.* **14(1)**: 587, plate 23, fig. 1 [*Carpodacus erythrinus*].
Pallas (1773). *Reise versch. Prov. Russ. Reichs* **2**: 711 [*Uragus sibiricus*].
Pallas (1776). *Reise versch. Prov. Russ. Reichs* **3**: 699 [*Carpodacus roseus*].
Pallas (1811). *Zoogr. Rosso-Asiat.* **1**: 496 [*Dendroica petechia rubiginosa*], 497 [*Wilsonia pusilla pileolata*]; **2**: 21 [*Leucosticte arctoa*], 28 [*Serinus pusillus*].
Parkes (1958). *Proc. US Natl. Mus.* **108**: 280 [*Lonchura leucogastra manueli*], 282 [*Lonchura leucogastra smythiesi*], 285 [*Lonchura punctulata yunnanensis*], 290 [*Lonchura atricapilla deignani*].
Parkes (1990). *Ann. Carnegie Mus.* **59**: 52 [*Vireo pallens angulensis*], 57 [*Vireo pallens nicoyensis*].
Parkes (1991). In: Phillips, *Known Birds North Middle America* **2**: 169 [*Hylophilus decurtatus dickermani*], 170 [*Hylophilus decurtatus phillipsi*], 173 [*Hylophilus ochraceiceps pacificus*].
Parkes & Dickerman (1967). *Ann. Carnegie Mus.* **39(5)**: 87 [*Dendroica petechia oraria*].
Parrot (1905). *J. Orn.* **53**: 649 [*Carduelis chloris muehlei*].
Payne (1973). *Orn. Monogr.* **11**: 234 [*Vidua chalybeata okavangoensis*].
Payne (1982). *Misc. Publ. Univ. Mich. Mus. Zool.* **162**: 16 [*Vidua raricola*], 33 [*Vidua larvaticola*], 42 [*Vidua maryae*].
Payne (1998). *Ibis* **140(3)**: 370 [*Lagonosticta sanguinodorsalis*].
Peale (1848). *US Expl. Exped.*, 1st edition, **8**: 117 [*Erythrura cyaneovirens*].
Pelzeln (1868). *Orn. Brasil. Natterers Reisen* **2**: 72 [*Basileuterus leucophrys*], 136 [*Hylophilus hypoxanthus*].
Perkins (1901). *Ibis* **Ser. 8, no. 1**: 583 [*Paroreomyza*].
Peters, J.L. (1926). *Proc. New England Zool. Club* **9**: 41 [*Dendroica petechia alsiosa*].
Peters, W.K.H. (1868). *J. Orn.* **16(2)**: 133 [*Hypargos niveoguttatus*, *Plocepasser mahali pectoralis*, *Ploceus intermedius cabanisii*].
Phelps, Sr & Gilliard (1941). *Amer. Mus. Novit.* **1153**: 10 [*Dendroica petechia paraguanae*].
Phelps, Sr & Phelps, Jr (1946). *Bol. Soc. Venez. Cienc. Nat.* **10(67)**: 237 [*Myioborus albifacies*].
Phelps, Sr & Phelps, Jr (1948). *Proc. Biol. Soc. Washington* **61**: 173 [*Vireo altiloquus bonairensis*
Phelps, Sr & Phelps, Jr (1949). *Proc. Biol. Soc. Washington* **62**: 40 [*Myioborus pariae*], 41 [*Basileuterus tristriatus pariae*].
Phelps, Sr & Phelps, Jr (1950). *Bol. Soc. Venez. Cienc. Nat.* **13(76)**: 21 [*Dendroica petechia aurifrons*].
Phelps, Sr & Phelps, Jr (1961). *Proc. Biol. Soc. Washington* **74**: 246 [*Myioborus castaneocapilla maguirei*].
Phillips, A.R. (1947). *Auk* **64**: 297 [*Oporornis tolmiei monticola*].
Phillips, A.R. (1966). *Bull. Brit. Orn. Club* **86(7)**: 129 [*Vireo huttoni pacificus*].
Phillips, A.R. (1991). In: Phillips, *Known Birds North Middle America* **2**: 164 [*Cyclarhis gujanensis septentrionalis*], 166 [*Vireolanius melitophrys crossini*], 167 [*Vireolanius pulchellus ramosi*], 177 [*Vireo griseus marshalli*], 179 [*Vireo pallens browningi*, *Vireo pallens wetmorei*], 193 [*Vireo plumbeus gravis*], 201 [*Vireo magister decoloratus*, *Vireo magister stilesi*], 209 [*Vireo flavoviridis perplexus*], 216 [*Vireo gilvus sympatricus*], 217 [*Vireo leucophrys dubius*], 218 [*Vireo leucophrys palmeri*].
Phillips, A.R. & Webster (1961). *Auk* **78**: 551 [*Dendroica graciae yaegeri*].
Phillips, E.L. (1897). *Bull. Brit. Orn. Club* **6(8)**: 47 [*Rhynchostruthus louisae*].
duPont (1972). *Wilson Bull.* **84(4)**: 376 and plate [*Erythrura cyaneovirens gaughrani*].
Pratt, H.D. (2009). *Elepaio* **69**: 49 [*Manucerthia*].
Price (1897). *Auk* **14**: 182 [*Pinicola enucleator californica*].
Prigogine (1975). *Rev. Zool. Afr.* **89**: 605 [*Estrilda atricapilla marungensis*].
Przevalski (1876). *Mongoliya i strana Tangutov* **2**: 90, plate 12 [*Carpodacus rubicilloides*], 92, plate 13 [*Carpodacus thura dubius*], 95, plate 14 [*Pyrrhospiza punicea longirostris*], 99, plate 15 [*Urocynchramus, Urocynchramus pylzowi*].
Przevalski (1887). *Zapiski Imp. Akad. nauk, St. Pétersbourg* **55**: 88 [*Kozlowia roborowskii*].
Pucheran (1845). *Rev. Zool.* **Ser. 1, no. 8**: 52 [*Lepidopygia nana*].
Pucheran (1859). *Rev. Mag. Zool.* **Ser. 2, no. 11**: 412, plate 16 [*Fringilla coelebs moreletti*].
Quoy & Gaimard (1830). In: Dumont d'Urville, *Voy. 'Astrolabe'. Zool.* **1**: 211 [*Stagonopleura oculata*].
Rafinesque (1819). *J. Phys. Chim. Hist. Nat.* **88**: 418 [*Helmitheros*].
Rand (1940). *Amer. Mus. Novit.* **1072**: 14 [*Lonchura teerinki*, *Oreostruthus fuliginosus pallidus*].
Rand & Traylor (1959). *Fieldiana Zool.* **39**: 273 [*Serinus capistratus hildegardae*].
Rapine (1925). *Rev. Franç. Orn.* **9**: 333 [*Fringilla coelebs sarda*].
Rea (1991). In: Phillips, *Known Birds North Middle America* **2**: 184 [*Vireo huttoni parkesi*, *Vireo huttoni sierrae*], 185 [*Vireo huttoni unitti*].
Reichenbach (1850). *Av. Syst. Nat.*, Part **6**: plate 75 [*Stagonopleura*], plate 76 [*Quelea*], plate 79 [*Foudia*], plate 78, fig. 9 [*Linurgus*].
Reichenbach (1863). *Singvögel*: 21 [*Hypargos*], 23 [*Coccopygia*], 26 [*Taeniopygia*], 33 [*Erythrura hyperythra*], 46 [*Euodice*], 48 [*Lepidopygia*], 78 [*Ploceus taeniopterus*], 86 [*Anaplectes*], 88 [*Dinemellia*].
Reichenow (1879). *Orn. Centralbl.* **4**: 114 [*Granatina ianthinogaster*], 139 [*Spermestes caniceps*].
Reichenow (1881). *Orn. Centralbl.* **6**: 78 [*Estrilda erythronotos charmosyna*].
Reichenow (1882). *J. Orn.* **30**: 209 [*Serinus reichardi*].
Reichenow (1882). *Orn. Centralbl.* **7**: 91 [*Vidua fischeri*].
Reichenow (1883). *J. Orn.* **31**: 221 [*Vidua purpurascens*].
Reichenow (1885). *J. Orn.* **33**: 372 [*Dinemellia dinemelli boehmi*].
Reichenow (1886). *Zool. Jb.* **1**: 147 [*Ploceus heuglini*], 150 [*Ploceus reichardi*].
Reichenow (1887). *J. Orn.* **35**: 67 [*Histurgops*, *Histurgops ruficauda*], 71 [*Pseudonigrita arnaudi dorsalis*], 72 [*Serinus dorsostriatus*], 214 [*Brachycope anomala*].
Reichenow (1892). *J. Orn.* **40**: 47 [*Estrilda paludicola roseicrissa*], 126 [*Euplectes albonotatus asymmetrurus*], 184 [*Ploceus bicolor tephronotus*], 187 [*Cryptospiza salvadorii*], 442 [*Ploceus preussi*].
Reichenow (1893). *Orn. Monatsber.* **1**: 29 [*Ploceus baglafecht stuhlmanni*, *Ploceus tricolor interscapularis*], 177 [*Ploceus dorsomaculatus*], 205 [*Malimbus erythrogaster*].
Reichenow (1894). *J. Orn.* **42**: 38 [*Malimbus scutatus scutopartitus*].
Reichenow (1898). *Orn. Monatsber.* **6**: 23 [*Serinus mozambicus punctigula*].

Reichenow (1899). *Orn. Monatsber.* **7**: 7 [*Ploceus olivaceiceps*].
Reichenow (1900). *J. Orn.* **48**: 249 [*Brachycope*].
Reichenow (1900). *Orn. Monatsber.* **8**: 39 [*Euplectes psammocromius*], 40 [*Estrilda paludicola marwitzi*], 122 [*Serinus melanochrous*].
Reichenow (1902). *Orn. Monatsber.* **10**: 173 [*Estrilda astrild angolensis*, *Estrilda astrild damarensis*, *Nigrita bicolor brunnescens*, *Nigrita bicolor saturatior*], 184 [*Estrilda kandti*], 185 [*Estrilda poliopareia*].
Reichenow (1903). *J. Orn.* **51**: 149 [*Pseudonigrita*].
Reichenow (1903). *Orn. Monatsber.* **11**: 24 [*Lagonosticta senegala ruberrima*].
Reichenow (1904). *Vög. Afr.* **3**: 39 [*Ploceus nigrimentus*], 260 [*Serinus gularis benguellensis*], 275 [*Serinus citrinelloides frontalis*, *Serinus citrinelloides hypostictus*].
Reichenow (1905). *Orn. Monatsber.* **13**: 147 [*Ploceus rubiginosus trothae*].
Reichenow (1907). *J. Orn.* **55**: 623 [*Carduelis carduelis niediecki*].
Reichenow (1910). *Orn. Monatsber.* **18**: 82 [*Lagonosticta umbrinodorsalis*].
Reichenow (1911). *Mitt. Zool. Mus. Berlin* **5**: 228 [*Uraeginthus angolensis niassensis*, *Uraeginthus bengalus ugogensis*].
Reichenow (1916). *Orn. Monatsber.* **24**: 168 [*Estrilda astrild niediecki*], 169 [*Lonchura tristissima calaminoros*].
Reichenow (1918). *J. Orn.* **66**: 438 [*Serinus atrogularis deserti*].
Reichenow (1919). *J. Orn.* **67**: 227 [*Pytilia melba grotei*].
Reichenow & Neumann (1895). *Orn. Monatsber.* **3**: 74 [*Linurgus olivaceus kilimensis*, *Nigrita canicapillus diabolicus*].
Restall (1995). *Bull. Brit. Orn. Club* **115(3)**: 146 [*Lonchura melaena bukaensis*], 148 [*Lonchura tristissima bigilalae*].
Richmond (1897). *Auk* **14(2)**: 155 [*Serinus burtoni kilimensis*], 157 [*Uraeginthus cyanocephalus*].
Richmond (1900). *Auk* **17**: 197 [*Geothlypis nelsoni*].
Richmond (1917). *Smithsonian Misc. Coll.* **68(7)**: 2 [*Vireo crassirostris tortugae*].
Ridgway (1872). *Amer. J. Sci.* **Ser. 3, no. 4**: 457 [*Vermivora celata lutescens*], 459 [*Geothlypis poliocephala caninucha*].
Ridgway (1873). *Amer. Naturalist* **7**: 606 [*Dendroica petechia bryanti*], 608 [*Dendroica graciae decora*].
Ridgway (1874). *Amer. Sportsman* **4**: 241 [*Leucosticte atrata*].
Ridgway (1874). *Bull. Essex Inst.* **5** (1873): 197 [*Leucosticte australis*].
Ridgway (1874). In: Baird, Brewer & Ridgway, *Hist. North Amer. Birds* **1**: 359 [*Vireo altiloquus barbadensis*], 449, plate 22, fig. 4 [*Hesperiphona vespertina montana*].
Ridgway (1876). *Bull. Nuttall Orn. Club* **1**: 85 [*Dendroica palmarum hypochrysea*].
Ridgway (1876). *Bull. US Geol. & Geogr. Survey Territ.* **2(2)**: 187 [*Carpodacus mexicanus amplus*].
Ridgway (1881). *Proc. US Natl. Mus.* **3** (1880): 12 [*Seiurus noveboracensis notabilis*].
Ridgway (1882). *Proc. US Natl. Mus.* **5(285)**: 344 [*Geothlypis beldingi*].
Ridgway (1883). *Proc. US Natl. Mus.* **5(311)** (1882): 525 [*Dendroica delicata*].
Ridgway (1884). In: Nutting, *Proc. US Natl. Mus.* **6** (1883): 398 [*Geothlypis semiflava bairdi*].
Ridgway (1884). *Proc. Biol. Soc. Washington* **2**: 101 [*Loxia curvirostra bendirei*], 103 [*Loxia curvirostra japonica*].
Ridgway (1884). *Proc. US Natl. Mus.* **7**: 173 [*Dendroica petechia rufopileata*], 178 [*Vireo altiloquus grandior*], 179 [*Vireo pallens approximans*].
Ridgway (1885). *Proc. Biol. Soc. Washington* **3**: 21 [*Dendroica petechia rufivertex*], 22 [*Cyclarhis gujanensis insularis*, *Vireo bairdi*].
Ridgway (1885). *Proc. US Natl. Mus.* **8**: 23 [*Granatellus sallaei boucardi*], 24 [*Vireolanius pulchellus verticalis*], 350 [*Dendroica petechia castaneiceps*], 354 [*Loxia curvirostra stricklandi*].
Ridgway (1886). *Auk* **3**: 334 [*Geothlypis rostrata coryi*], 335 [*Geothlypis rostrata tanneri*].
Ridgway (1887). *Man. North Amer. Birds*: 391 [*Carpodacus mexicanus ruberrimus*], 492 [*Parula pitiayumi graysoni*], 526 [*Geothlypis poliocephala palpebralis*].
Ridgway (1887). *Proc. US Natl. Mus.* **9**: 519 [*Cyclarhis gujanensis yucatanensis*].
Ridgway (1889). *Proc. US Natl. Mus.* **11** (1888): 537 [*Zeledonia*], 538 [*Zeledonia coronata*], 539 [*Geothlypis poliocephala icterotis*].
Ridgway (1892). *Proc. US Natl. Mus.* **15**: 119 [*Basileuterus rufifrons dugesi*, *Basileuterus rufifrons jouyi*].
Ridgway (1893). *Proc. US Natl. Mus.* **16**: 598 [*Foudia eminentissima aldabrana*].
Ridgway (1894). *Proc. US Natl. Mus.* **16** (1893): 692 [*Geothlypis poliocephala ralphi*].
Ridgway (1896). *Proc. US Natl. Mus.* **18** (1895): 119 [*Geothlypis flavovelata*].
Ridgway (1898). *Auk* **15**: 319 [*Pinicola enucleator montana*], 320 [*Carduelis psaltria jouyi*].
Ridgway (1899). *Auk* **16**: 37 [*Carduelis magellanica alleni*].
Ridgway (1902). *Auk* **19**: 69 [*Parula pitiayumi speciosa*].
Ridgway (1902). *Birds North Middle Amer. Descript. Cat.* **2**: 657 [*Geothlypis rostrata exigua*].
Ridgway (1902). *Bull. US Natl. Mus.* **50(2)**: 705 [*Wilsonia pusilla chryseola*], 741 [*Basileuterus belli clarus*], 742 [*Basileuterus culicivorus flavescens*].
Ridgway (1903). *Proc. Biol. Soc. Washington* **16**: 107 [*Vireo gilvus brewsteri*, *Vireo huttoni cognatus*, *Vireo huttoni mexicanus*, *Vireo leucophrys costaricensis*], 108 [*Hylophilus ochraceiceps pallidipectus*, *Vireo bellii arizonae*, *Vireolanius pulchellus viridiceps*].
Riley (1904). *Smithsonian Misc. Coll.* **47**: 289 [*Dendroica subita*].
Riley (1915). *Proc. Biol. Soc. Washington* **28**: 163 [*Eophona migratoria sowerbyi*].
Riley (1916). *Smithsonian Misc. Coll.* **66(15)**: 1 [*Loxia megaplaga*].
Riley (1918). *Proc. Biol. Soc. Washington* **31**: 33 [*Pyrrhula erythaca wilderi*].
Riley (1920). *Proc. Biol. Soc. Washington* **33**: 57 [*Lonchura punctulata particeps*].
Ripley (1964). *Peabody Mus. Nat. Hist. Yale Univ. Bull.* **19**: 74 [*Lonchura teerinki mariae*].
Ripley & Rabor (1961). *Postilla Yale Peabody Mus.* **50**: 13 [*Serinus estherae mindanensis*], 18 [*Erythrura coloria*].
Ripley & Rabor (1962). *Postilla Yale Peabody Mus.* **73**: 11 [*Lonchura leucogastra palawana*].
Rippon (1906). *Bull. Brit. Orn. Club* **16(4)**: 47 [*Pyrrhula nipalensis victoriae*]; **19(3)**: 31 [*Carpodacus thura femininus*].
Roberts (1916). *Ann. Transvaal Mus.* **5(3)** (Suppl. 1): 1 [*Pseudochloroptila symonsi*].
Roberts (1922). *Ann. Transvaal Mus.* **8**: 264 [*Serinus flaviventris damarensis*].
Roberts (1924). *Ann. Transvaal Mus.* **10**: 186 [*Serinus canicollis thompsonae*].
Roberts (1929). *Ann. Transvaal Mus.* **13**: 74 [*Ploceus xanthopterus marleyi*].
Roberts (1932). *Ann. Transvaal Mus.* **15**: 32 [*Ortygospiza atricollis pallida*], 33 [*Serinus atrogularis semideserti*, *Serinus mozambicus vansoni*].
Roberts (1936). *Ann. Transvaal Mus.* **18**: 216 [*Serinus sulphuratus wilsoni*], 256 [*Serinus flaviventris guillarmodi*].
Roberts (1937). *Ostrich* **8**: 105 [*Serinus albogularis orangensis*].
Roberts (1940). *Birds South Africa*: 365 [*Serinus scotops transvaalensis*].
Robinson & Kloss (1919). *Ibis* **Ser. 11, no. 1**: 618 [*Loxia curvirostra meridionalis*].
Roselaar (1992). *Bull. Brit. Orn. Club* **112(4)**: 226 [*Leucosticte sillemi*].
Roselaar (1993). *Dutch Birding* **15(6)**: 259 [*Carduelis chloris voousi*].
van Rossem (1929). *Proc. Biol. Soc. Washington* **42**: 179 [*Vermivora ruficapilla ridgwayi*].
van Rossem (1930). *Condor* **32**: 298 [*Geothlypis trichas chryseola*].
van Rossem (1933). *Trans. San Diego Soc. Nat. Hist.* **7**: 285 [*Vireo plumbeus montanus*].
van Rossem (1934). *Bull. Mus. Comp. Zool. Harvard* **77**: 418 [*Vireo pallens salvini*], 465 [*Vireo hypochryseus nitidus*].
van Rossem (1935). *Trans. San Diego Soc. Nat. Hist.* **8**: 67 [*Dendroica petechia rhizophorae*].
van Rossem (1936). *Condor* **38**: 117 [*Myioborus miniatus hellmayri*].
van Rossem (1938). *Bull. Brit. Orn. Club* **58(9)**: 134 [*Carduelis pinus perplexa*].
van Rossem (1939). *Proc. Biol. Soc. Washington* **52**: 12 [*Parula superciliosa palliata*].
van Rossem (1943). *Condor* **45**: 158 [*Carduelis tristis jewetti*].
Rothschild (1893). *Avifauna Laysan & Hawaiian Possessions*: 75 [*Hemignathus wilsoni*].
Rothschild (1893). *Bull. Brit. Orn. Club* **1(7)**: 35 [*Pseudonestor*], 36 [*Pseudonestor xanthophrys*]; **1(8)**: 42 [*Chlorodrepanis virens wilsoni*].
Rothschild (1893). *Ibis* **Ser. 6, no. 5**: 112 [*Hemignathus affinis*, *Loxops ochraceus*], 113 [*Palmeria*].
Rothschild (1906). *Bull. Brit. Orn. Club* **16(7)**: 81 [*Granatellus pelzelni paraensis*].
Rothschild (1909). *Bull. Brit. Orn. Club* **23(9)**: 102 [*Euschistospiza cinereovinacea graueri*].
Rothschild (1912). *Bull. Brit. Orn. Club* **31(3)**: 26 [*Foudia omissa*].
Rothschild & Hartert, E.J.O. (1899). *Orn. Monatsber.* **7**: 139 [*Lonchura hunsteini nigerrima*].
Rowley, J.S. (1968). *Occas. Pap. West. Found. Vert. Zool.* **1**: 5 [*Vireo leucophrys bulli*].
Rüppell (1840). *Neue Wirbelth. Fauna Abyss.* **13.** *Vög.* **6**: 92, plate 32, fig. 2 [*Ploceus galbula*], 93, plate 33, fig. 1 [*Ploceus rubiginosus*], 94 [*Euplectes capensis xanthomelas*], 95, plate 34, fig. 1 [*Serinus citrinelloides*], 96 [*Serinus xanthopygius*], 96, plate 34, fig. 2 [*Serinus nigriceps*], 97 [*Serinus tristriatus*], 97, plate 36, fig. 1 [*Lagonosticta larvata*], 99, plate 37, fig. 1 [*Serinus striolatus*].
Rüppell (1845). *Syst. Uebers. Vög. N.-O. Afr.*: 71 [*Ploceus intermedius*], 72, plate 30 [*Dinemellia dinemelli*], 74 [*Plocepasser mahali melanorhynchus*].
Sachtleben (1919). *Anz. Orn. Ges. Bayern* **1**: 3 [*Carduelis carduelis balcanica*].
Salaman & Stiles (1996). *Ibis* **138(4)**: 612, plate 1 [*Vireo masteri*].
Salvadori (1869). *Proc. Zool. Soc. London* **1868(3)**: 579, plate 44 [*Leucosticte arctoa gigliolii*].
Salvadori (1876). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 9(3)** (1876/1877): 38 [*Lonchura caniceps*].
Salvadori (1884). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 2, no. 1(12)**: 180 [*Cryptospiza*].
Salvadori (1888). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 2, no. 6(17)**: 272 [*Serinus flavigula*, *Serinus reichenowi*]; **Ser. 2, no. 6(18)**: 287 [*Euplectes axillaris traversii*].
Salvadori (1894). *Mem. Accad. Sci. Torino* **Ser. 2, no. 44**: 557 [*Lagonosticta senegala somaliensis*].
Salvadori (1896). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 2, no. 16(3)**: 44 [*Serinus xantholaemus*], 45 [*Ploceus dicrocephalus*].
Salvadori (1897). *Boll. Mus. Zool. Anat. Comp. Univ. Torino* **12(287)**: 4 [*Estrilda paludicola ochrogaster*].
Salvadori (1903). *Mem. Accad. Sci. Torino* **Ser. 2, no. 53**: 26 [*Neospiza*].
Salvin (1863). *Proc. Zool. Soc. London* **1863(2)**: 188 [*Vireo pallens*, *Vireo pallens ochraceus*, *Vireo pallens semiflavus*], 188, plate 24, fig. 1 [*Ergaticus versicolor*], 190 [*Carduelis atriceps*].
Salvin (1872). *Ibis* **Ser. 3, no. 2**: 148 [*Geothlypis aequinoctialis chiriquensis*].
Salvin (1878). *Ibis* **Ser. 4, no. 2**: 314, plate 7, fig. 2 [*Myioborus ornatus chrysops*].
Salvin (1883). *Proc. Zool. Soc. London* **1883(3)**: 420 [*Geothlypis aequinoctialis auricularis*].
Salvin (1887). *Ibis* **Ser. 5, no. 5**: 129, plate 4 [*Myioborus flavivertex*].
Salvin & Godman (1880). *Ibis* **Ser. 4, no. 4**: 117 [*Basileuterus conspicillatus*].
Salvin & Godman (1881). *Biol. Centr.-Amer., Aves* **1**: 193 [*Vireo leucophrys amauronotus*].
Salvin & Godman (1883). *Ibis* **Ser. 5, no. 1**: 205 [*Hylophilus sclateri*].
Salvin & Godman (1886). *Biol. Centr.-Amer., Aves* **1**: 429 [*Carduelis notata forreri*].
Salvin & Godman (1889). *Ibis* **Ser. 6, no. 1**: 380 [*Vermivora crissalis*].
Sassi (1920). *Orn. Monatsber.* **28**: 81 [*Ploceus albinucha holomelas*, *Ploceus aureonucha*].
Say (1823). In: Long, *Exped. Rocky Mountains (Philadelphia ed.)* **1**: 169 [*Vermivora celata*]; **2**: 40 [*Carpodacus mexicanus frontalis*, *Carduelis psaltria*].
Schlegel (1867). *Proc. Zool. Soc. London* **1866(3)**: 423 [*Foudia eminentissima algondae*].
Schouteden (1950). *Rev. Zool. Bot. Afr.* **44**: 117 [*Linurgus olivaceus prigoginei*].
Schouteden (1956). *Rev. Zool. Bot. Afr.* **54**: 272 [*Spermestes bicolor woltersi*].
Schuchmann & Wolters (1982). *Bull. Brit. Orn. Club* **102(1)**: 12 [*Serinus estherae renatae*].
Sclater, P.L. (1858). *Proc. Zool. Soc. London* **1857(25)**, no. 340: 213 [*Vireo brevipennis*].
Sclater, P.L. (1859). *Proc. Zool. Soc. London* **1858(26)**, no. 374: 447 [*Geothlypis speciosa*], 448 [*Cyclarhis gujanensis flavipectus*]; **1859(2)**: 137, plate 154 [*Vireo leucophrys josephae*].
Sclater, P.L. (1860). *Proc. Zool. Soc. London* **1859(3)**: 375 [*Hylophilus ochraceiceps*]; **1860(1)**: 84 [*Basileuterus fulvicauda semicervinus*]; **1860(2)**: 251 [*Basileuterus rufifrons mesochrysus*], 273 [*Geothlypis semiflava*], 274, plate 164 [*Cyclarhis gujanensis virenticeps*].
Sclater, P.L. (1861). *Proc. Zool. Soc. London* **1860(3)**: 462 [*Vireo modestus*]; **1861(1)**: 72, plate 14, fig. 2 [*Vireo osburni*], 128 [*Hylophilus flavipes insularis*].
Sclater, P.L. (1862). *Cat. Coll. Amer. Birds*: 125 [*Carduelis uropygialis*].
Sclater, P.L. (1862). *Proc. Zool. Soc. London* **1862(1)**: 110 [*Hylophilus ochraceiceps ferrugineifrons*].
Sclater, P.L. (1863). *Proc. Zool. Soc. London* **1862(3)**: 369, plate 46 [*Vireo hypochryseus*].
Sclater, P.L. (1864). *Proc. Zool. Soc. London* **1864(2)**: 166 [*Basileuterus cinereicollis*].
Sclater, P.L. (1865). *Proc. Zool. Soc. London* **1864(3)**: 606, plate 37, fig. 1 [*Granatellus pelzelni*]; **1865(1)**: 286, plate 9, fig. 1 [*Basileuterus rivularis mesoleucus*].
Sclater, P.L. (1866). *Proc. Zool. Soc. London* **1866(2)**: 321 [*Hylophilus pectoralis*], 322 [*Hylophilus brunneiceps*].
Sclater, P.L. (1876). *Proc. Zool. Soc. London* **1876(1)**: 14 [*Leucopeza*], 14, plate 2 [*Leucopeza semperi*].
Sclater, P.L. (1879). *Proc. Zool. Soc. London* **1879(3)**: 449, plate 37, fig. 2 [*Lonchura spectabilis*], 449, plate 37, fig. 3 [*Lonchura forbesi*].
Sclater, P.L. (1880). *Ibis* **Ser. 4, no. 4**: 74 [*Catharopeza*].
Sclater, P.L. (1880). *Proc. Zool. Soc. London* **1880(1)**: 66, plate 7, fig. 2 [*Lonchura melaena*].
Sclater, P.L. (1881). *Ibis* **Ser. 4, no. 5**: 308 [*Hylophilus ochraceiceps luteifrons*], 544, plate 15, fig. 1 [*Erythrura cyaneovirens serena*], 544, plate 15, fig. 2 [*Erythrura cyaneovirens regia*].
Sclater, P.L. (1884). *Proc. Zool. Soc. London* **1883(4)**: 653, plate 61 [*Basileuterus fraseri*].
Sclater, P.L. (1887). *Ibis* **Ser. 5, no. 5**: 324, plate 10 [*Cyclarhis nigrirostris atrirostris*].
Sclater, P.L. & Hartlaub (1881). *Proc. Zool. Soc. London* **1881(1)**: 170 [*Rhynchostruthus*], 171 [*Rhynchostruthus socotranus*].
Sclater, P.L. & Salvin (1859). *Ibis* **Ser. 1, no. 1**: 12 [*Vireolanius pulchellus*].
Sclater, P.L. & Salvin (1860). *Proc. Zool. Soc. London* **1860(2)**: 298 [*Dendroica chrysoparia*].
Sclater, P.L. & Salvin (1867). *Proc. Zool. Soc. London* **1867(2)**: 569, plate 30, fig. 1 [=fig. 2] [*Hylophilus ochraceiceps rubrifrons*], 570, plate 30, fig. 1 [*Hylophilus semicinereus*].
Sclater, P.L. & Salvin (1868). *Proc. Zool. Soc. London* **1868(1)**: 170 [*Basileuterus griseiceps*].
Sclater, P.L. & Salvin (1871). *Proc. Zool. Soc. London* **1870(3)**: 784 [*Myioborus albifrons*].
Sclater, P.L. & Salvin (1873). *Nomen. Aves Neotrop.*: 156 [*Basileuterus fulvicauda leucopygius*, *Hylophilus muscicapinus*].
Sclater, P.L. & Salvin (1876). *Proc. Zool. Soc. London* **1876(2)**: 352 [*Basileuterus luteoviridis euophrys*].
Sclater, P.L. & Salvin (1877). *Proc. Zool. Soc. London* **1877(3)**: 521 [*Basileuterus coronatus castaneiceps*].
Sclater, P.L. & Salvin (1880). *Proc. Zool. Soc. London* **1880(2)**: 155 [*Hylophilus hypoxanthus fuscicapillus*].
Sclater, W.L. (1925). *Bull. Brit. Orn. Club* **46(3)**: 45 [*Cryptospiza salvadorii ruwenzori*].
Sclater, W.L. (1931). *Bull. Brit. Orn. Club* **52(1)**: 26 [*Ploceus nicolli*].
Sclater, W.L. (1932). *Bull. Brit. Orn. Club* **52(9)**: 143 [*Ortygospiza atricollis fuscata*].
Sclater, W.L. & Mackworth-Praed (1918). *Ibis* **Ser. 10, no. 6**: 460 [*Anomalospiza imberbis butleri*], 465 [*Serinus mozambicus tando*].
Sclater, W.L. & Mackworth-Praed (1931). *Ibis* **Ser. 13, no. 1**: 581 [*Serinus mozambicus grotei*].
Scopoli (1786). *Deliciae Florae Faunae Insubricae*, Part **2**: 96 [*Ploceus nelicourvi*].
Seebohm (1890). *Ibis* **Ser. 6, no. 2**: 101 [*Carduelis sinica kittlitzi*].
Severtsov (1883). *Ibis* **Ser. 5, no. 1**: 58 [*Leucosticte brandti pamirensis*].
Sharpe (1869). *Ibis* **Ser. 2, no. 5**: 384, plate 11 [*Nigrita canicapillus emiliae*, *Nigrita fusconotus uropygialis*].
Sharpe (1870). *Ibis* **Ser. 2, no. 6**: 56 [*Pytilia hypogrammica*], 482, plate 14, figs. 2–3 [*Mandingoa nitidula schlegeli*].

Sharpe (1871). *Ann. Mag. Nat. Hist.* **Ser. 4, no. 8**: 235 [*Serinus leucopterus*].
Sharpe (1871). *Cat. Afr. Birds*: 63 [*Euplectes axillaris bocagei*].
Sharpe (1871). *Ibis* **Ser. 3, no. 1**: 101 [*Serinus albogularis crocopygius*].
Sharpe (1871). *Proc. Zool. Soc. London* **1871(1)**: 133 [*Vidua funerea nigerrima*].
Sharpe (1882). *J. Linn. Soc. London (Zool.)* **16(92)**: 319 [*Lonchura grandis*].
Sharpe (1885). *Cat. Birds Brit. Mus.* **10**: 386 [*Basileuterus tristriatus auricularis*], 387 [*Basileuterus tristriatus meridanus*], 392 [*Basileuterus bivittatus roraimae*], 402 [*Basileuterus rivularis bolivianus*], 403 [*Basileuterus fulvicauda veraguensis*], 417 [*Myioborus pictus guatemalae*].
Sharpe (1886). *Proc. Zool. Soc. London* **1886(1)**: 97 [*Coccothraustes coccothraustes humii*]; **1886(3)**: 354 [*Carpodacus rubicilla severtzovi*].
Sharpe (1888). *Cat. Birds Brit. Mus.* **12**: 175 [*Fringilla coelebs maderensis*], 210 [*Carduelis xanthogastra stejnegeri*], 220 [*Carduelis magellanica longirostris*, *Carduelis magellanica boliviana*], 282 [*Rhodospiza*], 424 [*Carpodacus mexicanus roseipectus*], 433 [*Pyrrhospiza punicea humii*].
Sharpe (1889). *Ann. Mag. Nat. Hist.* **Ser. 6, no. 3**: 424 [*Erythrura hyperythra borneensis*].
Sharpe (1890). *Cat. Birds Brit. Mus.* **13**: 277 [*Lagonosticta senegala brunneiceps*], 280, plate 11, fig. 3 [*Lagonosticta rubricata congica*], 283, plate 12, fig. 1 [*Lagonosticta rubricata landanae*], 298 [*Pytilia melba soudanensis*], 307 [*Coccopygia quartinia kilimensis*], 309 [*Vidua chalybeata amauropteryx*], 353 [*Lonchura punctulata cabanisi*], 368 [*Lonchura molucca propinqua*], 403 [*Granatina*], 426 [*Ploceus pelzelni monacha*], 448 [*Ploceus castaneiceps*].
Sharpe (1890). *J. Linn. Soc. London (Zool.)* **20**: 478 [*Vireo gracilirostris*].
Sharpe (1891). *Ibis* **Ser. 6, no. 3**: 117 [*Ploceus insignis*, *Ploceus melanogaster stephanophorus*], 118 [*Nigrita canicapillus schistaceus*, *Serinus burtoni albifrons*], 246 [*Euplectes jacksoni*], 258 [*Serinus reichardi striatipectus*].
Sharpe (1895). *Bull. Brit. Orn. Club* **4(9)**: 41 [*Serinus donaldsoni*, *Serinus dorsostriatus maculicollis*]; **5(3)**: 14 [*Plocepasser donaldsoni*].
Sharpe (1898). *Bull. Brit. Orn. Club* **7(9)**: 60 [*Lonchura caniceps scratchleyana*].
Sharpe (1900). *Bull. Brit. Orn. Club* **10(8)**: 102 [*Estrilda erythronotos delamerei*].
Sharpe (1900). *Ibis* **Ser. 7, no. 6**: 110 [*Estrilda astrild cavendishi*].
Sharpe (1901). *Bull. Brit. Orn. Club* **11(5)**: 57 [*Euplectes hartlaubi humeralis*].
Sharpe (1902). *Bull. Brit. Orn. Club* **13(1)**: 8 [*Cryptospiza jacksoni*, *Cryptospiza reichenovii ocularis*]; **13(2)**: 21 [*Cryptospiza shelleyi*, *Ploceus alienus*].
Sharpe (1903). *Bull. Brit. Orn. Club* **13(9)**: 80 [*Alario alario leucolaemus*].
Sharpe (1905). *Bull. Brit. Orn. Club* **15(9)**: 95 [*Carpodacus pulcherrimus waltoni*].
Sharpe (1906). *Bull. Brit. Orn. Club* **19(2)**: 18 [*Malimbus coronatus*].
Sharpe (1908). *Ibis* **Ser. 9, no. 2**: 348 [*Ploceus batesi*].
Sharpe & Ussher (1872). *Ibis* **Ser. 3, no. 2**: 182 [*Parmoptila rubrifrons*].
Shaw (1796). *Mus. Lever.* **6**: 47 [*Stagonopleura guttata*].
Shelley (1873). *Ibis* **Ser. 3, no. 3**: 140 [*Pachyphantes superciliosus*], 141 [*Lagonosticta rubricata polionota*].
Shelley (1881). *Proc. Zool. Soc. London* **1881(3)**: 586 [*Euplectes axillaris zanzibaricus*].
Shelley (1882). *Ibis* **Ser. 4, no. 6**: 355 [*Lagonosticta rhodopareia jamesoni*].
Shelley (1887). *Proc. Zool. Soc. London* **1887(1)**: 126 [*Ploceus melanogaster*].
Shelley (1888). *Ibis* **Ser. 5, no. 6**: 293 [*Ploceus jacksoni*].
Shelley (1888). *Proc. Zool. Soc. London* **1888(1)**: 30 [*Spermophaga ruficapilla*], 35 [*Ploceus castanops*].
Shelley (1890). *Ibis* **Ser. 6, no. 2**: 163, plate 5, fig. 1 [*Parmoptila jamesoni*].
Shelley (1893). *Ibis* **Ser. 6, no. 5**: 23 [*Ploceus bertrandi*].
Shelley (1894). *Ibis* **Ser. 6, no. 6**: 20 [*Pyrenestes minor*].
Shelley (1896). *Birds Afr.* **1**: 32 [*Clytospiza*], 36 [*Pachyphantes*].
Shelley (1896). *Ibis* **Ser. 7, no. 2**: 184 [*Cryptospiza reichenovii australis*].
Shelley (1897). *Ibis* **Ser. 7, no. 3**: 528 [*Serinus striolatus whytii*].
Shelley (1898). *Ibis* **Ser. 7, no. 4**: 557 [*Ploceus baglafecht sharpii*].
Shelley (1901). *Bull. Brit. Orn. Club* **12(2)**: 30 [*Anomalospiza*].
Shelley (1902). *Birds Afr.* **3**: 200 [*Serinus flaviventris marshalli*].
Shelley (1903). *Bull. Brit. Orn. Club* **13(6)**: 56 [*Coccopygia bocagei*]; **13(8)**: 73 [*Euplectes progne delamerei*], 75 [*Amandava subflava clarkei*, *Estrilda astrild peasei*], 76 [*Pytilia melba jessei*].
Sibley (1940). *Condor* **42**: 255 [*Vireo gilvus victoriae*].
Smith, A. (1828). *South Afr. Comm. Advert.* **3**: 144 [*Ploceus ocularis*].
Smith, A. (1833). *South Afr. Quart. J.* **Ser. 2, no. 1**: 48 [*Serinus albogularis*].
Smith, A. (1836). *Rep. Exped. Explor. Central Africa*: 49 [*Serinus atrogularis*, *Serinus gularis*, *Sporopipes squamifrons*], 50 [*Euplectes afer taha*], 51 [*Bubalornis*, *Plocepasser*, *Plocepasser mahali*, *Quelea quelea lathamii*], 52 [*Bubalornis niger*].
Smith, A. (1837). *Charlesworth's Mag. Nat. Hist.* **1**: 536 [*Philetairus*].
Smith, A. (1838). *Illustr. Zool. South Afr.*, Part **4**: plate 17 and text [*Euplectes axillaris*].
Smith, A. (1839). *Illustr. Zool. South Afr.*, Part **7**: plate 30 and text [*Ploceus subaureus*, *Ploceus subaureus aureoflavus*].
Snethlage, E. (1907). *Orn. Monatsber.* **15**: 160 [*Hylophilus muscicapinus griseifrons*].
Snethlage, E. (1914). *Orn. Monatsber.* **22**: 43 [*Hylophilus hypoxanthus inornatus*, *Hylophilus ochraceiceps lutescens*].
van Someren (1918). *Novit. Zool.* **25**: 283 [*Linurgus olivaceus elgonensis*].
van Someren (1919). *Bull. Brit. Orn. Club* **40(2)**: 55 [*Estrilda erythronotos kiwanukae*], 56 [*Pytilia melba percivali*].
van Someren (1920). *Bull. Brit. Orn. Club* **40(4)**: 94 [*Anaplectes rubriceps jubaensis*].
van Someren (1921). *Bull. Brit. Orn. Club* **41(7)**: 114 [*Serinus dorsostriatus taruensis*], 115 [*Ortygospiza atricollis dorsostriata*]; **41(8)**: 121 [*Euplectes ardens suahelicus*, *Ortygospiza atricollis ugandae*], 122 [*Amblyospiza albifrons montana*].
Sousa (1888). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 12**: 155 [*Estrilda thomensis*].
Sousa (1889). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 2, no. 1**: 40 [*Serinus flavivertex huillensis*], 49 [*Euschistospiza cinereovinacea*].
Sparrman (1786). *Mus. Carlsonianum*, Part **1**: plate 18 [*Pseudochloroptila totta*].
Sparrman (1788). *Mus. Carlsonianum*, Part **3**: plate 71 [*Ploceus hypoxanthus*], plates 72–73 [*Erythrura prasina*].
Sparrman (1789). *Mus. Carlsonianum*, Part **4**: plates 90–91 [*Lonchura ferruginosa*].
Spix (1825). *Aves Spec. Nov. Brasil.* **2**: 20, plate 28, fig. 2 [*Basileuterus fulvicauda*].
Statius Müller (1776). *Vollst. Natursystem*, Part **7** (Suppl.): 87 [*Ploceus cucullatus*], 150 [*Pinicola enucleator leucura*], 163 [*Serinus mozambicus*], 165 [*Carduelis cabaret*, *Carpodacus mexicanus*], 166 [*Vidua chalybeata*], 175 [*Dendroica fusca*].
Stegmann (1929). *J. Orn.* **77(2)**: 247 [*Carduelis sinica chabarovi*].
Stegmann (1931). *Orn. Monatsber.* **39**: 184 [*Carpodacus thura deserticolor*].
Stegmann (1932). *J. Orn.* **80**: 106 [*Leucosticte arctoa sushkini*].
Stejneger (1885). *Bull. US Natl. Mus.* **29**: 265 [*Carpodacus erythrinus grebnitskii*].
Stejneger (1887). *Proc. US Natl. Mus.* **10**: 94 [*Magumma parva*], 99 [*Oreomystis bairdi*].
Stejneger (1903). *Proc. Biol. Soc. Washington* **16**: 11 [*Oreomystis*].
Stone (1914). *Science (Washington, D.C.)* **Ser. 2, no. 40(1018)**: 26 [*Limnothlypis*].
Stresemann (1912). *Novit. Zool.* **19**: 317 [*Lonchura punctulata blasii*].
Stresemann (1914). *Novit. Zool.* **21**: 147 [*Erythrura trichroa pinaiae*].
Stresemann (1921). *Anz. Orn. Ges. Bayern* **1**: 33 [*Lonchura grandis ernesti*].
Stresemann (1930). *Orn. Monatsber.* **38**: 17 [*Carpodacus synoicus beicki*], 75 [*Carpodacus eos*].
Stresemann (1931). *Orn. Monatsber.* **39**: 12 [*Erythrura hyperythra microrhyncha*, *Erythrura trichroa sanfordi*].
Stresemann (1934). *Orn. Monatsber.* **42**: 101 [*Lonchura nevermanni*], 102 [*Lonchura stygia*].
Stresemann (1940). *Mitt. Zool. Mus. Berlin* **24**: 153 [*Carduelis spinoides heinrichi*].
Stresemann & Paludan (1934). *Orn. Monatsber.* **42**: 43 [*Lonchura castaneothorax uropygialis*, *Lonchura tristissima hypomelaena*].
Strickland (1841). *Proc. Zool. Soc. London* **1841(9)**, no. 99: 30 [*Nigrita canicapillus*].
Strickland (1843). In: Fraser, *Proc. Zool. Soc. London* **1842(10)**, no. 117: 145 [*Nigrita*].
Strickland (1844). *Ann. Mag. Nat. Hist.* **Ser. 1, no. 13**: 418, plate 10 [*Hypargos margaritatus*].
Strickland (1853). In: Jardine, *Contr. Orn.* **1852**: 151 [*Pytilia melba citerior*].
Stuart Baker (1925). *Bull. Brit. Orn. Club* **45(4)**: 58 [*Ploceus manyar peguensis*], 59 [*Lonchura striata subsquamicollis*]; **45(6)**: 84 [*Erythrura prasina coelica*]; **45(7)**: 92 [*Carpodacus nipalensis intensicolor*].
Sundevall (1850). *Öfver. Kongl. Vet. Akad. Förhandl.* **7**: 97 [*Anaplectes rubriceps*], 98 [*Amblyospiza*, *Estrilda perreini incana*, *Ortygospiza*, *Serinus scotops*], 126 [*Estrilda rhodopyga*, *Quelea quelea aethiopica*], 127 [*Serinus leucopygius*].
Sundevall (1870). *Öfver. Kongl. Vet. Akad. Förhandl.* **26** (1869): 607 [*Dendroica petechia bartholemica*], 609 [*Dendroica petechia aequatorialis*, *Dendroica petechia peruviana*].
Sushkin (1925). *List Distr. Birds Russian Altai*: 66 [*Loxia curvirostra altaiensis*].
Sushkin (1925). *Proc. Boston Soc. Nat. Hist.* **38**: 6 [*Carduelis flavirostris kirghizorum*], 7 [*Carduelis flavirostris altaica*], 13 [*Carpodacus rubicilla kobdensis*].
Sutton (1951). *Auk* **68**: 28, plate 1 [*Dendroica dominica stoddardi*].
Sutton & Burleigh (1939). *Proc. Biol. Soc. Washington* **52**: 145 [*Hesperiphona abeillei saturata*].
Sutton & Burleigh (1940). *Auk* **57**: 399 [*Vireo leucophrys eleanorae*].
Swainson (1820). *Zool. Illustr.*, Part **1**: plate 7 and text [*Carduelis cucullata*].
Swainson (1824). *Zool. J.* **1(1)** (1825): 294 [*Cyclarhis*].
Swainson (1827). *Philos. Mag., N.S.* **1**: 368 [*Ergaticus ruber*, *Myioborus miniatus*, *Setophaga*], 369 [*Seiurus*], 434 [*Vermivora*].
Swainson (1827). *Zool. J.* **3**: 349 [*Amadina*, *Estrilda*].
Swainson (1829). *Zool. Illustr. (2nd Ser.)* **1**, Part **1-6**: plate 3 and text [*Myioborus pictus*].
Swainson (1830). *Zool. Illustr. (2nd Ser.)* **1**, Part **8**: plate 37 and text [*Euplectes*].
Swainson (1832). In: Swainson & Richardson, *Fauna Bor.-Amer.* **2** (1831): 265 [*Leucosticte*, *Leucosticte tephrocotis*].
Swainson (1837). *Birds West. Afr.* **7(1)**: 156 [*Pyrenestes*, *Pyrenestes sanguineus*], 164 [*Spermophaga*], 168 [*Ploceus nigricollis brachypterus*], 201 [*Spermestes*, *Spermestes cucullata*], 203, plate 16 [*Pytilia*, *Pytilia phoenicoptera*].
Swainson (1837). *Classif. Birds* **2**: 280 [*Erythrura*].
Swainson (1838). *Anim. in Menag.*: 293 [*Basileuterus culicivorus auricapilla*], 294 [*Basileuterus rufifrons*], 306 [*Malimbus rubricollis*], 317 [*Serinus canicollis*], 341 [*Vireolanius leucotis*].
Swinhoe (1863). *Ibis* **Ser. 1, no. 5**: 380 [*Lonchura punctulata topela*].
Swinhoe (1865). *Ibis* **Ser. 2, no. 1**: 356 [*Lonchura atricapilla formosana*].
Swinhoe (1870). *Proc. Zool. Soc. London* **1870(2)**: 447 [*Eremopsaltria mongolica*].
Sykes (1832). *Proc. Zool. Soc. London* **1832(2)**, no. 18: 94 [*Lonchura*].
Taczanowski (1879). *Proc. Zool. Soc. London* **1879(2)**: 224, plate 21 [*Cyclarhis gujanensis contrerasi*].
Taczanowski (1880). *Proc. Zool. Soc. London* **1880(2)**: 191 [*Basileuterus trifasciatus*].
Taczanowski (1884). *Orn. Péruviana* **1**: 471 [*Geothlypis aequinoctialis peruviana*].
Takatsukasa & Yamashina (1931). *Tori* **7**: 110 [*Erythrura trichroa clara*].
Tarragon (1847). *Rev. Zool.* **Ser. 1, no. 10**: 180 [*Vidua funerea*].
Temminck (1820). *Man. d'Orn. Tabl. Syst.*, 2nd edition, **1**: 70 [*Psittirostra*], 86 [*Drepanis*].
Temminck (1822). *Planches Color.*, Livr. **29**: plate 173 [*Hylophilus*], plate 173, fig. 1 [*Hylophilus thoracicus*], plate 173, fig. 2 [*Hylophilus poicilotis*].
Temminck (1823). *Planches Color.*, Livr. **37**: plate 221, fig. 1 [*Coccopygia melanotis*].
Temminck (1825). *Planches Color.*, Livr. **63**: plate 375 [*Carpodacus synoicus*].
Temminck (1830). *Planches Color.*, Livr. **84**: plate 500, fig. 2 [*Lonchura punctulata nisoria*].
Temminck (1836). *Planches Color.*, Livr. **99**: plate 588, fig. 1 [*Carduelis sinica kawarahiba*].
Temminck & Schlegel (1845). In: Siebold, *Fauna Jap., Aves*, Part **2**: plate 52 [*Eophona personata*].
Temminck & Schlegel (1848). In: Siebold, *Fauna Jap., Aves*, Part **4–8**: 89 [*Carduelis sinica minor*], 90, plate 51 [*Coccothraustes coccothraustes japonicus*], 92, plate 54 [*Uragus sibiricus sanguinolentus*].
Ticehurst (1932). *Bull. Brit. Orn. Club* **52(5)**: 105 [*Ploceus philippinus burmanicus*].
Todd (1909). *Proc. Biol. Soc. Washington* **22**: 171 [*Dendroica dominica flavescens*].
Todd (1912). *Ann. Carnegie Mus.* **8**: 204 [*Parula pitiayumi elegans*].
Todd (1913). *Proc. Biol. Soc. Washington* **26**: 170 [*Basileuterus basilicus*, *Basileuterus culicivorus viridescens*].
Todd (1916). *Ann. Carnegie Mus.* **10**: 256 [*Vireo gundlachii orientalis*].
Todd (1916). *Proc. Biol. Soc. Washington* **29**: 95 [*Basileuterus culicivorus indignus*].
Todd (1924). *Proc. Biol. Soc. Washington* **37**: 123 [*Dendroica petechia xanthotera*, *Parula pitiayumi melanogenys*], 124 [*Vireo leucophrys laetissimus*].
Todd (1926). *Ann. Carnegie Mus.* **17**: 47 [*Carduelis magellanica santaecrucis*], 51 [*Carduelis magellanica paula*], 62 [*Carduelis magellanica tucumana*], 65 [*Carduelis magellanica urubambensis*].
Todd (1929). *Proc. Biol. Soc. Washington* **42**: 191 [*Hylophilus semicinereus viridiceps*], 194 [*Hylophilus ochraceiceps viridior*], 195 [*Hylophilus ochraceiceps nelsoni*].
Todd (1929). *Proc. US Natl. Mus.* **74**: 32 [*Basileuterus coronatus chapmani*], 33 [*Basileuterus coronatus notius*], 35 [*Basileuterus coronatus elatus*], 36 [*Basileuterus coronatus regulus*], 45 [*Basileuterus signatus flavovirens*].
Todd (1931). *Auk* **48**: 412 [*Vireo olivaceus solimoensis*].
Townsend, C.H. (1890). *Proc. US Natl. Mus.* **13**: 139 [*Vermivora celata sordida*].
Townsend, J.K. (1837). *J. Acad. Nat. Sci. Philadelphia* **7**: 190 [*Dendroica occidentalis*], 191 [*Dendroica coronata auduboni*, *Dendroica nigrescen*, *Dendroica townsendis*].
Townsend, J.K. (1839). *Narr. J. Rocky Mountains, etc.* 343 [*Oporornis tolmiei*].
Traylor (1964). *Bull. Brit. Orn. Club* **84(4)**: 64 [*Estrilda atricapilla avakubi*].
Traylor (1970). *Bull. Brit. Orn. Club* **90(3)**: 85 [*Serinus citrinelloides brittoni*].
Tristram (1889). *Ann. Mag. Nat. Hist.* **Ser. 6, no. 3**: 489 [*Fringilla coelebs palmae*].
Tschudi (1844). *Arch. Naturges.* **10(1)**: 276 [*Basileuterus chrysogaster*, *Myioborus melanocephalus*], 283 [*Basileuterus coronatus*, *Basileuterus tristriatus*], 284 [*Hylophilus olivaceus*].
Tschudi (1845). *Arch. Naturges.* **11(1)**: 362 [*Cyclarhis gujanensis ochrocephala*].
Tschusi (1901). *Orn. Monatsber.* **9**: 131 [*Carduelis carduelis parva*].
Tschusi (1903). *Orn. Jahrb.* **14**: 139 [*Carduelis cannabina mediterranea*].
Tschusi (1911). *Orn. Jahrb.* **22**: 145 [*Carduelis chloris madaraszi*].
Tschusi (1912). *Orn. Jahrb.* **23**: 217 [*Loxia curvirostra corsicana*].
Tweeddale (1877). *Ann. Mag. Nat. Hist.* **Ser. 4, no. 20**: 96 [*Lonchura leucogastra everetti*].
Van Tyne (1933). *Occas. Pap. Mus. Zool. Univ. Mich.* **255**: 3 [*Geothlypis trichas insperata*]; **256**: 2 [*Vireo plumbeus notius*].
Vaurie (1956). *Amer. Mus. Novit.* **1775**: 6 [*Serinus leucopygius pallens*], **1786**: 20 [*Pyrrhospiza punicea kilianensis*, *Pyrrhospiza punicea sikangensis*].
Verheyen (1947). *Bull. Mus. Hist. Nat. Belg.* **23(10)**: 3 [*Ploceus katangae*].
Verheyen (1953). *Expl. Parc Nat. Upemba, Mission G.F. Witte* **19**: 612 [*Ploceus katangae upembae*].
Verreaux, J. (1870). *Nouv. Arch. Mus. Hist. Nat. Paris (Bull.)* **Ser. 1, no. 6**: 39 [*Carpodacus edwardsii*, *Carpodacus trifasciatus*, *Carpodacus vinaceus*].
Verreaux, J. & Verreaux, É. (1851). *Rev. Mag. Zool.* **Ser. 2, no. 3**: 420 [*Nigrita luteifrons*], 421 [*Estrilda atricapilla*].
Verreaux, J. & Verreaux, É. (1856). *Rev. Mag. Zool.* **Ser. 2, no. 8**: 260, plate 16 [*Vidua hypocherina*].
Vieillot (1805). *Hist. Nat. Ois. Chant.* **1/2**: 54, plate 30 [*Carduelis magellanica*], 71 [*Malimbus*], 73 [*Ploceus aurantius*], 74 [*Ploceus nigricollis*], 79, plate 48 [*Pyrenestes ostrinus*].

Vieillot (1807). *Hist. Nat. Ois. Chant.* **3/4**: 84, plate 53 [*Lonchura atricapilla*], 85, plate 54 [*Lonchura quinticolor*], 95, plate 62 [*Lonchura fuscata*].
Vieillot (1808). *Hist. Nat. Ois. Amér. Septentrionale* **1** (1807): plate 1, fig. 13 [*Pinicola*], 65, plate 34 [*Vireo gilvus*], 67, plate 38 [*Vireo altiloquus*], 83 [*Vireo*], 85 [*Icteria*], 85, plate 54 [*Vireo flavifrons*].
Vieillot (1808). *Hist. Nat. Ois. Chant.* **5/6**: 102, plate 67 [*Spermophaga haematina*].
Vieillot (1809). *Hist. Nat. Ois. Amér. Septentrionale* **2** (1807): 22, plate 74 [*Geothlypis aequinoctialis velata*], 37, plate 98 [*Dendroica discolor*], 9, plate 65 [*Seiurus motacilla*].
Vieillot (1816). *Analyse Nouv. Orn. Elément.*: 45 [*Mniotilta*].
Vieillot (1816). *Nouv. Dict. Hist. Nat.*, 2nd edition, **4**: 286 [*Pyrrhula pyrrhula europoea*].
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INDEX

INDEX

Numbers in *italics* refer to the page numbers of individual photographs.

A

Abeille's Grosbeak 616
abeillei, Hesperiphona 616
Abyssinian Canary 521
Abyssinian Citril 521
Abyssinian Crimsonwing 313
Abyssinian Fawn-breasted Waxbill 315
Abyssinian Firefinch 342
Abyssinian Grosbeak-canary 528
Abyssinian Red-rumped Waxbill 313
Abyssinian Siskin 521
Abyssinian Waxbill 315
Abyssinian Yellow-rumped Seedeater 524
abyssinicus, Ploceus cucullatus 165
Acacia Paradise Whydah 221
achrustera, Dendroica pinus 755
actuosus, Basileuterus rufifrons 793
acuticauda, Lonchura striata 367
acuticauda, Poephila 277, 281, 358
adelaidae, Dendroica 754
Adelaide's Warbler 754
adesma, Estrilda astrild 318
Aegintha 353
aemulus, Hylophilus thoracicus 435
aenea, Vidua chalybeata 227
aequatorialis, Dendroica petechia 745
aequinoctialis, Geothlypis 773
aestiva, Dendroica petechia 745
aethiopica, Quelea quelea 139
afer, Euplectes 99, 143
affinis, Hemignathus 656
affinis, Mycerobas 467, 614
affinis, Serinus striolatus 535
afra, Loxia 143
afra, Pytilia 331
African Bibfinch 359
African Black-headed Siskin 521
African Chaffinch 513
African Citril 521
African Firefinch 341
African Firefinch Indigobird 230
African Firefinch Widowfinch 230
African Golden Weaver *103, 116, 121,* 161
African Masked Weaver 164
African Paradise Whydah 221
African Parsonfinch 359
African Quailfinch *235, 274,* 300
African Silverbill *250, 253, 270,* 359
African Yellow Weaver 161
africana, Fringilla coelebs 513
agilis, Oporornis 672, 768
agilis, Vireo olivaceus 430
Aidemosyne 354
aithocorys, Dendroica petechia 745
Akakane 652, 653
Akakani 652, 657
Akekee *642,* 653
Akepa 652
  Common 652
  Hawaii *620,* 652
  Kauai 653
  Maui 653
  Oahu 647
Akepeuie 652, 653
  Ochraceous 653
Akialoa ellisiana 647
Akialoa lanaiensis 647
Akialoa obscura 647
Akialoa stejnegeri 647
Akialoa, Hawaii 647
Akialoa, Kauai 647
Akialoa, Lanai 647
Akialoa, Oahu 647
Akiapolaau *624, 627, 636,* 657
Akikiki *637,* 651
Akohekohe *626,* 658
Alario 538
alario, Alario 444, 538
alarum, Parula pitiayumi 743
alascensis, Pinicola enucleator 599
Alauahio 649
  Maui *635, 641,* 649
  Oahu 649
Alauwahio 649
albicollis, Dendroica petechia 745
albidigularis, Ploceus bicolor 181
albifacies, Myioborus 785
albifrons, Amblyospiza 112, 123, 138
albifrons, Myioborus 786
albifrons, Pyrrhula 138
albifrons, Serinus burtoni 535
albigula, Hylophilus hypoxanthus 437
albilora, Dendroica dominica 753
albinucha, Ploceus 187
albirostris, Bubalornis 75, 132
albirostris, Coccothraustes 132
albiventer, Neochmia phaeton 353
albogularis, Serinus 496, 530
albonotata, Vidua 150
albonotatus, Euplectes 150
aldabrana, Foudia eminentissima 155
Alexander's Indigobird 228
alexanderi, Amadina fasciata 301
alexanderi, Nigrita luteifrons 306
alexandrovi, Fringilla coelebs 513
algondae, Foudia eminentissima 155
alienus, Ploceus 183
alienus, Rhodopechys sanguineus 577
alleni, Carduelis magellanica 553
alleni, Vireo crassirostris 418
Allied Grosbeak 614
Alpine Mannikin 373
Alpine Munia 373
alsiosa, Dendroica petechia 745
alta, Limnothlypis swainsonii 765
altaica, Carduelis flavirostris 566
altaica, Leucosticte nemoricola 571
altaiensis, Loxia curvirostra 601
Altamira Yellowthroat 772
alticola, Vireo solitarius 425
altiloquus, Vireo 432
Amadina 301
Amadine, Pearl-headed 360
amadoni, Carduelis crassirostris 553
Amakihi 655
  Common 656
  Greater 647
  Hawaii *623, 639,* 656
  Kauai *633,* 655
  Oahu *629,* 655
Amandava 299
amandava, Amandava 235, 299
amantum, Bucanetes githagineus 578
amaurocephalus, Hylophilus 389, 435
amaurocephalus, Ploceus bicolor 181
amauronotus, Vireo leucophrys 429
amauropteryx, Vidua chalybeata 227
Amazon Greenlet 437
ambigua, Carduelis 490, 545
Amblynura 347
Amblyospiza 138
American Fan-tailed Warbler 786
American Goldfinch *468, 487, 493, 495,* 559
American Parula 743
American Red-faced Warbler 779
American Redstart *707, 710,* 761
American River Warbler 797
americana, Parula 743
amnicola, Dendroica petechia 745
amplus, Carpodacus mexicanus 585
analogus, Ploceus bicolor 181
Anambra Waxbill *294,* 317
Anaplectes 197
Anaplectes, Red-headed 197
anconophila, Carpodacus mexicanus 585
Andean Redstart 786
Andean Siskin 549
anderseni 187
Andros Yellowthroat 772
angelae, Dendroica 760
angelorum, Ploceus philippinus 169
Angola Black Bishop 144
Angola Cordon-bleu 326
Angola Swee *237,* 307
Angola Waxbill 307
Angola Weaver 161
angolensis, Estrilda astrild 318
angolensis, Euplectes capensis 149
angolensis, Nigrita canicapillus 306
angolensis, Notiospiza 85, 193
angolensis, Uraeginthus 259, 326
angulensis, Vireo pallens 418
Anianiau *631,* 652
anjuanensis, Foudia eminentissima 155
Ankober Seedeater 570
Ankober Serin *507,* 570
ankoberensis, Carduelis 507, 570
anna, Ciridops 647
annulosa, Taeniopygia bichenovii 358
anomala, Brachycope 157
Anomalospiza 219
ansorgei, Euplectes gierowii 144
ansorgei, Lagonosticta rhodopareia 342
ansorgei, Nesocharis 311
ansorgei, Ortygospiza atricollis 300
ansorgei, Parmoptila woodhousei 305
ansorgei, Plocepasser mahali 135
Antillean Siskin 554
Antpecker
  Jameson's 305
  Red-fronted 305
  Woodhouse's *236,* 305
Apakane 657
Apapane *625, 630,* 657
apo, Pyrrhula leucogenis 607
approximans, Euplectes capensis 149
approximans, Vireo pallens 418
Arabian Golden-winged Grosbeak 541
Arabian Grosbeak *506,* 541
Arabian Linnet 570
Arabian Serin 524
Arabian Waxbill *269,* 316
Arabian Yellow-rumped Canary 524
Arabian Yellow-rumped Seedeater 524
Arabian Yellow-rumped Serin 524
Arctic Redpoll *446,* 565
Arctic Rosy-finch 572
arctoa, Leucosticte 471, 572
ardens, Euplectes 91, 144
ardens, Fringilla 144
Arfak Mannikin 373
Arfak Munia 373
argentinae, Basileuterus bivittatus 787
argyrophrys, Carpodacus pulcherrimus 586
arizela, Geothlypis trichas 771
arizonae, Peucedramus taeniatus 665
arizonae, Vireo bellii 422
Arkansas Goldfinch 559
armouri, Dendroica petechia 745
arnaudi, Nigrita 137
arnaudi, Pseudonigrita 77, 137
Arrow-headed Warbler 760
Ashy-headed Greenlet 436
Ashy-throated Warbler 789
Asian Golden Weaver *127,* 158
Asian Rosy-finch *471,* 572
Asiatic Golden Weaver 158
assimilis, Lonchura castaneothorax 374
astrild, Estrilda 260, 283, 317
asymmetrurus, Euplectes albonotatus 150
Atlantic Canary 518
atrata, Carduelis 448, 555
atrata, Leucosticte 449, 574
atricapilla, Estrilda 321
atricapilla, Lonchura 252, 276, 369
atricapilla, Vireo 404, 411, 422
atriceps, Carduelis 549
atricollis, Ortygospiza 235, 274, 300
atrirostris, Cyclarhis nigrirostris 415
atrogularis, Serinus 466, 523
atropygialis, Poephila cincta 359
aucupum, Vidua orientalis 222
audreyana, Leucosticte brandti 571
Audubon's Warbler 748
auduboni, Dendroica coronata 748
aurantiaca, Pyrrhula 607
aurantiacus, Myioborus miniatus 781
aurantiacus, Peucedramus taeniatus 665
aurantiifrons, Hylophilus 437
aurantiiventris, Carduelis chloris 542
aurantius, Ploceus 81, 175
aurea, Loxia 143
aureoflavus, Ploceus subaureus 161
aureola, Dendroica petechia 745
aureonucha, Ploceus 185
aurescens, Serinus flaviventris 528
aureus, Euplectes 143
auricapilla, Basileuterus culicivorus 793
auricollis, Icteria virens 799
auricularis, Basileuterus tristriatus 795
auricularis, Geothlypis aequinoctialis 773
aurifrons, Dendroica petechia 745
aurocapilla, Seiurus 716, 766
Aurora Finch 332
Aurora Pytilia 332
Aurora Waxbill 332
Aurora, Red-billed 332
austerus, Basileuterus culicivorus 793
austinsmithi, Oporornis tolmiei 769
Australian Firefinch 353
Australian Green-backed Finch 348
Australian Waxbill 353
Australian Zebra Finch *251,* 357
australis, Cryptospiza reichenovii 312
australis, Leucosticte 487, 574
australoabyssinicus, Pseudonigrita arnaudi 137
autochthona, Carduelis cannabina 569
Avadavat 299
  Green *295,* 299
  Red *235,* 299
avakubi, Estrilda atricapilla 321
avakubi, Estrilda kandti 321
avakubi, Estrilda nonnula 321
axantha, Dendroica dominica 753
axillaris, Euplectes 150
axillaris, Ploceus badius 172
azarae, Basileuterus culicivorus 793
Azores Bullfinch *510,* 608

B

babad, Dendroica petechia 745
baddeleyi, Hypargos niveoguttatus 334
badius, Ploceus 172

baezae, Basileuterus tristriatus 795
Baglafecht Weaver *88*, 190
baglafecht, Ploceus 88, 191
Bahama Yellowthroat 772
bahamensis, Dendroica pityophila 755
Baikal Bullfinch 609
bailleui, Loxioides 634, 650
Baird's Vireo 419
bairdi, Geothlypis semiflava 772
bairdi, Oreomystis 637, 651
bairdi, Vireo 408, 419
Baka Indigobird 229
Bakra Indigobird 229
balcanica, Carduelis carduelis 561
balearica, Fringilla coelebs 513
balearica, Loxia curvirostra 601
Ballman's Malimbe 193
ballmanni, Malimbus 193
ballux, Myioborus miniatus 781
baltistanicus, Carduelis flavirostris 566
Bamboo Munia 346
Bamboo Parrofinch 346
Banded Finch 357
banksi, Dendroica petechia 745
Bannerman's Weaver *128*, 191
bannermani, Ploceus 128, 191
bansoensis, Nesocharis shelleyi 311
barbadensis, Vireo altiloquus 432
barbata, Carduelis 556
barbatulus, Vireo altiloquus 432
barbatus, Serinus mozambicus 527
Bar-breasted Firefinch 338
Bar-breasted Firefinch Indigobird 228
Barbuda Warbler 754
Barka Indigobird 229
Barred Munia 366
Barred Waxbill 317
Bartam's Weaver 189
bartholemica, Dendroica petechia 745
Bar-winged Weaver *85*, 193
Basileuterus 787
basilicus, Basileuterus 732, 795
batakana, Lonchura atricapilla 369
bateli, Basileuterus belli 794
Bates's Weaver 191
batesi, Euplectes axillaris 150
batesi, Ploceus 191
Bathilda 354
baweana, Lonchura punctulata 366
Baya 169
  Finn's 158
  Indian 169
Baya Weaver *114*, 169
Bay-breasted Warbler *669*, 758
Bay-crowned Warbler 789
beattyi, Ploceus intermedius 161
Beautiful Firetail *272*, 353
Beautiful Firetail-Finch 353
Beautiful Rosefinch 586
Beavan's Bullfinch 608
beicki, Carpodacus synoicus 591
Belding's Yellowthroat *737*, 771
beldingi, Geothlypis 737, 771
Belize Vireo 432
Bell's Vireo *409*, 422
Bell's Warbler 794
bella, Cardellina rubrifrons 779
bella, Carduelis cannabina 569
bella, Stagonopleura 272, 353
belli, Basileuterus 794
belli, Pytilia melba 331
bellii, Vireo 409, 422
bendirei, Loxia curvirostra 601
Bengal Weaver 169
Bengalee 367
Bengalese 367
Bengalese Munia 367
bengalus, Uraeginthus 257, 327
benghalensis, Ploceus 83, 169
Benguella Waxbill 315
benguellensis, Estrilda paludicola 316
benguellensis, Serinus gularis 531
bensoni, Basileuterus melanogenys 794
bensonorum, Carduelis flavirostris 566
benti, Loxia curvirostra 601
bermudianus, Vireo griseus 417
Bertram's Weaver 189
Bertrand's Weaver 189
bertrandi, Ploceus 189
bessereri, Basileuterus tristriatus 795
Bibfinch 359
  African 359
  Madagascar *247*, 359
Bicheno Finch 357
bichenovii, Taeniopygia 262, 357
bichenovii, Taeniopygia bichenovii 358
bicolor, Nigrita 306
bicolor, Ploceus 115, 181
bicolor, Spermestes 248, 361
Bicoloured Mannikin 361
bifasciata, Loxia leucoptera 604
bigilalae, Lonchura tristissima 366
bilkevitchi, Carduelis chloris 542
Bird
  Paddy 365
  Rice 365
  Spice 366
Bishop
  Angola Black 144
  Black 144
  Black-and-yellow 149
  Black-bellied 146
  Black-crowned Red 146
  Black-winged *89*, 143, 146
  Black-winged Red 146
  Cape 149
  Fiery-crowned 146
  Fire-crowned 146
  Fire-fronted 146
  Franciscan 143
  Gierow's 144
  Golden 143
  Golden-backed 143
  Little 145
  Napoleon 143
  Northern Black 144
  Northern Red *78*, 143
  Orange 143
  Red 143, 145
  Red-crowned 146
  Southern Black 144
  Southern Red *90*, *112*, 145
  Taha Golden 143
  Yellow 149
  Yellow-crowned *99*, 143
  Yellow-rumped 149
  Zanzibar 146
  Zanzibar Red 146
bishopi, Catharopeza 761
Bismarck Mannikin 377
Bismarck Munia 377
bivittatus, Basileuterus 787
Black Bishop 144
Black Borneo Mannikin 368
Black Buffalo-weaver 132
Black Indigobird 230
Black Mamo 647
Black Mannikin 368, 376
Black Munia 376
Black Rosy-finch *449*, 574
Black Siskin *448*, 555
Black Weaver 181
Black Whydah 144
Black Widowbird 144
Black-and-white Mannikin *248*, 361
Black-and-white Munia 361
Black-and-white Warbler *671*, 761
Black-and-yellow Bishop 149
Black-and-yellow Grosbeak 613
Black-and-yellow Hawfinch 613
Black-backed Weaver 181
Black-beaked Bronze Mannikin 368
Black-bellied Bishop 146
Black-bellied Firefinch 337
Black-bellied Seedcracker 322
Black-bellied Waxbill 337
Black-bibbed Firefinch 337
Black-billed Finch 579
Black-billed Peppershrike *379*, 415
Black-billed Quailfinch 300
Black-billed Weaver *82*, 187
Black-breasted Mannikin 375
Black-breasted Munia 377
Black-breasted Teerink's Munia 375
Black-breasted Weaver *83*, 169
Black-breasted Weaver Finch 377
Black-capped Siskin 549
Black-capped Social-weaver *110*, 137
Black-capped Vireo *404*, *411*, 422
Black-capped Warbler 778
Black-cheeked Warbler 794
Black-cheeked Waxbill 313
Black-chinned Quailfinch 300
Black-chinned Siskin 556
Black-chinned Weaver 188
Black-crested Warbler 788
Black-crowned Red Bishop 146
Black-crowned Waxbill 321
Black-eared Canary 531
Black-eared Seedeater 531
Black-eared Serin 531
Black-eared Warbler 780
Black-faced Canary 521
Black-faced Dioch 139
Black-faced Firefinch 336
Black-faced Firefinch Indigobird 229
Black-faced Honeycreeper 649
Black-faced Munia 367
Black-faced Parrotfinch 345
Black-faced Quailfinch 300
Black-faced Quelea 139
Black-faced Swee Waxbill 307
Black-faced Waxbill *268*, 313, 317
Black-faced Weaver 164
Black-fronted Warbler 748
Black-headed Canary *444*, 538
Black-headed Greenfinch *490*, 545
Black-headed Grosbeak 613
Black-headed Mannikin 369
Black-headed Mountain-finch 571
Black-headed Munia 369
Black-headed Nun 369
Black-headed Siskin 521, 554
Black-headed Waxbill 321
Black-headed Weaver 163, 165
Black-hearted Finch 358
Black-lored Waxbill 317
Black-lored Yellowthroat 773
Black-necked Weaver 182
Black-polled Yellowthroat *733*, 773
Black-ringed Finch 357
Black-rumped Finch 359
Black-rumped Munia 368
Black-rumped Silverbill 360
Black-rumped Waxbill 317
Black-tailed Finch 315, 359
Black-tailed Grey Waxbill 315
Black-tailed Hawfinch 613
Black-tailed Lavender Finch 315
Black-tailed Lavender Waxbill 315
Black-tailed Waxbill 315
Black-throated Blue Warbler *724*, 747
Black-throated Canary *466*, 523
Black-throated Finch *293*, 359
Black-throated Firefinch 336
Black-throated Green Warbler 751
Black-throated Grey Warbler 751
Black-throated Malimbe 193
Black-throated Munia 367, 370
Black-throated Seedeater 523
Black-throated Serin 523
Black-throated Weaver 169
Black-throated Weaver Bird 169
Black-whiskered Vireo 432
Black-winged Bishop *89*, 143, 146
Black-winged Red Bishop 146
Blackburnian Warbler 753
Blackcap Waxbill 321
Blackcapped Waxbill 321
Blackfinch
  Grey-crowned 306
  White-breasted 305
Blackheart Finch 358
Blackpoll Warbler *691*, 759
Blanford's Rosefinch 581
blasii, Lonchura punctulata 366
Blood Finch 353
Blue Chaffinch *505*, 514
Blue Mountain Vireo *410*, 424
Blue Waxbill *259*, 326
Blue-bellied Parrotfinch 347
Blue-billed Firefinch 341
Blue-billed Malimbe *85*, 195
Blue-billed Mannikin 361
Blue-billed Waxbill 323
Blue-billed Weaver 323
Blue-breasted Cordon-bleu 326
Blue-breasted Parrotfinch 347
Blue-breasted Waxbill 326
Blue-capped Cordon-bleu 327
Blue-capped Waxbill 327
Blue-cheeked Cordon-bleu 326
Blue-faced Finch 348
Blue-faced Parrotfinch *244*, *281*, 348
Blue-headed Cordonbleu 327
Blue-headed Parrotfinch 348
Blue-headed Vireo *384*, *400*, *403*, 425
Blue-winged Warbler *722*, 739
Bluebill
  Crimson-breasted 323
  Gabon 323
  Grant's 323
  Red-billed 323
  Red-breasted 323
  Red-headed *258*, 323
  Usambara 323
  Western *254*, 323
Blyth's Rosefinch 593
blythi, Carpodacus thura 593
Bob-tailed Weaver 157
Bocage's Golden-weaver 161
Bocage's Swee Waxbill 307
Bocage's Weaver 161
bocagei, Coccopygia 237, 307
bocagei, Euplectes axillaris 150
boehmi, Dinemellia dinemelli 133
bohndorffi, Ploceus cucullatus 165
bojeri, Ploceus 175
boliviana, Carduelis magellanica 553
bolivianus, Basileuterus rivularis 797
bolivianus, Myioborus melanocephalus 785
bolivianus, Vireolanius leucotis 417
bonairensis, Vireo altiloquus 432
borneensis, Erythrura hyperythra 346
Borneo Mannikin 368
Borneo Munia 368
boschmai, Lonchura castaneothorax 374
Bottle Weaver 182
boucardi, Granatellus sallaei 799
brachidactylus, Geothlypis trichas 771
Brachycope 157
brachypterus, Ploceus nigricollis 182
bradfieldi, Ortygospiza atricollis 300
Brambling *461*, *468*, 515
Brandt's Mountain-finch *448*, 571
Brandt's Rosy-finch 571
brandti, Leucosticte 448, 571
brasherii, Basileuterus culicivorus 793
brasierii, Basileuterus culicivorus 793
brevior, Ploceus ocularis 182
brevipennis, Hylophilus decurtatus 438
brevipennis, Vireo 382, 417
brevirostris, Carduelis carduelis 561
brevirostris, Carduelis flavirostris 566
Brewster's Warbler 668, 739
brewsteri, Dendroica petechia 745
brewsteri, Vireo gilvus 429
Brimstone Canary *494*, 529
Brimstone Serin 529
britannica, Carduelis carduelis 561
brittoni, Serinus citrinelloides 521
Broad-tailed Paradise Whydah 222
Broad-tailed Paradise Widow 221
Broad-tailed Paradise-whydah *203*, 221
Bronze Mannikin *266*, *277*, 361
Bronze Munia 361
Bronze-winged Mannikin 361
brooksi, Hesperiphona vespertina 615
Brown Bullfinch *477*, 607
Brown Firefinch 340
Brown Linnet 569
Brown Padda 365
Brown Ricebird 365
Brown Twinspot 334
Brown Waxbill 317
Brown-backed Firefinch 341
Brown-backed Firefinch Indigobird 230
Brown-backed Firefinch Widowfinch 230
Brown-backed Munia 361
Brown-backed Seedcracker 322
Brown-capped Redstart 781
Brown-capped Rosy-finch *487*, 574
Brown-capped Vireo 429
Brown-capped Weaver *81*, 189
Brown-capped Whitestart 781
Brown-headed Greenlet 436
Brown-rumped Seedeater 532
Brown-rumped Serin 532
Brown-throated Golden Weaver 176
Brown-throated Weaver 162, 176
browni, Vireo brevipennis 417
browningi, Vireo pallens 418
brunneiceps, Hylophilus 436
brunneiceps, Lagonosticta senegala 337
brunneiceps, Lonchura atricapilla 369
brunneigularis, Uraeginthus bengalus 327
brunneiventris, Erythrura hyperythra 346
brunneonucha, Leucosticte arctoa 572
brunnescens, Nigrita bicolor 306
brunnescens, Plocepasser superciliosus 135
brunniceps, Myioborus 781
Brush Yellowthroat 773
bryanti, Dendroica petechia 745
Bubalornis 132
Bucanetes 578
buchanani, Serinus 528

budongoensis, Ploceus baglafecht 191
Buff-bellied Black Mannikin 377
Buff-bellied Mannikin 377
Buff-bellied Waxbill 315
Buff-breasted Mannikin 377
Buff-cheeked Greenlet 437
Buff-chested Greenlet 437
Buff-rumped Warbler *690, 708,* 796
Buff-shouldered Widowbird 151
Buffalo-weaver
Black 132
Common 132
Kenya 132
Northern Red-billed 132
Red-billed *109,* 132
Southern Red-billed 132
White-billed *75,* 132
White-faced 133
White-headed *99,* 133
bukaensis, Lonchura melaena 377
Bullfinch
Azores *510,* 608
Baikal 609
Beavan's 608
Brown *477,* 607
Common 609
Eurasian *458, 500,* 609
Grey 609
Grey-headed *477,* 608
Northern 609
Orange 607
Philippine 607
Red-headed 608
White-cheeked *504,* 607
bulli, Vireo leucophrys 429
Bully Canary 529
Bully Seedeater 529
bulunensis, Hylophilus ochraceiceps 438
Bunting
Grosbeak 538
Pink-tailed 580
Rose 580
burmanicus, Ploceus philippinus 169
burnieri, Ploceus 129, 176
burtoni, Callacanthis 450, 577
burtoni, Serinus 535
butleri, Anomalospiza imberbis 219
buvryi, Coccothraustes coccothraustes 610

C

Cabanis's Warbler 793
cabanisi, Basileuterus culicivorus 793
cabanisi, Lonchura punctulata 366
cabanisi, Nigrita 137
cabanisi, Pseudonigrita 110, 137
cabanisii, Ploceus intermedius 161
cabaret, Carduelis 563
caeruleirostris, Loxops 642, 653
caerulescens, Dendroica 724, 747
caerulescens, Estrilda 239, 315
cairnsi, Dendroica caerulescens 747
calaminoros, Lonchura tristissima 366
californica, Hesperiphona vespertina 615
californica, Pinicola enucleator 599
californicus, Carpodacus purpureus 584
Callacanthis 577
Cameroon Indigobird 230
camerunensis, Vidua 230
campicola, Geothlypis trichas 771
cana, Spermophaga ruficapilla 323
Canada Warbler *690,* 779
canadensis, Wilsonia 690, 779
canaria, Serinus 480, 518
canariensis, Fringilla coelebs 513
Canary
Abyssinian 521
Arabian Yellow-rumped 524
Atlantic 518
Black-eared 531
Black-faced 521
Black-headed *444,* 538
Black-throated *466,* 523
Brimstone *494,* 529
Bully 529
Cape *492,* 519
Common 518
Damara 538
Damara Blackhead 538
Forest 522
Green 527
Grey 522
Icterine 527
Island *480,* 518
Kenya 518
Lemon-breasted *501,* 527
Mountain 538
Namibia 538
Olive-rumped 524
Papyrus 522
Protea 536
Rothschild's 524
Sao Tome 538
Shell 528
Somali 529
St Thoma's 538
Streaky-headed 531
Van Someren's 522
White-bellied 529
White-rumped 522
White-throated *496,* 530
Yellow *442,* 528
Yellow-crowned 518
Yellow-eyed 527
Yellow-fronted *480,* 527
Canary Chaffinch 513
Canary Islands Finch 514
Canary-like Bishop Finch 219
candidus, Nigrita canicapillus 307
canens, Basileuterus tristriatus 795
canescens, Vireo altiloquus 432
canicapilla, Serinus gularis 531
canicapillus, Nigrita 237, 306
caniceps, Carduelis carduelis 561
caniceps, Lonchura 376
caniceps, Serinus mozambicus 527
caniceps, Spermestes 360
canicollis, Serinus 492, 519
caninucha, Geothlypis poliocephala 774
canivirens, Seiurus aurocapilla 766
cannabina, Carduelis 465, 569
cantans, Euodice 250, 253, 270, 359
cantans, Telespiza 640, 645, 650
cantica, Cyclarhis gujanensis 415
Cape Bishop 149
Cape Canary *492,* 519
Cape May Warbler 747
Cape Siskin 537
Cape Weaver *93,* 162
capensis, Euplectes 149
capensis, Loxia 149
capensis, Ploceus 93, 162
capistrata, Nesocharis 238, 311
capistratus, Serinus 521
capitalba, Amblyospiza albifrons 138
capitalis, Carduelis magellanica 553
capitalis, Ploceus melanocephalus 163
capitanea, Carduelis spinescens 549
Cardellina 779
Cardinal 155
Cardinal Fody 155
Cardinal Quelea 140
cardinalis, Quelea 141
cardonai, Myioborus 785
Carduelis 537, 542
carduelis, Carduelis 475, 561
caribaeus, Vireo 412, 419
carlottae, Pinicola enucleator 599
Carmiol's Vireo 426
carmioli, Vireo 408, 426
carnipes, Mycerobas 486, 615
carolinae, Vireo huttoni 427
Carpodacus 581, 597
caspica, Pyrrhula pyrrhula 609
Cassin's Finch *505,* 585
Cassin's Malimbe 193
Cassin's Vireo *385, 391, 399,* 425
cassini, Malimbus 193
cassinii, Carpodacus 505, 585
cassinii, Pyrrhula pyrrhula 609
cassinii, Vireo 385, 391, 399, 425
castanea, Dendroica 669, 758
castaneiceps, Basileuterus coronatus 789
castaneiceps, Dendroica petechia 745
castaneiceps, Ploceus 176
castaneigula, Ploceus xanthopterus 176
castaneocapilla, Myioborus 781
castaneofuscus, Ploceus nigerrimus 181
castaneothorax, Lonchura 374
castanonota, Lonchura leucogastra 368
castanops, Ploceus 95, 162
castanotis, Taeniopygia 251, 357
Catharopeza 761
caucae, Vireo olivaceus 430
caucasia, Loxia curvirostra 600
Caucasian Great Rosefinch 594
caucasica, Fringilla coelebs 513
caudatus, Basileuterus rufifrons 793
caurinus, Ploceus velatus 164
cavendishi, Estrilda astrild 318
caymanensis, Vireo magister 433
cearensis, Cyclarhis gujanensis 415
celata, Vermivora 702, 740
Celebes Munia 373
centralis, Carpodacus mexicanus 585
centralis, Estrilda rhodopyga 316
centralis, Malimbus rubricollis 196
centralis, Vidua chalybeata 227
cerulea, Dendroica 732, 759
Cerulean Warbler *732,* 759
Ceylon Hill Munia 367
chabarovi, Carduelis sinica 543
Chaco Peppershrike 415
Chad Firefinch *243,* 342
Chaffinch
African 513
Blue *505,* 514
Canary 513
Common *441, 464, 498, 501,* 513
European 513
Mount Teyde Blue 514
Teydean 514
chalybeata, Vidua 212, 227
Chamaethlypis 774
Chapala Yellowthroat 771
chapalensis, Geothlypis trichas 771
Chapin's Paradise Whydah 221
Chapman's Warbler 800
chapmani, Basileuterus coronatus 789
charmensis, Carpodacus thura 593
Charmosyna Waxbill 313
charmosyna, Estrilda erythronotos 313
Chat
Grey-crowned Ground 774
Grey-throated 799
Ground 774
Red-breasted *681,* 799
Rose-breasted 800
Tres Marias 799
Yellow-breasted *701,* 798
Chequered Mannikin 361
Cherry Finch 354
Chestnut Finch 374
Chestnut Mannikin 369
Chestnut Munia *252, 276,* 369
Chestnut Nun 369
Chestnut Weaver *82,* 158
Chestnut-and-black Weaver 181
Chestnut-and-white Mannikin 375
Chestnut-and-white Munia 375
Chestnut-backed Munia 361
Chestnut-backed Sparrow-weaver 136
Chestnut-backed Weaver 181
Chestnut-breasted Finch 374
Chestnut-breasted Mannikin 374
Chestnut-breasted Munia 374
Chestnut-breasted Negrofinch 306
Chestnut-breasted Nigrita 306
Chestnut-capped Warbler 793
Chestnut-crowned Redstart 785
Chestnut-crowned Sparrow-weaver *75,* 135
Chestnut-crowned Whitestart 785
Chestnut-eared Finch 357
Chestnut-mantled Sparrow-weaver 136
Chestnut-sided Shrike-vireo *380,* 416
Chestnut-sided Warbler *705, 709,* 746
Chinese Beautiful Rosefinch 586
Chinese Greenfinch 543
Chinese Grosbeak 613
Chinese Hawfinch 613
Chinese White-browed Rosefinch 593
chiriquensis, Geothlypis aequinoctialis 773
chiriquensis, Vireo leucophrys 429
Chiriqui Yellowthroat 773
chitrensis, Basileuterus tristriatus 795
Chivi Vireo 430
chivi, Vireo olivaceus 430
Chloebia 345
chlora, Dendroica petechia 745
chloridoides, Chlorodrepanis virens 656
Chloridops kona 647
Chloris 542, 543, 544
chloris, Carduelis 473, 493, 500, 542
Chlorodrepanis 655
chlorotica, Carduelis chloris 542
Choco Vireo *413,* 426
Chocó Warbler 787
chrysendeta, Dendroica petechia 745
chryseola, Geothlypis trichas 771
chryseola, Wilsonia pusilla 778
chrysogaster, Basileuterus 787
chrysoleuca, Dendroica pinus 755
chrysoparia, Dendroica 736, 751
chrysops, Myioborus ornatus 786
chrysoptera, Vermivora 668, *729,* 739
chubbi, Mandingoa nitidula 311
cienagae, Dendroica petechia 745
Cincinnati Warbler 739, 767
cincta, Poephila 293, 359
Cinderella Waxbill *288,* 315
cineracea, Pyrrhula pyrrhula 609
cinereicollis, Basileuterus 789
cinereovinacea, Euschistospiza 243, 333
cinereus, Seiurus aurocapilla 766
Cinnamon Weaver 172
Cinnamon-breasted Negrofinch 306
Cinnamon-shouldered Widowbird 150
Ciridops anna 647
cirrha, Parula pitiayumi 743
citerior, Pytilia melba 331
citrea, Protonotaria 706, 719, 764
Citril
Abyssinian 521
African 521
East African 521
Eastern 521
Kenya 521
Southern 521
Tanzanian 521
Western 521
Citril Finch *460,* 562
citrina, Wilsonia 676, 778
Citrine Warbler 788
citrinella, Carduelis 460, 562
citrinelloides, Serinus 521
citrinipectus, Serinus 501, 527
clanceyi, Pytilia melba 331
clara, Erythrura trichroa 348
clarescens, Neochmia ruficauda 354
Clarke's Weaver *131,* 173
clarkei, Amandava subflava 300
clarus, Basileuterus belli 794
clementis, Carpodacus mexicanus 585
Clytospiza 334
cobanensis, Hesperiphona abeillei 616
coccinea, Drepanis 619, 628, 658
coccinea, Pyrrhula pyrrhula 609
coccineus, Carpodacus mexicanus 585
coccineus, Loxops 620, 652
coccineus, Pyrenestes sanguineus 322
Coccopygia 307
Coccothraustes 610
coccothraustes, Coccothraustes 488, 490, 610
Codrington's Indigobird 231
codringtoni, Vidua 231
coelebs, Fringilla 441, 464, 498, 501, 513
coelica, Erythrura prasina 346
cognata, Leucosticte arctoa 572
cognatus, Vireo huttoni 427
coibae, Cyclarhis gujanensis 415
colchica, Carduelis carduelis 561
Colima Warbler 741
Collared Grosbeak *467,* 614
Collared Redstart 785
Collared Whitestart *697,* 785
collaris, Ploceus cucullatus 165
Colombian Redstart 785
colombiana, Carduelis psaltria 559
coloria, Erythrura 290, 347
Coloured Finch 375
Coloured Munia 375
Combassou, Senegal 227
Common Akepa 652
Common Amakihi 656
Common Buffalo-weaver 132
Common Bullfinch 609
Common Canary 518
Common Chaffinch *441, 464, 498, 501,* 513
Common Crimson Finch 353
Common Crossbill 600
Common Greenfinch 542
Common Grenadier 328
Common House Finch 585
Common Indigobird 227
Common Linnet *465,* 569
Common Locustfinch 300
Common Quailfinch 300
Common Redpoll *502,* 564
Common Rosefinch *469, 497,* 583
Common Serin 516
Common Silverbill 360
Common Siskin 547
Common Slender-billed Weaver 183
Common Social Weaver 138

Common Trumpeter Finch 578
Common Waxbill *260, 283,* 317
Common Weaver 169
Common Yellowthroat *689, 714,* 771
Comoro Fody 155
Compact Weaver *80,* 157
comptus, Myioborus miniatus 781
concolor, Euplectes ardens 144
concolor, Neospiza 511, 538
confidens, Lagonosticta senegala 337
congica, Lagonosticta rubricata 341
connectens, Myioborus miniatus 781
connectens, Vireo gilvus 429
Connecticut Warbler *672,* 768
conradsi, Euplectes macroura 149
consobrina, Foudia eminentissima 155
conspicillatus, Basileuterus 789
contigua, Amadina fasciata 301
contrerasi, Cyclarhis gujanensis 415
Cordon-bleu 327
  Angola 326
  Blue-breasted 326
  Blue-capped 327
  Blue-cheeked 326
  Red-cheeked *257,* 327
  Southern 326
Cordonbleu, Blue-headed 327
coriaria, Pyrrhula leucogenis 607
coronata, Dendroica 683, 714, 748
coronata, Zeledonia 680, 798
coronatus, Basileuterus 679, 789
coronatus, Malimbus 194
Corsican Finch 563
corsicana, Carduelis 563
corsicana, Loxia curvirostra 601
coryi, Geothlypis rostrata 772
costaricensis, Vireo leucophrys 429
Cozumel Vireo *408,* 419
craspedopterus, Euplectes hordeaceus 146
crassirostris, Bucanetes githagineus 578
crassirostris, Carduelis 553
crassirostris, Euplectes capensis 149
crassirostris, Malimbus malimbicus 195
crassirostris, Vireo 418
crawfordi, Dendroica vitellina 758
Cream-bellied Munia 369
Creeper 649
  Hawaii *622, 638,* 654
  Lanai 649
  Maui 649
Crescent-chested Warbler *699,* 742
Crested Honeycreeper 658
Crested Malimbe *102,* 195
Crimson Finch *246, 263,* 353
Crimson Firefinch 337
Crimson Rosefinch 581
Crimson Seedcracker 322
Crimson-backed Forest-finch 313
Crimson-breasted Bluebill 323
Crimson-browed Finch 599
Crimson-cheeked Blue Waxbill 327
Crimson-eared Rosefinch 594
Crimson-rumped Waxbill *240,* 316
Crimson-sided Finch 351
Crimson-sided Weaver Finch 351
Crimson-winged Desert Finch 577
Crimson-winged Finch *451,* 577
Crimson-winged Pytilia 332
Crimsonwing
  Abyssinian 313
  Dusky 312
  Ethiopian *239,* 313
  Jackson's 312
  Nyasa 312
  Red-billed 312
  Red-faced 312
  Reichenow's 312
  Salvadori's 313
  Shelley's *294,* 312
crissalis, Vermivora 741
Crithagra 522, 523, 535
crocatus, Ploceus ocularis 182
crocopygius, Serinus albogularis 530
Crossbill
  Common 600
  Hispaniolan 605
  Parrot *457,* 603
  Red *484, 486,* 600
  Scottish *507,* 602
  South Hills 600
  Two-barred *485,* 604
  White-winged 604
crossini, Vireolanius melitophrys 416
cruciana, Dendroica petechia 745
Cryptospiza 312
crystallochresta, Cryptospiza salvadorii 313
Cuban Vireo *397,* 421
cubensis, Vireo crassirostris 418
Cuckoo Finch *199,* 219
Cuckoo Weaver 219
cucullata, Carduelis 509, 550
cucullata, Spermestes 266, 277, 361
cucullatus, Ploceus 88, 117, 122, 165
culicivorus, Basileuterus 717, 793
curvirostra, Loxia 484, 486, 600
Cut-throat 301
Cut-throat Finch *236,* 301
Cut-throat Weaver 301
Cuzco Warbler 787
cyaneifrons, Erythrura trichroa 348
cyaneovirens, Erythrura 347
cyanifrons, Erythrura trichroa 348
cyanocephalus, Uraeginthus 327
cyanofrons, Erythrura trichroa 348
cyanopleurus, Uraeginthus angolensis 326
cyanoptera, Vermivora 668, *722,* 739
Cyclarhidae 415
Cyclarhis 415

D

daedalus, Basileuterus tristriatus 795
Damara Blackhead Canary 538
Damara Canary 538
damarensis, Estrilda astrild 318
damarensis, Pytilia melba 331
damarensis, Serinus flaviventris 528
danotia, Icteria virens 798
darienensis, Hylophilus decurtatus 438
Dark Firefinch 341
Dark Rosefinch 581
Dark-backed Goldfinch 559
Dark-backed Weaver *115,* 181
Dark-breasted Rosefinch 581
Dark-rumped Rosefinch 588
Dark-vented Quailfinch 300
davidianus, Carpodacus pulcherrimus 586
dawsoni, Leucosticte tephrocotis 573
dearborni, Vireolanius pulchellus 416
decoloratus, Vireo magister 432
decora, Dendroica graciae 754
decurtatus, Hylophilus 383, 438
deignani, Lonchura atricapilla 369
Delacourella 311
delacouri, Euplectes progne 152
delamerei, Estrilda erythronotos 313
delamerei, Euplectes progne 152
Delattre's Warbler 793
delattrii, Basileuterus rufifrons 793
delicata, Dendroica 668, 755
Dendroica 745, 761
Dendrospiza 521, 522
deppei, Psittirostra psittacea 651
Desert Finch *452,* 579
deserti, Serinus atrogularis 523
deserticolor, Carpodacus thura 593
destructa, Lonchura grandis 377
diabolicus, Carpodacus rubicilla 594
diabolicus, Nigrita canicapillus 307
Diadem Finch 354
diadematus, Euplectes 146
Diamond Finch 352
Diamond Firetail *292,* 352
Diamond Sparrow 352
dickermani, Hylophilus decurtatus 438
dicrocephalus, Ploceus 124, 172
Diggles's Finch 359
digressa, Ortygospiza atricollis 301
dilutescens, Ploceus cucullatus 165
dimidiatus, Ploceus melanocephalus 163
dinemelli, Dinemellia 99, 133
dinemelli, Textor 133
Dinemellia 133
Dioch, Black-faced 139
discolor, Dendroica 687, 757
disjunctus, Vireo leucophrys 429
dissita, Amadina erythrocephala 301
dissors, Vireo leucophrys 429
diversus, Vireo olivaceus 430
dolei, Palmeria 626, 658
dominica, Dendroica 753
dominicensis, Carduelis 554
donaldsoni, Plocepasser 136
donaldsoni, Serinus 528
Donaldson-Smith's Sparrow-weaver 136
dorsalis, Cyclarhis gujanensis 415
dorsalis, Pseudonigrita arnaudi 137
dorsomaculatus, Ploceus 189
dorsostriata, Ortygospiza atricollis 300
dorsostriatus, Serinus 529
Double-banded Finch 357
Double-barred Finch *262,* 357
Drakensberg Siskin *443,* 538
DREPANIDIDAE 618, 649
Drepanis 658
Drepanis funerea 647
Drepanis pacifica 647
dubius, Carpodacus thura 593
dubius, Vireo leucophrys 429
duboisi, Ploceus melanocephalus 163
Dufresnaye's Waxbill 307
dugesi, Basileuterus rufifrons 793
dugesi, Dendroica petechia 745
duidae, Myioborus castaneocapilla 781
Dull Blue-black Finch 227
Dusky Crimsonwing 312
Dusky Firefinch 333, 336
Dusky Indigobird *200,* 230, 231
Dusky Mannikin 368
Dusky Munia *249,* 368
Dusky Twinspot *243,* 333
Dusky-capped Greenlet 437
Dwarf Mannikin 359
Dwarf Vireo 423
Dybowski's Dusky Twinspot 333
Dybowski's Twinspot 333
dybowskii, Euschistospiza 333
Dysmorodrepanis munroi 647

E

East African Citril 521
East African Swee 307
East African Swee Waxbill 307
East African Whydah 221
Eastern Alpine Mannikin 373
Eastern Alpine Munia 373
Eastern Baya Weaver 169
Eastern Citril 521
Eastern Forest Weaver 181
Eastern Golden Weaver 161, 163
Eastern Goldfinch 561
Eastern Great Rosefinch 594
Eastern Paradise Whydah 221
Eastern Red-collared Widowbird 144
Eastern Warbling Vireo 429
eaver, Vieillot's 181
eblis, Carpodacus rubicilla 594
Edwards's Rosefinch 588
edwardsii, Carpodacus 588
efatensis, Erythrura cyaneovirens 347
eichhorni, Erythrura trichroa 348
eisentrauti, Estrilda nonnula 321
elatus, Basileuterus coronatus 789
eleanorae, Vireo leucophrys 429
elegans, Parula pitiayumi 743
Elfin Woods Warbler 760
elgonensis, Linurgus olivaceus 541
elgonensis, Serinus gularis 531
elizae, Estrilda nonnula 321
ellisiana, Akialoa 647
ellisianus, Hemignathus obscurus 647
Emblema 351, 352
emiliae, Nigrita canicapillus 306
Emin's Weaver 191
eminentissima, Foudia 79, 155
emini, Ploceus baglafecht 191
emini, Pytilia phoenicoptera 332
emini, Sporopipes frontalis 137
endemion, Serinus gularis 531
Entebbe Weaver 162, 163
enucleator, Pinicola 478, 494, 503, 599
eoa, Dendroica petechia 745
Eophona 613
eos, Carpodacus 491, 587
Epaulet Finch 616
epauletta, Pyrrhoplectes 459, 616
Epauletted Finch 616
eques, Euplectes albonotatus 150
eremnus, Philetairus socius 138
eremobius, Ploceus baglafecht 191
Eremopsaltria 578
Ergaticus 780
erithachorides, Dendroica petechia 745
ermaki, Loxia curvirostra 601
ernesti, Lonchura grandis 377
ernstmayri, Erythrura hyperythra 346
erythaca, Pyrrhula 477, 608
erythrinus, Carpodacus 469, 497, 583
erythrocephala, Amadina 279, 301
erythrocephala, Pyrrhula 608
erythrogaster, Malimbus 194
erythronotos, Estrilda 268, 313
erythrops, Ploceus 141
erythrops, Quelea 77, 141
Erythrosoma 780
Erythrura 345
eschatosa, Pinicola enucleator 599
Estrilda 299, 313
Estrilda atricapilla 321
Estrildidae 234, 299
Ethiopian Aurora Finch 332
Ethiopian Black-headed Siskin 521
Ethiopian Crimsonwing *239,* 313
Ethiopian Firefinch 342
Ethiopian Pytilia 332
Ethiopian Quailfinch 300
Ethiopian Siskin *462,* 521
Ethiopian Widowbird 149
Euodice 359
euophrys, Basileuterus luteoviridis 788
Euplectes 143
Eurasian Bullfinch *458, 500,* 609
Eurasian Goldfinch 561
Eurasian Linnet 569
Eurasian Serin 516
Eurasian Siskin *483,* 547
European Chaffinch 513
European Goldfinch *475,* 561
European Greenfinch *473, 493, 500,* 542
European Linnet 569
European Serin *499,* 516
europoea, Pyrrhula pyrrhula 609
Euschistospiza 333
Euthlypis 786
evangelinae, Neochmia phaeton 353
Evening Grosbeak *476,* 615
everetti, Lonchura leucogastra 368
Exclamatory Paradise-whydah 222
exigua, Geothlypis rostrata 772
exilipes, Carduelis hornemanni 565
eximius, Basileuterus melanogenys 794
eximius, Vireolanius 416
explita, Lonchura striata 367

F

Fan-tailed Warbler 786
Fan-tailed Whydah 150
Fan-tailed Widowbird 150
fasciata, Amadina 236, 301
Fawn-breasted Waxbill *261,* 315
femininus, Carpodacus thura 593
femininus, Ploceus cucullatus 165
ferghanensis, Carpodacus erythrinus 583
fernandinae, Teretistris 675, 777
Fernando Po Mannikin 361
Fernando Po Munia 361
Fernando Po Oliveback 311
ferrugineifrons, Hylophilus ochraceiceps 438
ferruginosa, Lonchura 255, 370
Fiery-crowned Bishop 146
Fiji Parrotfinch 347
Finch 440, 513
  Aurora 332
  Australian Green-backed 348
  Australian Zebra *251,* 357
  Banded 357
  Bicheno 357
  Black-billed 579
  Black-breasted Weaver 377
  Black-hearted 358
  Black-ringed 357
  Black-rumped 359
  Black-tailed 315, 359
  Black-tailed Lavender 315
  Black-throated *293,* 359
  Blackheart 358
  Blood 353
  Blue-faced 348
  Canary Islands 514
  Canary-like Bishop 219
  Cassin's *505,* 585
  Cherry 354
  Chestnut 374
  Chestnut-breasted 374
  Chestnut-eared 357
  Citril *460,* 562
  Coloured 375
  Common Crimson 353
  Common House 585
  Common Trumpeter 578
  Corsican 563

Crimson *246, 263,* 353
Crimson-browed 599
Crimson-sided 351
Crimson-sided Weaver 351
Crimson-winged *451,* 577
Crimson-winged Desert 577
Cuckoo *199,* 219
Cut-throat *236,* 301
Desert *452,* 579
Diadem 354
Diamond 352
Diggles's 359
Double-banded 357
Double-barred *262,* 357
Dull Blue-black 227
Epaulet 616
Epauletted 616
Ethiopian Aurora 332
Flowerpecker 305
Gold-crowned Black 616
Golden-headed 616
Gold-fronted 516
Gold-headed 616
Gold-headed Black 616
Gold-naped *459,* 616
Gouldian *269, 279, 297,* 345
Grassfinch 361
Greater Koa 647
Green Singing 527
Green Tiger 299
Guadalupe House 585
Heck's 358
Hooded Weaver 361
House *456, 481,* 585
Java 365
Juniper 599
Kenya Partridge 300
Lady Gouldian 345
Lavender 315
Laysan *640, 645,* 650
Lesser Koa 647
Lichtenstein's 579
Lichtenstein's Desert 579
Locust *280,* 300
Long-tailed *277, 281,* 358
Marsh 300
Masked *271, 273,* 358
Melba *242,* 331
Moluccan 367
Mongolian *451,* 578
Mongolian Trumpeter 578
Munia 361
New Britain 377
New Ireland 377
Nihoa *621,* 650
Nonpareil 346
Nutmeg 366
Orange-billed 358
Oriole *444,* 541
Owl 357
Painted *275,* 345, 351
Pale 353
Pallid 373
Parson 359
Partridge 300
Pectoral 351
Pictorella *267,* 351
Pied Mannikin 361
Plum-capped 354
Plum-headed 354
Przevalski's 580
Purple 584
Purple-breasted 345
Rainbow 345
Red Marsh 300
Red-billed 358
Red-browed *254,* 353, 577
Red-eared 352
Red-faced 332, 353, 354
Red-faced Aurora 332
Red-headed *279,* 301, 599
Red-sided Mountain 351
Red-spectacled 577
Red-tailed 353, 354
Ringed 357
Rock 342
Scaly-breasted 366
Scaly-feathered *97,* 136
Scarlet *472,* 583, 600
Serin 516
Siberian 572
Society 367
Spectacled *450,* 577
Spice 366
Spoted-sided 357
Spot-sided 352, 357
Spotted-sided 352, 357
Star *291,* 354
Strawberry 299
Striated 367
Sunda Zebra 357
Timor 365
Timor Zebra 357
Trumpeter *469,* 578
Weaver 361
White-bellied Crimson 353
White-breasted 351
Yellow Swamp 219
Yellow-rumped 374
Yellow-tailed 374
Finchbill, Laysan 650
Finn's Baya 158
Finn's Weaver 158
finschi, Ploceus velatus 164
Fire-crowned Bishop 146
Fire-fronted Bishop 146
Fire-fronted Serin 516
Firefinch
Abyssinian 342
African 341
Australian 353
Bar-breasted 338
Black-bellied 337
Black-bibbed 337
Black-faced 336
Black-throated 336
Blue-billed 341
Brown 340
Brown-backed 341
Chad *243,* 342
Crimson 337
Dark 341
Dusky 333, 336
Ethiopian 342
Grey 336
Grey Black-faced 336
Grey-backed 341
Jameson's 342
Kulikoro 341
Landana 341
Lavender 315
Lilac 341
Mali 341
Masked 336
Pale-billed 341
Pink-backed 342
Red-billed *253, 259,* 337
Reichenow's 342
Rock 342
Rosy 337
Senegal 337
Speckled 338
Vinaceous 336
Firetail
Beautiful *272,* 353
Diamond *292,* 352
Mountain *245,* 351
Painted 351
Red-browed 353
Red-eared *246,* 352
Sydney 353
Firetail-Finch, Beautiful 353
Firetail-finch, Red-eared 352
Fischer's Whydah 223
fischeri, Ploceus melanocephalus 163
fischeri, Vidua 204, 215, 223
Five-coloured Munia 375
Flame-throated Warbler *718,* 742
flammea, Carduelis 502, 564
flammea, Loxops maculata 647
flammea, Paroreomyza 647
flammula, Pinicola enucleator 599
Flat-billed Vireo 422
flava, Chlorodrepanis 629, 655
flavens, Cyclarhis gujanensis 415
flaveolus, Basileuterus 681, 795
flavescens, Basileuterus culicivorus 793
flavescens, Dendroica dominica 753
Flavescent Warbler *681,* 795
flavicans, Foudia 127, 156
flavicaudata, Pytilia melba 331
flaviceps, Dendroica petechia 745
flaviceps, Loxioides 647
flaviceps, Ploceus manyar 175
flaviceps, Psittirostra 647
flaviceps, Rhodacanthis 647
flaviceps, Rhodacanthis palmeri 647
flavida, Dendroica petechia 745
flavidiventris, Amandava amandava 299
flavifrons, Vireo 391, 399, 424
flavigula, Serinus 509, 524
flavipectus, Cyclarhis gujanensis 415
flavipes, Hylophilus 437
flavipes, Ploceus 187
flaviprymna, Lonchura 249, 374
flavirostris, Carduelis 471, 566
flaviventris, Cyclarhis gujanensis 415
flaviventris, Hylophilus hypoxanthus 437
flaviventris, Serinus 442, 528
flavivertex, Myioborus 727, 786
flavivertex, Serinus 518
flavovelata, Geothlypis 772
flavovirens, Basileuterus signatus 788
flavoviridis, Vireo 431
florida, Dendroica pinus 755
Flower-pecker, Red-faced 305
Flowerpecker Finch 305
Flowerpecker Weaver 305
Flowerpecker Weaver-finch 305
Fody
Cardinal 155
Comoro 155
Forest 156
Madagascan Red 155
Mascarene 155, 156
Mauritius *130,* 156
Red *86,* 155
Red Forest 155, 156
Red-headed *79,* 155, 156
Red-headed Forest 155
Rodrigues *127,* 156
Rothschild's 156
Sakalava 177
Seychelles *126,* 157
Yellow 156
Fonio Indigobird 230
Forbes's Mannikin 377
Forbes's Munia 377
Forbes's Parrotfinch 347
forbesi, Lagonosticta rara 337
forbesi, Lonchura 377
Forest Canary 522
Forest Fody 156
Forest Seedcracker 323
Forest Weaver 181
Forest-finch, Crimson-backed 313
formosa, Amandava 295, 299
formosana, Lonchura atricapilla 369
formosanus, Carpodacus vinaceus 587
formosus, Oporornis 688, 767
fornsi, Teretistris 728, 777
forreri, Carduelis notata 555
forreri, Vireo flavoviridis 431
fortior, Lonchura punctulata 366
Foudia 155
Fox's Weaver 178
fradei, Serinus rufobrunneus 536
fraithii, Himatione 647
francescae, Granatellus venustus 799
Franciscan Bishop 143
franciscana, Loxia 143
franciscanus, Euplectes 78, 143
Fraser's Warbler 787
fraseri, Basileuterus 787
freethi, Himatione sanguinea 647
fretensis, Lonchura punctulata 366
fricki, Ploceus baglafecht 191
friederichseni, Euplectes gierowii 144
frigoris, Carduelis carduelis 561
Fringilla 513
FRINGILLIDAE 513, 440
fringillirostris, Carduelis cannabina 569
fringilloides, Spermestes 256, 361
frobenii, Ploceus cucullatus 165
frommi, Pyrenestes ostrinus 322
frontalis, Carpodacus mexicanus 585
frontalis, Loxia 137
frontalis, Serinus citrinelloides 521
frontalis, Sporopipes 76, 107, 137
fucata, Estrilda melpoda 316
fuligescens, Sporopipes squamifrons 136
fuliginosus, Oreostruthus 245, 351
fulvicauda, Basileuterus 690, 708, 796
fumigata, Lonchura striata 367
funerea, Drepanis 647
funerea, Vidua 200, 230
furensis, Ploceus taeniopterus 172
furvior, Seiurus aurocapilla 766
fusca, Dendroica 753
fuscans, Lonchura 249, 368
fuscata, Lonchura 289, 365
fuscata, Ortygospiza atricollis 300
fuscicapillus, Hylophilus hypoxanthus 437
fuscocrissa, Ortygospiza atricollis 300
fusconotus, Nigrita 265, 305

G

Gabon Bluebill 323
gabonensis, Ortygospiza atricollis 300
gajduseki, Lonchura spectabilis 376
galbanus, Hylophilus flavipes 437
galbula, Ploceus 91, 106, 170
Gambian Black-headed Weaver 163
gaughrani, Erythrura cyaneovirens 348
geminus, Philetairus socius 138
gengleri, Fringilla coelebs 513
georgei, Peucedramus taeniatus 665
Geothlypis 767, 771, 798
germanica, Pyrrhula pyrrhula 609
Giant Mannikin 361
Giant Weaver *124,* 166
Gierow's Bishop 144
gierowii, Euplectes 144
gigliolii, Leucosticte arctoa 572
gilvus, Vireo 387, 429
giraudi, Peucedramus taeniatus 665
githagineus, Bucanetes 469, 578
godmani, Basileuterus culicivorus 793
Gola Malimbe 193
golandi, Ploceus 131, 173
Gold-breasted Waxbill 299
Gold-crowned Black Finch 616
Gold-fronted Finch 516
Gold-fronted Serin 516
Gold-headed Black Finch 616
Gold-headed Finch 616
Goldbreast 299
Goldbreast Indigobird 229
Golden Bishop 143
Golden Bishop, Taha 143
Golden Palm Weaver 175
Golden Swamp Warbler 764
Golden Vireo *393,* 428
Golden Warbler 745
Golden Weaver 158, 161
Golden-backed Bishop 143
Golden-backed Pytilia 331
Golden-backed Weaver 163, 188
Golden-bellied Warbler 787
Golden-breasted Waxbill 299
Golden-browed Warbler 794
Golden-cheeked Warbler *736,* 751
Golden-crowned Warbler *717,* 793
Golden-fronted Greenlet 437
Golden-fronted Redstart 786
Golden-fronted Whitestart 786
Golden-headed Finch 616
Golden-naped Weaver 185
Golden-weaver, Bocage's 161
Golden-winged Grosbeak 542
Golden-winged Warbler *729,* 739
Goldfinch
American *468, 487, 493, 495,* 559
Arkansas 559
Dark-backed 559
Eastern 561
Eurasian 561
European *475,* 561
Green-backed 559
Grey-crowned 561
Himalayan 544
Hispaniola 554
Lawrence's *447,* 560
Lesser 559
Goldman's Warbler 748
goldmani, Dendroica coronata 748
goldmani, Geothlypis beldingi 771
Gold-naped Finch *459,* 616
gommaensis, Serinus mozambicus 527
gouldiae, Erythrura 269, 279, 297, 345
Gouldian Finch *269, 279, 297,* 345
Grace's Warbler 754
graciae, Dendroica 754
gracilirostris, Vireo 392, 396, 410, 431
Granatellus 799
Granatina 328
granatina, Granatina 328
Grand Mannikin 377
Grand Munia 377
Grand Valley Mannikin 375
Grand Valley Munia 375
grandior, Vireo altiloquus 432
grandis, Carpodacus rhodochlamys 593
grandis, Lonchura 377

grandis, Ploceus 124, 166
Grant's Bluebill 323
Grant's Forest Weaver 323
granti, Serinus mozambicus 527
Grassfinch
Heck's 358
Long-tailed 358
Masked 358
Modest 354
Red-faced 354
Rufous-tailed 354
White-eared 358
Grassfinch Finch 361
Grauer's Waxbill 321
graueri, Estrilda kandti 321
graueri, Euschistospiza cinereovinacea 333
graueri, Ploceus cucullatus 165
graueri, Serinus striolatus 535
gravis, Vireo plumbeus 424
Gray's Malimbe 195
graysoni, Parula pitiayumi 743
Great Munia 377
Great Rosefinch *455,* 594
Great-billed Munia 377
Greater Amakihi 647
Greater Koa Finch 647
grebnitskii, Carpodacus erythrinus 583
Green Avadavat *295,* 299
Green Canary 527
Green Indigobird 227, 231
Green Munia 299
Green Parrotfinch 346
Green Shrike-vireo *380,* 416
Green Singing Finch 527
Green Tiger Finch 299
Green Twinspot *238,* 311
Green Waxbill 307
Green Widowfinch 231
Green-backed Goldfinch 559
Green-backed Twinspot 311
Green-faced Parrotfinch 346
Green-headed Mannikin 361
Green-tailed Ground Warbler 777
Green-tailed Ground-tanager 777
Green-tailed Parrofinch 346
Green-tailed Warbler *674,* 777
Green-winged Pytilia 331
Green-winged Vireo 417
Greenfinch
Black-headed *490,* 545
Chinese 543
Common 542
European *473, 493, 500,* 542
Grey-capped 543
Himalayan 544
Oriental 543
Oustalet's Black-headed 545
Tibetan 545
Vietnamese *506,* 544
Western 542
Yellow-breasted *445,* 544
Yunnan 545
Yunnan Black-headed 545
Greenland Redpoll 564
Greenlet
Amazon 437
Ashy-headed 436
Brown-headed 436
Buff-cheeked 437
Dusky-capped 437
Golden-fronted 437
Grey 423
Grey-chested 435
Grey-eyed *389,* 435
Grey-fronted 437
Grey-headed 438
Grey-naped 435
Lawrence's 437
Lemon-chested *383,* 435
Lesser *383,* 438
Olivaceous 438
Red-fronted 438
Rufous-crowned *383,* 435
Rufous-naped 436
Scrub 437
Tawny-crowned 438
Tepui 436
Yellow-bellied 437
Yellow-green 437
Grenadier Weaver 145
Grenadier, Common 328
Grenadier, Purple *241,* 328
Grey Black-faced Firefinch 336
Grey Bullfinch 609
Grey Canary 522
Grey Firefinch 336
Grey Greenlet 423
Grey Vireo *382,* 423
Grey Waxbill 315, 317
Grey-and-gold Warbler 787
Grey-backed Firefinch 341
Grey-backed Weaver 181
Grey-banded Mannikin 373
Grey-banded Munia 373
Grey-bellied Rosefinch 609
Grey-breasted Ground Warbler 777
Grey-breasted Oliveback 311
Grey-breasted Warbler 777
Grey-breasted Waxbill 321
Grey-capped Greenfinch 543
Grey-capped Shrike-vireo 417
Grey-capped Social-weaver 137
Grey-chested Greenlet 435
Grey-crowned Blackfinch 306
Grey-crowned Goldfinch 561
Grey-crowned Ground Chat 774
Grey-crowned Mannikin 375
Grey-crowned Munia 375
Grey-crowned Negrofinch 306
Grey-crowned Rosy-finch *470,* 573
Grey-crowned Yellowthroat 774
Grey-eyed Greenlet *389,* 435
Grey-fronted Greenlet 437
Grey-headed Bullfinch *477,* 608
Grey-headed Greenlet 438
Grey-headed Mannikin 360, 376
Grey-headed Munia 376
Grey-headed Negrofinch *237,* 306
Grey-headed Nigrita 306
Grey-headed Oliveback *238,* 311
Grey-headed Silverbill 360
Grey-headed Social-weaver *77,* 137
Grey-headed Warbler *735,* 740, 788
Grey-headed Waxbill 307
Grey-naped Greenlet 435
Grey-throated Chat 799
Grey-throated Warbler 789, 799
grinnelli, Carpodacus mexicanus 585
grinnelli, Loxia curvirostra 601
griscomi, Carpodacus mexicanus 585
griscomi, Granatellus sallaei 799
griseiceps, Basileuterus 735, 788
griseifrons, Hylophilus muscicapinus 437
griseitergum, Serinus canicollis 519
griseiventris, Hylophilus thoracicus 435
griseiventris, Pyrrhula pyrrhula 609
griseobarbatus, Vireo olivaceus 430
griseonucha, Leucosticte tephrocotis 573
griseonuchus, Myioborus melanocephalus 785
griseus, Vireo 386, 417
Grosbeak Bunting 538
Grosbeak Weaver 138, 538
Grosbeak
Abeille's 616
Allied 614
Arabian *506,* 541
Arabian Golden-winged 541
Black-and-yellow 613
Black-headed 613
Chinese 613
Collared *467,* 614
Evening *476,* 615
Golden-winged 542
Hooded 616
Japanese *458,* 613
Kona 647
Masked 613
Pine *478, 494, 503,* 599
Sao Tome *511,* 538
Scarlet 583
Socotra *445,* 542
Socotra Golden-winged 542
Somali 541
Somali Golden-winged 541
Spot-winged 614
White-fronted 138
White-winged *486,* 615
Yellow-billed *479,* 613
Grosbeak-canary
Abyssinian 528
Kenya 528
Northern 528
Southern 528
grotei, Pytilia melba 331
grotei, Serinus mozambicus 527
Ground Chat 774
Ground Warbler 777
Ground-tanager, Green-tailed 777
Guadalupe House Finch 585
guadeloupensis, Dendroica plumbea 760
Guaiquinima Redstart 785
Guaiquinima Whitestart 785
guatemalae, Myioborus pictus 780
guentheri, Carduelis cannabina 569
guillarmodi, Serinus flaviventris 529
guillemardi, Loxia curvirostra 601
guineensis, Lagonosticta senegala 337
gujanensis, Cyclarhis 384, 388, 394, 405, 415
gularis, Serinus 482, 531
Gundlach's Vireo 421
gundlachi, Dendroica petechia 745
gundlachii, Vireo 397, 421
gurneyi, Anaplectes rubriceps 197
guttata, Stagonopleura 292, 352
guttata, Taeniopygia 357
gutturalis, Parula 718, 742

H

haematina, Spermophaga 254, 323
haematocephala, Lagonosticta rubricata 341
haematopygia, Leucosticte brandti 571
Haematospiza 600
hagenensis, Oreostruthus fuliginosus 352
halseii, Dendroica nigrescens 751
hanapepe, Hemignathus 656
harrisoni, Carduelis chloris 542
harterti, Carduelis cannabina 569
Hartlaub's Marsh Widowbird 151
Hartlaub's Warbler 742
hartlaubi, Euplectes 151
Hawaii Akepa *620,* 652
Hawaii Akialoa 647
Hawaii Amakihi *623, 639,* 656
Hawaii Creeper *622, 638,* 654
Hawaii Mamo 647
Hawaii Nukupuu 657
Hawaiian Honeycreepers 618, 649
Hawfinch *488, 490,* 610
Hawfinch, Black-and-yellow 613
Hawfinch, Black-tailed 613
Hawfinch, Chinese 613
Hawfinch, Japanese 613
Hawfinch, Masked 613
Hawfinch, Yellow-billed 613
hawkeri, Granatina ianthinogaster 328
Heck's Finch 358
Heck's Grassfinch 358
hecki, Poephila acuticauda 358
heinrichi, Carduelis spinoides 544
hellmayri, Myioborus miniatus 781
Helmitheros 765
helvinus, Hylophilus aurantiifrons 437
Hemignathus 656
Hemignathus ellisianus lanaiensis 647
Hemignathus ellisianus stejnegeri 647
Hemignathus lucidus 647
Hemignathus obscurus ellisianus 647
Hemignathus obscurus lanaiensis 647
Hemignathus obscurus lichtensteinii 647
Hemignathus obscurus obscurus 647
Hemignathus obscurus procerus 647
Hemignathus sagittirostris 647
Hemispingus 795
henrici, Uragus sibiricus 580
Hermit Warbler 752
Hesperiphona 615
hesperophila, Carduelis psaltria 559
Heteromunia 351
Heterorhynchus lucidus 647
Heuglin's Masked Weaver 162
Heuglin's Weaver 162
heuglini, Ploceus 162
heurni, Lonchura grandis 377
hewitti, Serinus albogularis 530
hibernicus, Fringilla coelebs 513
Highland Marsh Widowbird 151
Highland Shrike-Vireo 416
Highland-tanager, Hispaniolan 800
hildegardae, Serinus capistratus 522
hilgerti, Serinus reichenowi 523
Hill Munia 367
Himalayan Beautiful Rosefinch 586
Himalayan Goldfinch 544
Himalayan Greenfinch 544
Himalayan Rosefinch 593
Himalayan Weaver 158
Himalayan White-browed Rosefinch 593
himalayensis, Loxia curvirostra 601
Himatione 657
Himatione fraithii 647
Himatione sanguinea freethi 647
hispana, Loxia curvirostra 600
Hispaniola Goldfinch 554
Hispaniola Siskin 554
Hispaniolan Crossbill 605
Hispaniolan Highland-tanager 800
Histurgops 136
Hoary Redpoll 565
Hodgson's Mountain-finch 571
Hodgson's Munia 367
Hodgson's Rosefinch 583
Hodgson's Rosy-finch 571
holmesi, Lonchura punctulata 366
holomelas, Ploceus albinucha 187
Holub's Golden Weaver *101, 105,* 184
homogenes, Cryptospiza reichenovii 312
Honeycreeper, Black-faced 649
Honeycreeper, Crested 658
Honeycreeper, Laysan 647, 650
Honeycreeper, Nioha 650
Hooded Grosbeak 616
Hooded Mannikin 361, 376
Hooded Munia 376
Hooded Siskin *476,* 553
Hooded Warbler *676,* 778
Hooded Weaver 361
Hooded Weaver Finch 361
Hooded Yellowthroat 773
Hookbill, Lanai 647
hooveri, Dendroica coronata 748
hordeacea, Loxia 146
hordeaceus, Euplectes 89, 146
Hornemann's Redpoll 565
hornemanni, Carduelis 446, 565
hortensis, Fringilla coelebs 513
House Finch *456, 481,* 585
Housefinch, McGregor's 585
Housefinch, San Benito 585
hoyi, Carduelis magellanica 553
huillensis, Serinus flavivertex 518
humeralis, Euplectes hartlaubi 151
humii, Coccothraustes coccothraustes 610
humii, Pyrrhospiza punicea 596
humilis, Serinus gularis 531
Hunstein's Mannikin 377
Hunstein's Munia 377
hunsteini, Lonchura 377
Hutton's Vireo 427
huttoni, Vireo 427
hygrophila, Pytilia melba 331
Hylophilus 435
hymenaicus, Ploceus hypoxanthus 158
Hypargos 333
hyperythra, Erythrura 346
hypocherina, Vidua 201, 219
hypochlora, Dendroica petechia 745
hypochrysea, Dendroica palmarum 758
hypochryseus, Vireo 393, 428
hypogrammica, Pytilia 332
hypoleucus, Basileuterus 793
hypomelaena, Lonchura tristissima 366
hypostictus, Serinus citrinelloides 521
hypoxanthus, Hylophilus 437
hypoxanthus, Ploceus 127, 158

I

ianthinogaster, Granatina 241, 328
Ibadan Malimbe *131,* 194
ibadanensis, Malimbus 131, 194
iberiae, Pyrrhula pyrrhula 609
Iceland Redpoll 564
Icteria 786, 798
icterica, Carduelis magellanica 553
ictericus, Hylophilus hypoxanthus 437
Icterine Canary 527
icterioides, Mycerobas 613
icterotis, Geothlypis poliocephala 774
idius, Hypargos niveoguttatus 334
ignota, Geothlypis trichas 771
ignotus, Basileuterus 794
Iiwi *619, 628,* 658
Iiwi polena 658
Iiwi popolo 658
imberbis, Anomalospiza 199, 219
impiger, Serinus atrogularis 523
inaequalis, Basileuterus coronatus 789
incana, Estrilda perreini 315
incognita, Vidua chalybeata 227
inconspicuus, Basileuterus tristriatus 795
Indian Baya 169
Indian Black-headed Munia 369
Indian Silverbill *260,* 360

Indian Weaver 169
indignus, Basileuterus culicivorus 793
Indigobird 198, 219
African Firefinch 230
Alexander's 228
Baka 229
Bakra 229
Bar-breasted Firefinch 228
Barka 229
Black 230
Black-faced Firefinch 229
Brown-backed Firefinch 230
Cameroon 230
Codrington's 231
Common 227
Dusky *200*, 230, 231
Fonio 230
Goldbreast 229
Green 227, 231
Jambandu *211*, 229
Jameson's Firefinch 231
Jos Plateau *209*, 229
Luangwa 231
Pale-winged 228, 229, 230
Peters's Twinspot 231
Purple *205*, 227, 231
Quailfinch 228
Red-billed Firefinch 227
South African 227
Southern Twinspot 231
Twinspot 231
Variable 230
Village *212*, 227
Wilson's 228
Zaire 227
Zambezi 231
Indigofinch 227
Indigofinch, Senegal 227
Indonesian Serin 537
inedita, Dendroica petechia 745
infortunatus, Ploceus philippinus 169
inornata, Parula pitiayumi 743
inornatus, Hylophilus hypoxanthus 437
insignis, Ploceus 81, 189
insperata, Geothlypis trichas 771
insulanus, Vireo flavoviridis 431
insularis, Cyclarhis gujanensis 415
insularis, Hylophilus flavipes 437
insularis, Parula pitiayumi 743
insularis, Vireo huttoni 427
intensicolor, Carpodacus nipalensis 581
interior, Hypargos niveoguttatus 334
interjecta, Vidua 222
intermedia, Erythrura hyperythra 346
intermedia, Leucosticte brandti 571
intermedia, Oporornis tolmiei 769
intermedius, Bubalornis niger 132
intermedius, Euplectes macroura 149
intermedius, Myioborus miniatus 781
intermedius, Ploceus 113, 161
interposita, Stagonopleura bella 353
interscapularis, Ploceus tricolor 184
inustus, Ploceus velatus 164
irvingi, Leucosticte tephrocotis 573
Island Canary *480*, 518

J

Jackson's Crimsonwing 312
Jackson's Dancing Widowbird 151
Jackson's Golden-backed Weaver 163
Jackson's Whydah 151
Jackson's Widowbird *125*, 151
jacksoni, Cryptospiza 312
jacksoni, Euplectes 125, 151
jacksoni, Ploceus 163
jacksoni, Vireo plumbeus 424
jagoensis, Estrilda astrild 318
jagori, Lonchura atricapilla 369
jaliscensis, Peucedramus taeniatus 665
Jamaican Vireo 421
Jamaican White-eyed Vireo 421
Jambandu Indigobird *211*, 229
Jameson's Antpecker 305
Jameson's Firefinch 342
Jameson's Firefinch Indigobird 231
jamesoni, Lagonosticta rhodopareia 342
jamesoni, Parmoptila 305
Japanese Grosbeak *458*, 613
Japanese Hawfinch 613
Japanese Rosy-finch 572
japonica, Loxia curvirostra 601
japonicus, Coccothraustes coccothraustes 610
Java Finch 365
Java Sparrow *296*, 365
Javan Greenfinch 537
Javan Mannikin 368
Javan Munia 368
Javanese Mannikin 368
Javanese Munia 368
Javanese White-bellied Munia 368
Jerdon's Mannikin 367
Jerdon's Munia 367
jerdoni, Lonchura kelaarti 367
jessei, Pytilia melba 331
jewetti, Carduelis tristis 559
johannis, Carduelis 570
Jos Plateau Indigobird *209*, 229
josephae, Vireo leucophrys 429
jouyi, Basileuterus rufifrons 793
jouyi, Carduelis psaltria 559
Juba Weaver *124*, 172
jubaensis, Anaplectes rubriceps 197
Jubaland Weaver 172
jubaris, Dendroica petechia 745
Juniper Finch 599
juruanus, Hylophilus semicinereus 435

K

Kakawahie 647
kalaana, Chlorodrepanis virens 656
kamtschatkensis, Pinicola enucleator 599
Kandt's Waxbill *240*, 321
kandti, Estrilda 240, 321
kangrae, Carpodacus nipalensis 581
karlenae, Geothlypis nelsoni 773
kasaica, Amblyospiza albifrons 138
Katanga Masked Weaver 172
katangae, Ploceus 172
katangae, Uraeginthus bengalus 327
Kauai Akepa 653
Kauai Akialoa 647
Kauai Amakihi *633*, 655
Kauai Nukupuu 656
kavirondensis, Ploceus luteolus 170
kawarahiba, Carduelis sinica 543
kelaarti, Lonchura 367
kempi, Estrilda astrild 317
keniensis, Estrilda kandti 321
Kentucky Warbler *688*, 767
Kenya Buffalo-weaver 132
Kenya Canary 518
Kenya Citril 521
Kenya Grosbeak-canary 528
Kenya Mountain Waxbill 321
Kenya Partridge Finch 300
Kenya Yellow-rumped Seedeater 523
Kenyan Yellow-rumped Seedeater 523
kersteni, Ploceus bicolor 181
Kiabo Waxbill 317
kigomaensis, Ploceus bicolor 181
kikuyensis, Serinus citrinelloides 521
kikuyuensis, Lagonosticta senegala 337
kilgoris, Spermophaga ruficapilla 323
kilianensis, Pyrrhospiza punicea 596
kilimensis, Coccopygia quartinia 307
kilimensis, Cryptospiza salvadorii 313
kilimensis, Euplectes capensis 149
kilimensis, Linurgus olivaceus 541
kilimensis, Serinus burtoni 535
Kilombero Weaver *129*, 176
Kipengere Seedeater 536
kirghizorum, Carduelis flavirostris 566
Kirtland's Warbler *730*, 757
kirtlandii, Dendroica 730, 757
kittlitzi, Carduelis sinica 543
kiwanukae, Estrilda erythronotos 313
kleinschmidti, Erythrura 345
knysnae, Euplectes capensis 149
Koa-Finch, Parrot-billed 657
kobdensis, Carpodacus rubicilla 594
koliensis, Serinus 522
Kona Grosbeak 647
kona, Chloridops 647
kona, Loxioides 647
kona, Psittirostra 647
korejevi, Carduelis flavirostris 566
kotschubeii, Carpodacus rhodochlamys 593
Kozlowia 597
Krimhilda 321
Krimhilda, Estrilda atricapilla 321
kubanensis, Carpodacus erythrinus 583
kudugliensis, Vidua orientalis 222
Kulikoro Firefinch 341
kumusii, Lonchura caniceps 376
Kungwe Negrofinch 306
Kupang Munia 365
Kupang Sparrow 365

L

lachrymosa, Euthlypis 678, 786
ladoensis, Euplectes afer 143
Lady Gouldian Finch 345
laetissimus, Vireo leucophrys 429
Lagonosticta 336
Lake Lufira Weaver 171
Lake Victoria Weaver 162, 163
Lanai Akialoa 647
Lanai Creeper 649
Lanai Hookbill 647
lanaiensis, Akialoa 647
lanaiensis, Hemignathus ellisianus 647
lanaiensis, Hemignathus obscurus 647
Landana Firefinch 341
landanae, Lagonosticta rubricata 341
languens, Serinus sulphuratus 529
Large Golden Weaver 184
Large Rosefinch 588
Large-billed Parrotfinch 348
Large-billed Seedcracker 322
Large-billed Vireo 418
Larger Golden Weaver 184
Large-tailed Parrotfinch 348
larvata, Lagonosticta 336
larvaticola, Vidua 229
lateritia, Lagonosticta rufopicta 338
lathamii, Quelea quelea 139
laticauda, Euplectes ardens 144
Latimer's Vireo 421
latimeri, Vireo 421
Lavender Finch 315
Lavender Firefinch 315
Lavender Waxbill *239*, 315
Lawrence's Goldfinch *447*, 560
Lawrence's Greenlet 437
Lawrence's Warbler 739
lawrencei, Carduelis 447, 560
Layard's Black-headed Weaver 165
Layard's Seedeater 536
Layard's Weaver 165
Laysan Finch *640*, *645*, 650
Laysan Finchbill 650
Laysan Honeycreeper 647, 650
Least Bell's Vireo 422
lebomboensis, Ploceus bicolor 181
Leiothlypis 740, 741
Lemon-breasted Canary *501*, 527
Lemon-breasted Seedeater 527
Lemon-chested Greenlet *383*, 435
Lemuresthes 359
lemurum, Basileuterus leucoblepharus 796
Lepidopygia 359
lepidus, Philetairus socius 138
lepidus, Uragus sibiricus 580
Lesser Goldfinch 559
Lesser Greenlet *383*, 438
Lesser Koa Finch 647
Lesser Masked Weaver *113*, 161
Lesser Redpoll 563
Lesser Seedcracker *241*, 322
Lesser Sunda Munia 375
leucoblepharus, Basileuterus 711, 796
leucogastra, Lonchura 368
leucogastroides, Lonchura 368
leucogenis, Pyrrhula 504, 607
leucogenys, Pyrrhula 607
leucolaemus, Alario alario 538
leuconotos, Anaplectes rubriceps 197
Leucopeza 777
leucophrys, Basileuterus 796
leucophrys, Vireo 429
leucopolius, Vireo gilvus 429
leucoptera, Loxia 485, 604
leucopterus, Serinus 536
leucopygius, Basileuterus fulvicauda 796
leucopygius, Serinus 522
leucosticta, Lonchura tristissima 366
Leucosticte 571
leucotis, Poephila personata 358
leucotis, Vireolanius 388, 417
leucura, Pinicola enucleator 599
Lichtenstein's Desert Finch 579
Lichtenstein's Finch 579
lichtensteinii, Hemignathus obscurus 647
Lilac Firefinch 341
limnaeus, Seiurus noveboracensis 766
limnatis, Geothlypis speciosa 773
lineata, Pytilia 332
Lineated Pytilia 332
Linnet
Arabian 570
Brown 569
Common *465*, 569
Eurasian 569
European 569
Warsangli 570
Yemen *489*, 570
Linurgus 541
litoris, Euplectes capensis 149
Little Bishop 145
Little Masked-weaver 170
Little Olive Waxbill 311
Little Olive Weaver 311
Little Oliveback 311
Little Ruddy Waxbill 337
Little Weaver *94*, 170, 183
littoralis, Leucosticte tephrocotis 573
littoralis, Uraeginthus bengalus 327
Loango Slender-billed Weaver 189
Loango Weaver *128*, 189
Locust Finch *280*, 300
Locust Quailfinch 300
locustella, Paludipasser 280, 300
Locustfinch, Common 300
Locustfinch, Zaire 300
loftyi, Neochmia temporalis 353
Lonchura 351, 359, 361, 365
Lonchura monticola 373
longicauda, Icteria virens 798
longirostris, Carduelis magellanica 553
longirostris, Pyrrhospiza punicea 596
Long-tailed Black Whydah 150
Long-tailed Finch *277*, *281*, 358
Long-tailed Grassfinch 358
Long-tailed Munia 346, 367
Long-tailed Paradise Whydah 222
Long-tailed Paradise Widow 221
Long-tailed Paradise-whydah *206*, *213*, 221
Long-tailed Rosefinch *498*, 580, 581
Long-tailed Whydah 152
Long-tailed Widowbird *100*, 152
lorenzi, Vidua wilsoni 228
loudoni, Carduelis carduelis 561
louisae, Rhynchostruthus 541
Louisiana Waterthrush *700*, *723*, 767
loveridgei, Serinus sulphuratus 529
Loxia 600
Loxioides 650
Loxioides flaviceps 647
Loxioides kona 647
Loxioides palmeri 647
Loxops 652
Loxops coccinea rufa 647
Loxops coccinea wolstenholmei 647
Loxops maculata flammea 647
Loxops sagittirostris 647
Loxops wolstenholmei 647
Luangwa Indigobird 231
lucasanus, Vireo cassinii 425
luciae, Vermivora 709, 742
lucidus, Hemignathus 647
lucidus, Heterorhynchus 647
lucifer, Carpodacus rubicilloides 594
Lucy's Warbler *709*, 742
ludoviciana, Parula americana 743
luebberti, Ploceus intermedius 161
Lufira Masked Weaver 171
lurida, Dendroica striata 759
luteifrons, Hylophilus ochraceiceps 438
luteifrons, Nigrita 306
luteolus, Ploceus 94, 170
luteoviridis, Basileuterus 788
lutescens, Hylophilus ochraceiceps 438
lutescens, Vermivora celata 740
luzoniensis, Loxia curvirostra 601
lwenarum, Serinus atrogularis 523
Lymnothlypis 765

M

MacGillivray's Warbler *703*, 769
macgillivrayi, Erythrura trichroa 348
macmillani, Anomalospiza imberbis 219
macmillani, Estrilda astrild 317
macrocercus, Euplectes macroura 149
macroptera, Carduelis pinus 548
macrorhynchus, Euplectes capensis 149
macrospilotus, Hypargos niveoguttatus 334
macroura, Euplectes 79, 149
macroura, Loxia 149

macroura, Vidua 208, 210, 216, 217, 219
maculata, Paroreomyza 649
maculicollis, Serinus dorsostriatus 529
Madagascan Red Fody 155
Madagascar Bibfinch *247,* 359
Madagascar Mannikin 359
Madagascar Munia 359
Madagascar Red Fody 155
madagascariensis, Foudia 85, 155
madaraszi, Carduelis chloris 542
maderensis, Fringilla coelebs 513
magellanica, Carduelis 476, 553
magister, Vireo 432
magnirostris, Eophona personata 613
Magnolia Warbler *698,* 746
magnolia, Dendroica 698, 746
magnus, Vireo gundlachii 421
Magpie Mannikin *256,* 361
Magpie Munia 361
maguirei, Myioborus castaneocapilla 781
Magumma 652
mahali, Plocepasser 95, 110, 135
maja, Lonchura 264, 373
major, Carduelis carduelis 561
makandakunae, Anomalospiza imberbis 219
malabarica, Euodice 260, 360
malacca, Lonchura 369
malaris, Myioborus melanocephalus 785
malayana, Erythrura hyperythra 346
Malaysian Finch 537
Malaysian Goldfinch 537
Malaysian Serin 537
Mali Firefinch 341
Malimbe
  Ballman's 193
  Black-throated 193
  Blue-billed *85,* 195
  Cassin's 193
  Crested *102,* 195
  Gola 193
  Gray's 195
  Ibadan *131,* 194
  Rachel's 196
  Red-bellied 194
  Red-collared 196
  Red-crowned 194
  Red-headed *94,* 196
  Red-vented *106,* 196
  Scarlet-crowned 194
  Tai 193
  Yellow-fronted 187
  Yellow-legged 187
malimbicus, Malimbus 102, 195
Malimbus 193
Mamo, Black 647
Mamo, Hawaii 647
mana, Manucerthia 622, 638, 654
Mandingoa 311
Mangrove Vireo 418
Mangrove Warbler 745
Mangrove Yellow Warbler 745
Manila Parrotfinch 346
Mannikin
  Alpine 373
  Arfak 373
  Bicoloured 361
  Bismarck 377
  Black 368, 376
  Black Borneo 368
  Black-and-white *248,* 361
  Black-beaked Bronze 368
  Black-breasted 375
  Black-headed 369
  Blue-billed 361
  Borneo 368
  Bronze *266, 277,* 361
  Bronze-winged 361
  Buff-bellied 377
  Buff-bellied Black 377
  Buff-breasted 377
  Chequered 361
  Chestnut 369
  Chestnut-and-white 375
  Chestnut-breasted 374
  Dusky 368
  Dwarf 359
  Eastern Alpine 373
  Fernando Po 361
  Forbes's 377
  Giant 361
  Grand Valley 375
  Green-headed 361
  Grey-banded 373
  Grey-crowned 375
  Grey-headed 360, 376
  Hooded 361, 376
  Hunstein's 377
  Javan 368
  Javanese 368
  Jerdon's 367
  Madagascar 359
  Magpie *256,* 361
  Mayr's 376
  Moluccan 367
  New Britain 376, 377
  New Ireland 377
  Nutmeg 366
  Pale-headed 373
  Pallid 373
  Pearl-headed 360
  Pearl-shouldered 360
  Pearl-winged 360
  Pictorella 351
  Red-backed 361
  Rufous-backed 361
  Rufous-bellied 367
  Scaly-breasted 366
  Snow Mountain *287,* 374
  Spice 366
  Spotted 366
  Streak-headed 365
  Striated 367
  Thick-billed 377
  Tricoloured 369
  Western Alpine 374
  White-bellied 368
  White-breasted 351, 368
  White-crowned 375
  White-headed 373, 377
  White-rumped 367
  White-spotted 365
  Yellow-rumped *249,* 374
  Yellow-tailed 374
Mannikinm, Grand 377
Manucerthia 654
manueli, Lonchura leucogastra 368
Manyar Weaver 175
manyar, Ploceus 107, 175
maranonicus, Vireo leucophrys 429
margaritacea, Leucosticte brandti 571
margaritatus, Hypargos 285, 333
mariae, Lonchura teerinki 375
mariae, Loxia curvirostra 600
marlevi, Ploceus xanthopterus 176
Marsh Finch 300
Marsh Waxbill 315
Marsh Whydah 151
Marsh Widowbird 151
marshalli, Serinus flaviventris 529
marshalli, Vireo griseus 417
martinsi, Serinus citrinelloides 521
marungensis, Estrilda atricapilla 321
marwitzi, Estrilda paludicola 316
maryae, Vidua 209, 229
Maryland Yellowthroat 771
Mascarene Fody 155, 156
Masked Finch *271, 273,* 358
Masked Firefinch 336
Masked Grassfinch 358
Masked Grosbeak 613
Masked Hawfinch 613
Masked Yellowthroat 773
Masked-weaver 161
Masked-weaver, Little 170
massaica, Estrilda astrild 318
masteri, Vireo 413, 426
Maui Akepa 653
Maui Alauahio *635, 641,* 649
Maui Creeper 649
Maui Nukupuu 656
Maui Parrotbill *624, 638,* 657
Mauritius Fody *130,* 156
maxima, Amblyospiza albifrons 138
maxima, Leucosticte tephrocotis 573
maximus, Pyrenestes ostrinus 322
Maxwell's Black Weaver 187
maxwelli, Ploceus albinucha 187
Maya Munia 373
Maya Vireo 418
Mayan Vireo 418
maynardi, Vireo griseus 417
Mayr's Mannikin 376
Mayr's Munia 376
mayri, Lonchura spectabilis 376
Mayrimunia 365
McGregor's Housefinch 585
mcgregori, Carpodacus mexicanus 585
meadewaldoi, Carduelis cannabina 569
Meadow Warbler 774
Mealy Redpoll 564
mediterranea, Carduelis cannabina 569
medius, Vireo bellii 422
megaplaga, Loxia 605
megarhynchus, Ploceus 158
melaena, Lonchura 377
Melamprosops 649
melanauris, Ergaticus ruber 780
melanocephalus, Myioborus 677, 785
melanocephalus, Ploceus 163
melanochrous, Serinus 536
melanogaster, Ploceus 82, 187
melanogenys, Basileuterus 794
melanogenys, Parula pitiayumi 743
melanops, Geothlypis trichas 771
melanoptera, Dendroica petechia 745
melanorhynchus, Plocepasser mahali 135
melanota, Amblyospiza albifrons 138
melanotis, Anaplectes rubriceps 197
melanotis, Basileuterus tristriatus 795
melanotis, Coccopygia 262, 278, 307
melanotis, Granatellus venustus 799
melanoxanthus, Ploceus nigricollis 182
melanozanthos, Mycerobas 614
Melba Finch *242,* 331
Melba Waxbill 331
melba, Pytilia 242, 331
melitophrys, Vireolanius 380, 416
melleus, Hylophilus flavipes 437
Melodivireo 430
melpoda, Estrilda 255, 316
melpoda, Estrilda paludicola 316
memorabilis, Dendroica coronata 748
Menacha Seedeater 535
Menacha Serin 535
menachensis, Serinus 442, 535
mendosus, Serinus gularis 531
mennelli, Serinus 531
mentalis, Ploceus bicolor 181
meridanus, Basileuterus tristriatus 795
meridionalis, Amadina fasciata 301
meridionalis, Loxia curvirostra 601
merzbacheri, Mycerobas carnipes 615
mesamericana, Loxia curvirostra 601
mesochrysus, Basileuterus rufifrons 793
mesoleucus, Basileuterus rivularis 797
Mexican Brown-capped Vireo 429
mexicana, Hesperiphona vespertina 615
mexicana, Parula superciliosa 742
mexicanus, Carpodacus 456, 481, 585
mexicanus, Vireo huttoni 427
Microligea 777, 800
microrhyncha, Erythrura hyperythra 346
micrus, Peucedramus taeniatus 665
micrus, Vireo griseus 417
migratoria, Eophona 479, 613
mikettae, Vireolanius leucotis 417
Mindanao Parrotfinch 347
Mindanao Serin 537
mindanensis, Serinus estherae 537
miniakensis, Carduelis flavirostris 566
miniatus, Myioborus 685, 781
minor, Carduelis sinica 543
minor, Estrilda astrild 318
minor, Hylophilus decurtatus 438
minor, Lonchura hunsteini 377
minor, Loxia curvirostra 601
minor, Neochmia temporalis 354
minor, Ploceus sakalava 177
minor, Pyrenestes 241, 322
minor, Spermestes bicolor 361
minuscula, Ortygospiza atricollis 300
mirandae, Vireo leucophrys 429
Mlle Thura's Rosefinch 593
Mniotilta 761
Modest Grassfinch 354
modesta, Erythrura trichroa 348
modesta, Geothlypis trichas 771
modesta, Neochmia 354
modestus, Vireo 421
molochinus, Myioborus miniatus 781
molucca, Lonchura 367
Moluccan Finch 367
Moluccan Mannikin 367
Moluccan Munia 367
monacha, Ploceus pelzelni 183
Mongolian Finch *451,* 578
Mongolian Trumpeter Finch 578
mongolica, Eremopsaltria 451, 578
monguilloti, Carduelis 506, 544
montana, Amblyospiza albifrons 138
montana, Hesperiphona vespertina 615
montana, Lonchura 287, 374
montana, Paroreomyza 635, 641, 649
montana, Pinicola enucleator 599
montana, Xenoligea 725, 800
Montane Marsh Whydah 151
Montane Marsh Widow 151
Montane Marsh Widowbird 151
montanella, Carduelis flavirostris 566
montanorum, Serinus gularis 531
montanus, Vireo plumbeus 424
monteiri, Clytospiza 334
Monteiro's Golden Weaver 184
Monteiro's Twinspot 334
monticola, Oporornis tolmiei 769
montifringilla, Fringilla 461, 468, 515
montium, Serinus gularis 531
morcomi, Dendroica petechia 745
moreletti, Fringilla coelebs 513
moresbyae, Lonchura tristissima 366
motacilla, Basileuterus fulvicauda 796
motacilla, Seiurus 700, 723, 767
Mottled Munia 377
Mottled Weaver 165
Mount Kataglad Parrotfinch *290,* 347
Mount Teyde Blue Chaffinch 514
Mountain Canary 538
Mountain Firetail *245,* 351
Mountain Marsh Whydah 151
Mountain Marsh Widowbird 151
Mountain Serin 537
Mountain-Finch 351
Mountain-finch
  Black-headed 571
  Brandt's *448,* 571
  Hodgson's 571
  Plain 571
  Rosy-rumped 571
  Sillem's 572
  Tawny-headed 572
  White-winged 572
Mourning Warbler *715,* 768
mozambicus, Serinus 480, 527
muehlei, Carduelis chloris 542
muelleri, Ortygospiza atricollis 300
Munia 351
Munia
  Alpine 373
  Arfak 373
  Bamboo 346
  Barred 366
  Bengalese 367
  Bismarck 377
  Black 376
  Black-and-white 361
  Black-breasted 377
  Black-breasted Teerink's 375
  Black-faced 367
  Black-headed 369
  Black-rumped 368
  Black-throated 367, 370
  Borneo 368
  Bronze 361
  Brown-backed 361
  Celebes 373
  Ceylon Hill 367
  Chestnut *252, 276,* 369
  Chestnut-and-white 375
  Chestnut-backed 361
  Chestnut-breasted 374
  Coloured 375
  Cream-bellied 369
  Dusky *249,* 368
  Eastern Alpine 373
  Fernando Po 361
  Five-coloured 375
  Forbes's 377
  Grand 377
  Grand Valley 375
  Great 377
  Great-billed 377
  Green 299
  Grey-banded 373
  Grey-crowned 375
  Grey-headed 376
  Hill 367
  Hodgson's 367
  Hooded 376
  Hunstein's 377
  Indian Black-headed 369
  Javan 368
  Javanese 368
  Javanese White-bellied 368
  Jerdon's 367
  Kupang 365

Lesser Sunda 375
Long-tailed 346, 367
Madagascar 359
Magpie 361
Maya 373
Mayr's 376
Moluccan 367
Mottled 377
New Britain 376
New Guinea 376
New Hanover 377
New Ireland 377
Pale 373
Pale-headed 373
Pallid 373
Pectoral 351
Pictorella 351
Red 299
Rice 365
Rufous-backed 361
Rufous-bellied 367
Rufous-breasted 367
Scaly-breasted *265*, 366
Sharp-tailed 367
Snow Mountain 374
Southern Black-headed 369
Spotted 366
Sri Lanka Hill 367
Streak-headed 365
Striated 367
Sunda 373
Teerink's 375
Thick-billed 377
Timor 365
Tricoloured 369
Western Alpine 374
White-backed 367
White-bellied 368
White-breasted 351, 368
White-capped *255*, 370
White-cowled 377
White-crowned 375
White-headed *264*, 373, 377
White-rumped *265*, 360, 367
White-throated 360
Yellow-rumped 374
Yellow-tailed 374
Munia Finch 361
munroi, Dysmorodrepanis 647
murina, Pyrrhula 510, 608
muscicapinus, Hylophilus 437
mutabilis, Vireolanius eximius 416
Mycerobas 613
Myioborus 780
myolae, Lonchura caniceps 376
myolae, Lonchura monticola 373
Myrtle Warbler 748

N

Namibia Canary 538
nana, Carduelis cannabina 569
nana, Lepidopygia 247, 359
nana, Parula pitiayumi 743
nanus, Vireo 422
Napoleon Bishop 143
Nashville Warbler *667*, 740
natalensis, Uraeginthus angolensis 326
neglecta, Lagonosticta rubricata 341
Negrofinch 305
Chestnut-breasted 306
Cinnamon-breasted 306
Grey-crowned 306
Grey-headed *237*, 306
Kungwe 306
Pale-fronted 306
Western 306
White-breasted *265*, 305
Nelicourvi Weaver *84*, 177
nelicourvi, Ploceus 84, 177
Nelson's Vireo 423
nelsoni, Dendroica vitellina 758
nelsoni, Geothlypis 773
nelsoni, Hylophilus ochraceiceps 438
nelsoni, Vireo 423
nemoricola, Leucosticte 571
Neochloe 417
Neochmia 353
Neopoephila 358
Neospiza 538
Neotropic Black-headed Siskin 554
Neotropic River Warbler 797
Neotropical Black-headed Siskin 554
Neotropical Fan-tailed Warbler *678*, 786
Neotropical River Warbler 797
Nepal Rosefinch 581
Nesocharis 311
nesophilus, Carpodacus purpureus 584
Neumann's Waxbill 315
neumanni, Ploceus baglafecht 191
neumanni, Vidua chalybeata 227
nevermanni, Lonchura 375
New Britain Finch 377
New Britain Mannikin 376, 377
New Britain Munia 376
New Guinea Munia 376
New Hanover Munia 377
New Hebrides Parrotfinch 347
New Ireland Finch 377
New Ireland Mannikin 377
New Ireland Munia 377
New World Warblers 666, 739
ngamiensis, Estrilda astrild 317
niassensis, Euplectes afer 143
niassensis, Uraeginthus angolensis 326
nicaraguae, Cyclarhis gujanensis 415
Nicoll's Weaver 187
nicolli, Ploceus 187
nicoyensis, Vireo pallens 418
niediecki, Carduelis carduelis 561
niediecki, Estrilda astrild 318
niethammeri, Amandava subflava 299
niger, Bubalornis 109, 132
Nigeria Paradise Whydah 222
Nigeria Paradise Widow 222
nigeriae, Malimbus rubricollis 196
nigeriae, Vidua 228
nigerrima, Lonchura hunsteini 377
nigerrima, Vidua funerea 230
nigerrimus, Ploceus 108, 181
nigrescens, Dendroica 751
nigricans, Coccothraustes 610
nigricauda, Carduelis spinescens 549
nigriceps, Ploceus cucullatus 165
nigriceps, Serinus 462, 521
nigriceps, Spermestes bicolor 362
nigricollis, Lagonosticta larvata 336
nigricollis, Ploceus 182
nigrifrons, Dendroica coronata 748
nigrifrons, Euplectes orix 145
nigrifrons, Malimbus malimbicus 195
nigrifrons, Ploceus velatus 164
nigrilora, Parula pitiayumi 743
nigriloris, Estrilda astrild 318
nigrimentus, Ploceus 188
nigrirostris, Cyclarhis 379, 415
Nigrita 305
Nigrita, Chestnut-breasted 306
Nigrita, Grey-headed 306
Nigrita, Pale-fronted 306
Nigrita, White-breasted 305
nigrocristatus, Basileuterus 788
nigrotecta, Poephila cincta 359
nigrotemporalis, Ploceus baglafecht 191
nigroventris, Euplectes 146
Nihoa Finch *621*, 650
nilotica, Vidua orientalis 222
Nioha Honeycreeper 650
nipalensis, Carpodacus 581
nipalensis, Pyrrhula 477, 607
nisoria, Lonchura punctulata 366
nitens, Malimbus 85, 195
nitidior, Basileuterus trifasciatus 790
nitidula, Lagonosticta 340
nitidula, Mandingoa 238, 311
nitidus, Vireo hypochryseus 428
niveoguttatus, Hypargos 282, 333
nonnula, Estrilda 321
Nonpareil Finch 346
Noronha Vireo *392*, *396*, *410*, 431
Northern Black Bishop 144
Northern Brown-throated Weaver *95*, 162
Northern Bullfinch 609
Northern Grosbeak-canary 528
Northern Masked Weaver *80*, 172
Northern Paradise Whydah 222
Northern Parula 743
Northern Red Bishop *78*, 143
Northern Red-billed Buffalo-weaver 132
Northern Red-headed Weaver 197
Northern Waterthrush *692*, *700*, 766
Northern Yellow Warbler 745
notabilis, Seiurus noveboracensis 766
notata, Carduelis 554
Notch-billed Seedcracker 322
Notiospiza 193
notius, Basileuterus coronatus 789
notius, Vireo plumbeus 424
noveboracensis, Seiurus 692, *700*, 766
noveboracensis, Vireo griseus 417
Nukupuu 656
Hawaii 657
Kauai 656
Maui 656
Oahu 647
Nun, Black-headed 369
Nun, Chestnut 369
Nun, Pale-headed 373
Nun, Three-coloured 369
Nun, Tricoloured 369
Nun, White-headed 373
Nutmeg Finch 366
Nutmeg Mannikin 366
nyansae, Estrilda astrild 317
Nyasa Crimsonwing 312
Nyasa Seedcracker 322
nyasae, Anomalospiza imberbis 219
Nyasaland Seedcracker 322
nyikae, Ploceus baglafecht 191

O

Oahu Akepa 647
Oahu Akialoa 647
Oahu Alauahio 649
Oahu Amakihi *629*, 655
Oahu Nukupuu 647
obscura, Akialoa 647
obscura, Dendroica petechia 745
obscura, Erythrura hyperythra 346
obscura, Lonchura atricapilla 369
obscurus, Hemignathus obscurus 647
obscurus, Vireo huttoni 427
obsoleta, Rhodospiza 452, 579
obtusa, Vidua 203, 221
occidentalis, Dendroica 752
occidentalis, Estrilda astrild 317
occidentalis, Geothlypis trichas 771
occultus, Basileuterus culicivorus 793
ochraceiceps, Hylophilus 438
ochraceicrista, Basileuterus fraseri 787
Ochraceous Akepeuie 653
ochraceus, Loxops 653
ochraceus, Vireo pallens 418
Ochre-crowned Peppershrike 415
ochrocephala, Cyclarhis gujanensis 415
ochrogaster, Estrilda paludicola 316
Ochrospiza 523, 527
ocularis, Cryptospiza reichenovii 312
ocularis, Ploceus 109, 182
oculata, Stagonopleura 246, 352
Odontospiza 360
okavangoensis, Vidua chalybeata 227
Old Providence Vireo 418
oleacea, Carduelis notata 555
olivacea, Carduelis 554
olivaceiceps, Ploceus 126, 188
Olivaceous Greenlet 438
Olivaceous Siskin 554
olivaceus, Hylophilus 438
olivaceus, Linurgus 444, 541
olivaceus, Ploceus capensis 162
olivaceus, Vireo 390, *395*, *401*, *402*, *406*, *407*, 430
olivascens, Basileuterus culicivorus 793
Olive Warbler *661*, *662*, *663*, 665
Olive warbler 660, 665
Olive Weaver-finch 311
Olive-backed Warbler 743
Olive-capped Warbler *726*, 755
Olive-crowned Yellowthroat *673*, 772
Olive-headed Golden Weaver 188
Olive-headed Weaver *126*, 188
Olive-rumped Canary 524
Olive-rumped Seedeater 524
Olive-rumped Serin 524
Oliveback
Fernando Po 311
Grey-breasted 311
Grey-headed *238*, 311
Little 311
Shelley's *270*, 311
White-cheeked 311
White-collared 311
olsoni, Vireo pallens 418
ombriosa, Fringilla coelebs 513
omissa, Foudia 156
Oporornis 767
oppidana, Psittirostra psittacea 651
Orange Bishop 143
Orange Bullfinch 607
Orange Waxbill 299
Orange Weaver *81*, 175
Orange-billed Finch 358
Orange-breasted Waxbill 299
Orange-cheeked Waxbill *255*, 316
Orange-crowned Warbler *702*, 740
orangensis, Serinus albogularis 530
Orange-winged Pytilia 331
oraria, Dendroica petechia 745
Oreomystis 651
Oreostruthus 351
Oreothlypis 742
orestera, Vermivora celata 740
Oriental Greenfinch 543
Oriental Rosefinch 609
orientalis, Basileuterus coronatus 789
orientalis, Euodice cantans 360
orientalis, Serinus estherae 537
orientalis, Vidua 202, 222
orientalis, Vireo gundlachii 421
Oriente Warbler *728*, 777
Oriole Finch *444*, 541
orix, Emberiza 145
orix, Euplectes 90, *112*, 145
Orizaba Yellowthroat 773
Ornate Redstart 786
ornatus, Myioborus 786
Ortygospiza 300
oryzivora, Lonchura 296, 365
Osburn's Vireo 424
osburni, Vireo 410, 424
ostrinus, Pyrenestes 322
Ou 651
Ou-holowai 653
Oustalet's Black-headed Greenfinch 545
Ovenbird *716*, 766
Owl Finch 357
owstoni, Pyrrhula erythaca 608

P

pacata, Pinicola enucleator 599
Pachyphantes 157
pacifica, Drepanis 647
pacifica, Parula pitiayumi 743
pacificus, Hylophilus ochraceiceps 438
pacificus, Vireo huttoni 427
Padda 365
Padda, Brown 365
Paddy Bird 365
Painted Finch *275*, 345, 351
Painted Firetail 351
Painted Redstart 780
Painted Whitestart *704*, 780
palawana, Lonchura leucogastra 368
Pale Finch 353
Pale Munia 373
Pale Rosefinch *454*, 591
Pale Vireo 418
Pale-billed Firefinch 341
Pale-fronted Negrofinch 306
Pale-fronted Nigrita 306
Pale-headed Mannikin 373
Pale-headed Munia 373
Pale-headed Nun 373
Pale-legged Warbler 788
Pale-winged Indigobird 228, 229, 230
Palila *634*, 650
Pallas's Rosefinch 591
Pallas's Rosy-finch 591
pallens, Serinus leucopygius 523
pallens, Vireo pallens 418
pallescens, Carduelis flavirostris 566
palliata, Parula superciliosa 742
Pallid Finch 373
Pallid Mannikin 373
Pallid Munia 373
pallida, Carduelis tristis 559
pallida, Hesperiphona abeillei 616
pallida, Lonchura 373
pallida, Ortygospiza atricollis 301
pallidicrissa, Lagonosticta senegala 337
pallidior, Estrilda erythronotos 313
pallidior, Leucosticte brandti 571
pallidior, Serinus tristriatus 532
pallidior, Sporopipes frontalis 137
pallidipectus, Hylophilus ochraceiceps 438
pallidirostris, Basileuterus flaveolus 795
pallidiventris, Myioborus miniatus 781
pallidulus, Basileuterus cinereicollis 789
pallidus, Oreostruthus fuliginosus 352
Palm Warbler *682*, *691*, 758

Palm Weaver 175
palmae, Fringilla coelebs 513
palmarum, Dendroica 682, 691, 758
palmeri, Loxioides 647
palmeri, Psittirostra 647
palmeri, Rhodacanthis 647
palmeri, Vireo leucophrys 429
Palmeria 658
palpebralis, Geothlypis poliocephala 774
paludicola, Dendroica discolor 757
paludicola, Estrilda 261, 315
Paludipasser 300
paluster, Vireo pallens 418
palustris, Microligea 674, 777
pamirensis, Carduelis flavirostris 566
pamirensis, Leucosticte brandti 571
paphlagoniae, Pyrrhula pyrrhula 609
Papuan Parrotfinch 348
papuana, Erythrura 348
Papyrus Canary 522
paradisaea, Vidua 206, 213, 221
Paradise Sparrow 301
Paradise Whydah 221
Paradise-whydah
  Broad-tailed *203,* 221
  Exclamatory 222
  Long-tailed *206, 213,* 221
  Sahel *202,* 222
  Togo 223
paraensis, Granatellus pelzelni 800
Paragua Redstart 786
paraguanae, Dendroica petechia 745
Parasitic Weaver 219
Paria Redstart 782
Paria Whitestart 782
pariae, Basileuterus tristriatus 795
pariae, Myioborus 734, 782
parkesi, Dendroica petechia 745
parkesi, Vireo huttoni 427
Parkesia 766, 767
Parmoptila 305
paropanisi, Carduelis carduelis 561
paroptus, Ploceus cucullatus 165
Paroreomyza 649
Paroreomyza flammea 647
Parrofinch, Bamboo 346
Parrofinch, Green-tailed 346
Parrot Crossbill *457,* 603
Parrot-billed Koa-Finch 657
Parrotfinch
  Black-faced 345
  Blue-bellied 347
  Blue-breasted 347
  Blue-faced *244, 281,* 348
  Blue-headed 348
  Fiji 347
  Forbes's 347
  Green 346
  Green-faced 346
  Large-billed 348
  Large-tailed 348
  Manila 346
  Mindanao 347
  Mount Katanglad *290,* 347
  New Hebrides 347
  Papuan 348
  Peale's 347
  Pink-billed 345
  Pin-tailed *266, 284,* 346
  Red-capped 347
  Red-collared 347
  Red-eared 347
  Red-headed *256,* 347
  Red-throated *244,* 347
  Royal 347
  Sunda 347
  Tanimbar 347
  Tawny-breasted 346
  Three-coloured 347
  Timor 347
  Tricolour 347
  Tricoloured *263, 286,* 347
Parrotbill, Maui *624, 638,* 657
Parson Finch 359
Parsonfinch, African 359
particeps, Lonchura punctulata 366
Partridge Finch 300
Parula 742
Parula
  American 743
  Northern 743
  Socorro 743
  Tropical *713,* 743
Parula Warbler 743
Parulidae 666, 739
parva, Carduelis carduelis 561
parva, Cyclarhis gujanensis 415
parva, Magumma 631, 652
parva, Parula superciliosa 742
Passeriformes 73
paula, Carduelis magellanica 553
pax, Cyclarhis gujanensis 415
Peale's Parrotfinch 347
pealii, Erythrura cyaneovirens 348
Pearl-headed Amadine 360
Pearl-headed Mannikin 360
Pearl-headed Silverbill 360
Pearl-shouldered Mannikin 360
Pearl-winged Mannikin 360
peasei, Estrilda astrild 317
Pectoral Finch 351
Pectoral Munia 351
pectoralis, Heteromunia 267, 351
pectoralis, Hylophilus 436
pectoralis, Plocepasser mahali 135
pectoralis, Vireo olivaceus 430
peguensis, Ploceus manyar 175
peixotoi, Ploceus velatus 164
pelewensis, Erythrura trichroa 348
pelzelni, Granatellus 800
pelzelni, Ploceus 89, 183
Peninsular Yellowthroat 771
pensylvanica, Dendroica 705, 709, 746
Peppershrike
  Black-billed *379,* 415
  Chaco 415
  Ochre-crowned 415
  Rufous-browed *384, 388, 394, 405,* 415
  Yellow-backed 415
percivali, Pytilia melba 331
percivali, Rhynchostruthus 506, 541
percna, Loxia curvirostra 601
peregrina, Vermivora 692, 696, 739
perijanus, Basileuterus tristriatus 795
perplexa, Carduelis pinus 548
perplexus, Vireo flavoviridis 431
perquisitor, Vireo griseus 417
perreini, Estrilda 315
perrygoi, Cyclarhis gujanensis 415
persica, Carduelis cannabina 569
personata, Eophona 458, 613
personata, Poephila 271, 273, 358
peruana, Carduelis magellanica 553
peruviana, Dendroica petechia 745
peruviana, Geothlypis aequinoctialis 773
petechia, Dendroica 670, 684, 694, 712, 717, 721, 745
Peters's Twinspot *282,* 333
Peters's Twinspot Indigobird 231
petrae, Carpodacus synoicus 591
petrorus, Vireo gilvus 429
Peucedramidae 660, 665
Peucedramus 665
phaeosoma, Melamprosops 643, 649
Phaeothlypis 795, 796
phaethontoptila, Lonchura striata 367
phaeton, Neochmia 246, 263, 353
pharetra, Dendroica 760
Philadelphia Vireo *381,* 430
philadelphia, Oporornis 715, 768
philadelphicus, Vireo 381, 430
Philetairus 138
Philippine Bullfinch 607
philippinus, Ploceus 114, 169
phillipsi, Dendroica petechia 745
phillipsi, Hylophilus decurtatus 438
phoeniceus, Euplectes axillaris 150
phoenicomerus, Euplectes capensis 149
phoenicoptera, Pytilia 332
pica, Spermestes fringilloides 361
Pictorella Finch *267,* 351
Pictorella Mannikin 351
Pictorella Munia 351
pictum, Emblema 275, 351
pictus, Myioborus 704, 780
Pied Mannikin Finch 361
pileata, Pyrrhula pyrrhula 609
Pileated Warbler 778
pileolata, Wilsonia pusilla 778
Pin-tailed Parrotfinch *266, 284,* 346
Pin-tailed Whydah *208, 210, 216, 217,* 219
Pin-tailed Widow 219
pinaiae, Erythrura trichroa 348
Pine Grosbeak *478, 494, 503,* 599
Pine Rosefinch 599
Pine Siskin *466,* 548
Pine Warbler 755
Pinicola 599
pinicolus, Vireo plumbeus 424
Pink-backed Firefinch 342
Pink-bellied Black-cheeked Waxbill 313
Pink-bellied Black-faced Waxbill 313
Pink-billed Parrotfinch 345
Pink-billed Quelea 139
Pink-browed Rosefinch 587
Pink-cheeked Waxbill 317
Pink-headed Warbler *731,* 780
Pink-mantled Rosefinch 587
Pink-rumped Rosefinch *491,* 587
Pink-tailed Bunting 580
Pink-tailed Rosefinch 580
Pink-throated Rosefinch 588
Pink-throated Twinspot *285,* 333
Pinkish-backed Rosefinch 593
pinus, Carduelis 466, 548
pinus, Dendroica 755
pipilans, Carduelis flavirostris 566
Pirre Warbler 794
pitiayumi, Parula 713, 743
pityophila, Dendroica 726, 755
Plain Mountain-finch 571
Ploceidae 74, 132
Plocepasser 135
Ploceus 158
Plum-capped Finch 354
Plum-headed Finch 354
plumbaria, Lagonosticta nitidula 340
plumbea, Dendroica 760
Plumbeous Vireo *398,* 424
Plumbeous Warbler 760
plumbeus, Vireo 398, 424
po, Ploceus nigricollis 182
poensis, Spermestes bicolor 362
Poephila 357, 358, 358
poicilotis, Hylophilus 383, 435
polatzeki, Fringilla teydea 514
polena, Iiwi 658
poliocephala, Geothlypis 774
poliogastra, Estrilda perreini 315
poliogenys, Spermophaga 323
poliogyna, Loxia curvirostra 601
polionota, Lagonosticta rubricata 341
poliopareia, Estrilda 294, 317
Poliospiza 530, 531
pondoensis, Ploceus bicolor 181
pontilis, Geothlypis poliocephala 774
Poo-uli *643,* 649
popolo, Iiwi 658
portenkoi, Carpodacus roseus 591
potosinus, Carpodacus mexicanus 585
praedi, Malimbus rubricollis 196
Prairie Warbler *687,* 757
prasina, Erythrura 266, 284, 346
Preuss's Golden-backed Weaver 188
Preuss's Weaver 188
preussi, Ploceus 188
prigoginei, Linurgus olivaceus 541
princeps, Ploceus 178
Principe Golden Weaver 178
Principe Seedeater *504,* 536
Principe Weaver 178
procerus, Hemignathus obscurus 647
progne, Euplectes 100, 152
propinqua, Lonchura molucca 367
propinquatus, Plocepasser mahali 135
Propyrrhula 599
Protea Canary 536
Protea Seedeater 536
Prothonotary Warbler *706, 719,* 764
Protonotaria 764
Przevalski's Finch 580
Przevalski's Rosefinch *453,* 580
psaltria, Carduelis 559
psammocromius, Euplectes 151
Pseudochloroptila 537
Pseudonestor 657
Pseudonestor 657
Pseudonigrita 137
psittacea, Erythrura 244, 347
psittacea, Psittirostra 651
Psittirostra 651
Psittirostra flaviceps 647
Psittirostra kona 647
Psittirostra palmeri 647
Puerto Rican Vireo 421
Puerto Rico Warbler 760
pulchellus, Vireolanius 380, 416
pulcherrimus, Carpodacus 586
pulchra, Parula pitiayumi 743
punctigula, Serinus mozambicus 527
punctipectus, Basileuterus tristriatus 795
punctulata, Lonchura 265, 366
punicea, Amandava amandava 299
punicea, Pyrrhospiza 456, 596
Purple Finch 584
Purple Grenadier *241,* 328
Purple Indigobird *205,* 227, 231
Purple Waxbill 328
Purple Widowfinch 231
Purple-bellied Waxbill 328
Purple-breasted Finch 345
purpurascens, Vidua 205, 231
purpureus, Carpodacus 584
pusilla, Loxia curvirostra 601
pusilla, Parula americana 743
pusilla, Wilsonia 683, 778
pusillus, Euplectes franciscanus 143
pusillus, Serinus 463, 516
pusillus, Vireo bellii 422
pustulata, Spermophaga haematina 323
pylzowi, Urocynchramus 453, 580
Pyrenestes 322
Pyrrhoplectes 616
Pyrrhospiza 596
Pyrrhula 607, 616
pyrrhula, Pyrrhula 458, 500, 609
Pytilia 331
Pytilia
  Aurora 332
  Crimson-winged 332
  Ethiopian 332
  Golden-backed 332
  Green-winged 331
  Lineated 332
  Orange-winged 331
  Red-billed 332
  Red-faced 332
  Red-winged 332
  Yellow-backed 332
  Yellow-breasted 331
  Yellow-winged 332
pytyopsittacus, Loxia 457, 603

Q

Quailfinch Indigobird 228
Quailfinch
  African *235, 274,* 300
  Black-billed 300
  Black-chinned 300
  Black-faced 300
  Common 300
  Dark-vented 300
  Ethiopian 300
  Locust 300
  Red 300
  Red-billed 300
  White-chinned 300
quanzae, Euplectes axillaris 150
quartinia, Coccopygia 307
Queen Whydah 224
Quelea 139
Quelea
  Black-faced 139
  Cardinal 141
  Pink-billed 139
  Red-billed *87, 98,* 139
  Red-headed *77,* 141, 196
  Sudan 139
quelea, Emberiza 139
quelea, Quelea 87, 98, 139
quercinus, Vireolanius melitophrys 416
quindianus, Basileuterus luteoviridis 788
quinticolor, Lonchura 375
quintoni, Serinus flaviventris 528

R

Rachel's Malimbe 196
racheliae, Malimbus 196
Rainbow Finch 345
ralphi, Geothlypis poliocephala 774
ramosi, Vireolanius pulchellus 416
ramsayi, Lonchura castaneothorax 374
rara, Lagonosticta 337
raricola, Vidua 211, 229
reai, Loxia curvirostra 601
Red Avadavat *235,* 299
Red Bishop 143, 145
Red Crossbill *484, 486,* 600
Red Fody *86,* 155
Red Forest Fody 155, 156
Red Marsh Finch 300
Red Munia 299

Red Quailfinch 300
Red Siskin *509*, 550
Red Warbler *676*, 780
Red-backed Mannikin 361
Red-backed Sparrow-weaver 136
Red-bellied Malimbe 194
Red-billed Aurora 332
Red-billed Bluebill 323
Red-billed Buffalo-weaver *109*, 132
Red-billed Crimsonwing 312
Red-billed Finch 358
Red-billed Firefinch *253*, *259*, 337
Red-billed Firefinch Indigobird 227
Red-billed Pytilia 332
Red-billed Quailfinch 300
Red-billed Quelea *87*, *98*, 139
Red-breasted Bluebill 323
Red-breasted Chat *681*, 799
Red-breasted Forest Weaver 323
Red-breasted Rosefinch 596
Red-breasted Warbler 799
Red-browed Finch *254*, 353, 577
Red-browed Firetail 353
Red-browed Rosefinch 577
Red-browed Waxbill 353
Red-capped Parrotfinch 347
Red-cheeked Blue Waxbill 327
Red-cheeked Cordon-bleu *257*, 327
Red-collared Malimbe 196
Red-collared Parrotfinch 347
Red-collared Whydah 144
Red-collared Widowbird *91*, 144
Red-crowned Bishop 146
Red-crowned Malimbe 194
Red-eared Finch 352
Red-eared Firetail *246*, 352
Red-eared Firetail-finch 352
Red-eared Parrotfinch 347
Red-eared Waxbill 317
Red-eyed Vireo *390*, *395*, *401*, *402*, *406*, *407*, 430
Red-faced Aurora Finch 332
Red-faced Crimsonwing 312
Red-faced Finch 332, 353, 354
Red-faced Flower-pecker 305
Red-faced Grassfinch 354
Red-faced Pytilia 332
Red-faced Rosefinch 596
Red-faced Warbler *720*, 779
Red-flanked Lavender Waxbill 315
Red-fronted Antpecker 305
Red-fronted Flowerpecker Weaver-finch 305
Red-fronted Greenlet 438
Red-fronted Rosefinch *456*, 596
Red-fronted Serin *463*, 516
Red-headed Anaplectes 197
Red-headed Bluebill *258*, 323
Red-headed Blue-billed Weaver 323
Red-headed Bullfinch 608
Red-headed Finch *279*, 301, 599
Red-headed Fody *79*, 155, 156
Red-headed Forest Fody 155
Red-headed Forest Weaver 323
Red-headed Malimbe *94*, 196
Red-headed Parrotfinch *256*, 347
Red-headed Quelea *77*, 141, 196
Red-headed Rosefinch 599
Red-headed Weaver *104*, 197
Red-mantled Rosefinch 587, 593
Red-naped Widowbird 144
Red-rumped Waxbill 313, 316
Red-shouldered Whydah 150
Red-shouldered Widow 150
Red-shouldered Widowbird 150
Red-sided Mountain Finch 351
Red-spectacled Finch 577
Red-tailed Finch 353, 354
Red-tailed Lavender Waxbill 315
Red-throated Parrotfinch *244*, 347
Red-throated Twinspot 333
Red-vented Malimbe *106*, 196
Red-winged Pytilia 332
Red-winged Weaver 197
Redpoll
  Arctic *446*, 565
  Common *502*, 564
  Greenland 564
  Hoary 565
  Hornemann's 565
  Iceland 564
  Lesser 563
  Mealy 564
  Tundra 565
Redstart, Colombian 785
Redstart, American *707*, *710*, 761
Redstart, Andean 786
Redstart, Brown-capped 781
Redstart, Chestnut-crowned 785
Redstart, Collared 785
Redstart, Golden-fronted 786
Redstart, Guaiquinima 785
Redstart, Ornate 786
Redstart, Painted 780
Redstart, Paragua 786
Redstart, Paria 782
Redstart, Rufous-crowned 785
Redstart, Saffron-breasted 785
Redstart, Santa Marta 786
Redstart, Slate-throated 781
Redstart, Spectacled 785
Redstart, Tepui 781
Redstart, White-faced 785
Redstart, White-fronted 786
Redstart, Yellow-bellied 781
Redstart, Yellow-crowned 786
Redstart, Yellow-faced 782
regia, Erythrura cyaneovirens 348
regia, Vidua 207, *209*, *214*, 224
regulus, Basileuterus coronatus 789
Reichard's Seedeater 530
reichardi, Ploceus 171
reichardi, Serinus 530
reichenovii, Cryptospiza 312
Reichenow's Crimsonwing 312
Reichenow's Firefinch 342
Reichenow's Seedeater 523
Reichenow's Serin 523
Reichenow's Weaver 191
reichenowi, Ploceus baglafecht 191
reichenowi, Serinus 523
Reichenowia, Erythrura hyperythra 346
remota, Dendroica graciae 754
renatae, Serinus estherae 537
rendalli, Lagonosticta senegala 337
repetens, Vireo plumbeus 424
retusa, Granatina granatina 328
rex, Ploceus aurantius 175
Rhamphostruthus 345
rhizophorae, Dendroica petechia 745
Rhodacanthis flaviceps 647
Rhodacanthis palmeri 647
Rhodacanthis palmeri flaviceps 647
rhodesiae, Quelea cardinalis 141
rhodochlamys, Carpodacus 593
rhodochroa, Carpodacus 587
rhodopareia, Lagonosticta 342
Rhodopechys 577
rhodopeplus, Carpodacus rodopeplus 592
rhodopnus, Carpodacus mexicanus 585
rhodopsis, Lagonosticta senegala 337
rhodopyga, Estrilda 240, 316
Rhodospiza 579
Rhynchostruthus 541
Rice Bird 365
Rice Munia 365
Ricebird 366
Ricebird, Brown 365
richardsoni, Basileuterus luteoviridis 788
ricketti, Pyrrhula nipalensis 607
ridgwayi, Basileuterus culicivorus 793
ridgwayi, Geothlypis poliocephala 774
ridgwayi, Vermivora ruficapilla 740
riggenbachi, Serinus leucopygius 523
Ringed Finch 357
riparia, Geothlypis trichas 771
Riverbank Warbler 797
Riverside Warbler 797
rivularis, Basileuterus 797
Roborovski's Rosefinch *457*, 597
roborowskii, Kozlowia 457, 597
Rock Finch 342
Rock Firefinch 342
rodochroa, Carpodacus 587
rodopeplus, Carpodacus 592
Rodrigues Fody *127*, 156
roosevelti, Granatina ianthinogaster 328
roraimae, Basileuterus bivittatus 787
roraimae, Parula pitiayumi 743
Roraiman Warbler 787
Rose Bunting 580
roseacea, Pyrrhula pyrrhula 609
roseatus, Carpodacus erythrinus 583
Rose-breasted Chat 800
Rose-breasted Rosefinch 596
Rose-breasted Warbler 800
Rosefinch
  Beautiful 586
  Blanford's 581
  Blyth's 593
  Caucasian Great 594
  Chinese Beautiful 586
  Chinese White-browed 593
  Common *469*, *497*, 583
  Crimson 581
  Crimson-eared 594
  Dark 581
  Dark-breasted 581
  Dark-rumped 588
  Eastern Great 594
  Edwards's 588
  Great *455*, 594
  Grey-bellied 609
  Himalayan 593
  Himalayan Beautiful 586
  Himalayan White-browed 593
  Hodgson's 583
  Large 588
  Long-tailed *498*, 580, 581
  Mlle Thura's 593
  Nepal 581
  Oriental 609
  Pale *454*, 591
  Pallas's 591
  Pine 599
  Pink-browed 587
  Pink-mantled 587
  Pink-rumped *491*, 587
  Pink-tailed 580
  Pink-throated 588
  Pinkish-backed 593
  Przevalski's *453*, 580
  Red-breasted 596
  Red-browed 577
  Red-faced 596
  Red-fronted *456*, 596
  Red-headed 599
  Red-mantled 587, 593
  Roborovski's *457*, 597
  Rose-breasted 596
  Ruddy 588
  Scarlet 583
  Severtzov's 594
  Sharpe's 592
  Siberian 580, 591
  Sinai 591
  Spot-crowned 594
  Spot-winged 592
  Spotted 592
  Spotted Great 594
  Streaked 594
  Streaked Great 594
  Stresemann's 587
  Three-banded *455*, 592
  Thura's 593
  Tibet 597
  Tibetan 597
  Tsinghai 597
  Ussuri 609
  Vinaceous *481*, 587
  White-browed *489*, 592
roseicrissa, Estrilda paludicola 316
roseipectus, Carpodacus mexicanus 585
roseus, Carpodacus 591
rossikowi, Pyrrhula pyrrhula 609
rostrata, Geothlypis 772
Rosy Firefinch 337
Rosy Twinspot 333
Rosy-cheeked Waxbill 316
Rosy-finch
  Arctic 572
  Asian *471*, 572
  Black *449*, 574
  Brandt's 571
  Brown-capped *487*, 574
  Grey-crowned *470*, 573
  Hodgson's 571
  Japanese 572
  Pallas's 591
  Sillem's 572
  White-winged 572
Rosy-flanked Waxbill 315
Rosy-rumped Mountain-finch 571
Rosy-rumped Waxbill 316
Rosy-winged Waxbill 316
Rothschild's Canary 524
Rothschild's Fody 156
Rothschild's Seedcracker 322
Rothschild's Seedeater 524
Rothschild's Serin 524
rothschildi, Granatina ianthinogaster 328
rothschildi, Serinus 524
rothschildim, Pyrenestes ostrinus 322
rowleyi, Ergaticus ruber 780
Royal Parrotfinch 347
ruber, Ergaticus 676, 780
ruberrima, Lagonosticta senegala 337
ruberrimus, Carpodacus mexicanus 585
rubescens, Carpodacus 581
rubicilla, Carpodacus 455, 594
rubicilloides, Carpodacus 594
rubicundus, Carpodacus edwardsii 588
rubidus, Carpodacus purpureus 584
rubiginosa, Dendroica petechia 745
rubiginosus, Ploceus 82, 158
rubra, Foudia 130, 156
rubricata, Lagonosticta 341
rubriceps, Anaplectes 104, 197
rubricollis, Malimbus 94, 196
rubricomus, Ploceus capensis 162
rubrifrons, Cardellina 720, 779
rubrifrons, Hylophilus ochraceiceps 438
rubrifrons, Parmoptila 305
rubriventris, Estrilda astrild 317
rubronigra, Lonchura atricapilla 369
Ruddy Rosefinch 588
Ruddy Waxbill 341
rufa, Loxops coccinea 647
rufibarba, Estrilda 269, 316
rufibarba, Estrilda rhodopyga 316
ruficapilla, Dendroica petechia 745
ruficapilla, Spermophaga 258, 323
ruficapilla, Vermivora 667, 740
ruficauda, Histurgops 76, 136
ruficauda, Neochmia 291, 354
ruficoronatus, Myioborus melanocephalus 785
rufifrons, Basileuterus 693, 793
rufigula, Euplectes nigroventris 146
rufivertex, Dendroica petechia 745
rufobrunneus, Serinus 504, 536
rufopicta, Lagonosticta 338
rufopileata, Dendroica petechia 745
rufoscapulatus, Plocepasser 136
rufostrigata, Carduelis flavirostris 566
Rufous-backed Mannikin 361
Rufous-backed Munia 361
Rufous-bellied Mannikin 367
Rufous-bellied Munia 367
Rufous-breasted Munia 367
Rufous-browed Peppershrike *384*, *388*, *394*, *405*, 415
Rufous-capped Warbler *693*, 793
Rufous-crowned Greenlet *383*, 435
Rufous-crowned Redstart 785
Rufous-crowned Vireo 435
Rufous-crowned Whitestart 785
Rufous-naped Greenlet 436
Rufous-tailed Grassfinch 354
Rufous-tailed Weaver *76*, 136
rufovelatus, Malimbus rubricollis 196
Rüppell's Weaver *91*, *106*, 170
Russet-crowned Warbler *679*, 789
ruthae, Estrilda paludicola 316
ruticilla, Setophaga 707, *710*, 761
ruwenzori, Cryptospiza salvadorii 313
Ruwet's Masked Weaver 171
ruweti, Ploceus 171

S

sabinjo, Euplectes capensis 149
Saffron Siskin 554
Saffron-breasted Redstart 785
Saffron-breasted Whitestart 785
sagittirostris, Hemignathus 647
sagittirostris, Loxops 647
sagittirostris, Viridonia 647
Sahel Paradise-whydah *202*, 222
Saka 177
Sakalava 177
Sakalava Fody 177
Sakalava Weaver *92*, 177
sakalava, Ploceus 92, 177
sakhalinensis, Pinicola enucleator 599
salicamans, Carduelis tristis 559
salimalii, Carpodacus synoicus 591
salimalii, Ploceus megarhynchus 158
sallaei, Granatellus 799
Salvadori's Crimsonwing 313
Salvadori's Seedeater *508*, 525
Salvadori's Serin 525
Salvadori's Weaver 172
salvadorii, Cryptospiza 239, 313
Salvin's Warbler 793
salvini, Basileuterus rufifrons 793
salvini, Vireo pallens 418

samaliyae, Serinus mozambicus 527
samueli, Stagonopleura bella 353
San Andres Vireo *412,* 419
San Benito Housefinch 585
San José Warbler 789
sanctaemartae, Myioborus miniatus 781
sanctithomae, Ploceus 84, 177
sanfelipensis, Vireo gundlachii 421
sanfordi, Erythrura trichroa 348
sanguinea, Himatione 625, 630, 657
sanguineus, Pyrenestes 322
sanguineus, Rhodopechys 451, 577
sanguinodorsalis, Lagonosticta 342
sanguinolentus, Uragus sibiricus 580
Santa Cruz Siskin 553
Santa Marta Redstart 786
Santa Marta Warbler *732,* 795
Santa Marta Whitestart 786
santaecrucis, Carduelis magellanica 553
santhome, Serinus mozambicus 527
Sao Tome Canary 538
Sao Tome Grosbeak *511,* 538
Sao Tome Grosbeak Weaver 538
Sao Tome Waxbill 315
Sao Tome Weaver *84,* 177
sarda, Fringilla coelebs 513
sassii, Euplectes albonotatus 150
sassii, Serinus flavivertex 518
saturata, Amblyospiza albifrons 138
saturata, Cyclarhis gujanensis 415
saturata, Hesperiphona abeillei 616
saturatior, Nigrita bicolor 306
saturatus, Hylophilus aurantiifrons 437
Savanna Seedcracker 322
Scaly Weaver 136
Scaly-breasted Finch 366
Scaly-breasted Mannikin 366
Scaly-breasted Munia *265,* 366
Scaly-feathered Finch *97,* 136
Scaly-feathered Weaver 136
Scaly-fronted Weaver 136, 137
Scarlet Finch *472,* 583, 600
Scarlet Grosbeak 583
Scarlet Rosefinch 583
Scarlet-crowned Malimbe 194
schiebeli, Fringilla coelebs 513
schistacea, Euthlypis lachrymosa 786
schistaceus, Nigrita canicapillus 306
Schlegel's Twinspot 311
schlegeli, Mandingoa nitidula 311
schoutedeni, Estrilda astrild 317
schulpini, Coccothraustes coccothraustes 610
scirpicola, Geothlypis trichas 771
scitulus, Basileuterus belli 794
sclateri, Hylophilus 436
sclateri, Ploceus bicolor 181
scotica, Fringilla coelebs 513
scotica, Loxia 507, 602
scotops, Serinus 522
Scottish Crossbill *507,* 602
scratchleyana, Lonchura caniceps 376
Scrub Greenlet 437
scutata, Spermestes cucullata 361
scutatus, Malimbus 106, 196
scutopartitus, Malimbus scutatus 196
sechellarum, Foudia 126, 157
Seedcracker 322
  Black-bellied 322
  Brown-backed 322
  Crimson 322
  Forest 323
  Large-billed 322
  Lesser *241,* 322
  Notch-billed 322
  Nyasa 322
  Nyasaland 322
  Rothschild's 322
  Savanna 322
  Urungu 322
  Western 322
Seedeater
  Abyssinian Yellow-rumped 524
  Ankober 570
  Arabian Yellow-rumped 524
  Black-eared 531
  Black-throated 523
  Brown-rumped 532
  Bully 529
  Kenya Yellow-rumped 523
  Kenyan Yellow-rumped 523
  Kipengere 536
  Layard's 536
  Lemon-breasted 527
  Menacha 535
  Olive-rumped 524
  Principe *504,* 536
  Protea 536
  Reichard's 530
  Reichenow's 523
  Rothschild's 524
  Salvadori's *508,* 525
  Southern Streaky 535
  Southern Yellow-rumped 523
  Streaky *474,* 535
  Streaky-headed *482,* 531
  Stripe-breasted 530
  Tanzania 536
  Thick-billed 535
  West African 531
  White-rumped 522
  White-throated 524, 530
  White-winged 536
  Yellow-browed 535
  Yellow-rumped 524
  Yellow-throated *509,* 524
segrex, Basileuterus culicivorus 793
Seiurus 766
selimbauensis, Lonchura atricapilla 369
semibrunneus, Hylophilus 436
semicervinus, Basileuterus fulvicauda 796
semicinereus, Hylophilus 435
semideserti, Serinus atrogularis 523
semiflava, Geothlypis 673, 772
semiflavus, Vireo pallens 418
semistriata, Lonchura striata 367
Semper's Warbler 777
semperi, Leucopeza 777
Senegal Combassou 227
Senegal Firefinch 337
Senegal Indigofinch 227
senegala, Lagonosticta 253, 259, 337
sepikensis, Lonchura spectabilis 376
septentrionalis, Cyclarhis gujanensis 415
serena, Erythrura cyaneovirens 348
Serin
  Ankober *507,* 570
  Arabian 524
  Arabian Yellow-rumped 524
  Black-eared 531
  Black-throated 523
  Brimstone 529
  Brown-rumped 532
  Common 516
  Eurasian 516
  European *499,* 516
  Fire-fronted 516
  Gold-fronted 516
  Menacha 535
  Mountain 537
  Olive-rumped 524
  Red-fronted *463,* 516
  Reichenow's 523
  Rothschild's 524
  Salvadori's 525
  Streaky 535
  Stripe-breasted 530
  Syrian *470,* 517
  Thick-billed 535
  Tibetan 546
  Tristram's 517
  West African 531
  White-rumped 522
  White-throated 524
  Yellow-rumped 524
  Yellow-throated 524
  Yemen *442,* 535
Serin Finch 516
Serinus 516
Serinus citrinelloides 521
Serinus estherae 537
serinus, Serinus 499, 516
seshekeensis, Serinus atrogularis 523
Setophaga 761
Severtzov's Rosefinch 594
severtzovi, Carpodacus rubicilla 594
Seychelles Fody *126,* 157
Shaft-tailed Whydah *207, 209, 214,* 224
Shaft-tailed Widow 224
Sharpe's Rosefinch 592
sharpii, Lonchura castaneothorax 374
sharpii, Ploceus baglafecht 191
sharpii, Serinus sulphuratus 529
Sharp-tailed Munia 367
Shell Canary 528
Shelley's Crimsonwing *294,* 312
Shelley's Oliveback *270,* 311
shelleyi, Cryptospiza 294, 312
shelleyi, Nesocharis 270, 311
shelleyi, Ploceus velatus 164
Shrike-vireo
  Chestnut-sided *380,* 416
  Green *380,* 416
  Grey-capped 417
  Highland 416
  Slaty-capped *388,* 417
  Venezuelan 416
  Yellow-browed 416
Siberian Finch 572
Siberian Rosefinch 580, 591
sibiricus, Uragus 498, 580
siccata, Granatina granatina 328
siemiradzkii, Carduelis 554
sierrae, Vireo huttoni 427
sigillifera, Erythrura trichroa 348
signatus, Basileuterus 788
significans, Basileuterus fulvicauda 796
sikangensis, Pyrrhospiza punicea 596
Sillem's Mountain-finch 572
Sillem's Rosy-finch 572
sillemi, Leucosticte 572
Silverbill 360
  African *250, 253, 270,* 359
  Black-rumped 360
  Common 360
  Grey-headed 360
  Indian *260,* 360
  Pearl-headed 360
  Warbling 360
  White-rumped 360
  White-throated 360
simplex, Vireolanius leucotis 417
Sinai Rosefinch 591
sinensis, Lonchura atricapilla 369
sinica, Carduelis 543
sinuosa, Geothlypis trichas 771
sipahi, Haematospiza 472, 600
Siskin
  Abyssinian 521
  African Black-headed 521
  Andean 549
  Antillean 554
  Black *448,* 555
  Black-capped 549
  Black-chinned 556
  Black-headed 521, 554
  Cape 537
  Common 547
  Drakensberg *443,* 538
  Ethiopian *462,* 521
  Ethiopian Black-headed 521
  Eurasian *483,* 547
  Hispaniola 554
  Hooded *476,* 553
  Neotropic Black-headed 554
  Neotropical Black-headed 554
  Olivaceous 554
  Pine *466,* 548
  Red *509,* 550
  Saffron 554
  Santa Cruz 553
  South African 537
  Southern 553
  Spruce 547
  Symond's 538
  Thick-billed 553
  Tibetan 546
  White-rumped 522
  Yellow-bellied 555
  Yellow-faced *508,* 549
  Yellow-rumped 555
sitchitoensis, Carduelis sinica 543
sitkensis, Loxia curvirostra 601
Slate-throated Redstart 781
Slate-throated Whitestart *685,* 781
Slaty Vireo *382,* 417
Slaty-capped Shrike-vireo *388,* 417
Slender-billed Weaver *89,* 183
Smaragdolanius 417
smithersi, Ortygospiza atricollis 300
smithi, Carpodacus mexicanus 585
smythiesi, Lonchura leucogastra 368
Snow Mountain Mannikin *287,* 374
Snow Mountain Munia 374
socia, Loxia 138
Sociable Weaver *96, 111, 119,* 138
Social Weaver 138
Social Weaver, Common 138
Social-weaver
  Black-capped *110,* 137
  Grey-capped 137
  Grey-headed 77, 137
Society Finch 367
socius, Philetairus 96, 111, 119, 138
Socorro Parula 743
Socotra Golden-winged Grosbeak 542
Socotra Grosbeak *445,* 542
socotranus, Rhynchostruthus 445, 542
sodalis, Parula superciliosa 742
solaris, Dendroica petechia 745
soligena, Estrilda erythronotos 313
solimoensis, Vireo olivaceus 430
solitarius, Vireo 384, 400, 403, 425
Solitary Vireo 424, 425
solitudinus, Carpodacus mexicanus 585
solomkoi, Fringilla coelebs 513
Somali Canary 529
Somali Golden-winged Grosbeak 541
Somali Grosbeak 541
somaliensis, Lagonosticta senegala 337
Somalita 137
somereni, Serinus atrogularis 523
sonorana, Dendroica petechia 745
sordahlae, Serinus albogularis 530
sordida, Vermivora celata 740
sordidus, Vireo hypochryseus 428
soudanensis, Pytilia melba 331
sousae, Estrilda astrild 317
South African Indigobird 227
South African Siskin 537
South Hills Crossbill 600
Southern Black Bishop 144
Southern Black-headed Munia 369
Southern Blue Waxbill 326
Southern Brown-throated Weaver 176
Southern Citril 521
Southern Cordon-bleu 326
Southern Grosbeak-canary 528
Southern Masked Weaver *120, 123,* 164
Southern Red Bishop *90, 112,* 145
Southern Red-billed Buffalo-weaver 132
Southern Siskin 553
Southern Streaky Seedeater 535
Southern Swee 307
Southern Twinspot Indigobird 231
Southern Yellow-rumped Seedeater 523
Southern Yellowthroat 773
sowerbyi, Eophona migratoria 613
Sparrow
  Diamond 352
  Java *296,* 365
  Kupang 365
  Paradise 301
  Timor *289,* 365
  Timor Dusky 365
Sparrow-Weaver 135
  Chestnut-backed 136
  Chestnut-crowned *75,* 135
  Chestnut-mantled 136
  Donaldson-Smith's 136
  Red-backed 136
  Stripe-breasted 135
  White-browed *95, 110,* 135
sparsimguttatus, Nigrita canicapillus 306
speciosa, Geothlypis 733, 773
speciosa, Parula pitiayumi 743
Speckle-fronted Weaver *76, 107,* 137
Speckled Firefinch 338
spectabilis, Lonchura 376
Spectacled Finch *450,* 577
Spectacled Redstart 785
Spectacled Weaver *109,* 182
Spectacled Whitestart *677,* 785
speculigerus, Mycerobas carnipes 615
Speke's Weaver *118,* 178
spekei, Ploceus 118, 178
spekeoides, Ploceus 178
Spermestes 359, 360
Spermophaga 323
Spice Bird 366
Spice Finch 366
Spice Mannikin 366
spilonotus, Ploceus cucullatus 165
spinescens, Carduelis 549
spinoides, Carduelis 445, 544
Spinus 548
spinus, Carduelis 483, 547
spodiogenys, Fringilla coelebs 513
spoliator, Quelea quelea 139
Sporaeginthus 299
Sporopipes 136
Spot-breasted Warbler 742
Spot-crowned Rosefinch 594
Spot-headed Weaver 181
Spot-sided Finch 352, 357
Spot-winged Grosbeak 614
Spot-winged Rosefinch 592

Spoted-sided Finch 357
Spotted Great Rosefinch 594
Spotted Mannikin 366
Spotted Munia 366
Spotted Rosefinch 592
Spotted-backed Weaver 165
Spotted-sided Finch 352, 357
Spruce Siskin 547
squamifrons, Estrelda 136
squamifrons, Sporopipes 97, 136
Sri Lanka Hill Munia 367
St Andrew Vireo 419
St Helena Waxbill 317
St Lucia Warbler *668*, 755
St Thoma's Canary 538
Stagonopleura 352
stalagmium, Vireo crassirostris 418
Star Finch *291*, 354
Steel-blue Whydah *201*, 219
Steel-blue Widow 220
Steel-blue Widowfinch 227
steerei, Pyrrhula leucogenis 607
Steganura 221, 222, 223
stejnegeri, Akialoa 647
stejnegeri, Carduelis xanthogastra 555
stejnegeri, Chlorodrepanis 633, 655
stejnegeri, Hemignathus ellisianus 647
stentor, Plocepasser mahali 135
stephanophorus, Ploceus melanogaster 187
stephensi, Vireo huttoni 427
stictifrons, Ploceus bicolor 181
stigmatophora, Spermestes bicolor 361
stilesi, Vireo magister 432
Stizoptera 358
stoddardi, Dendroica dominica 753
stoliczkae, Carpodacus synoicus 591
Strange Weaver 183
Strawberry Finch 299
Strawberry Waxbill 299
Straw-tailed Whydah *204*, *215*, 223
Straw-tailed Widow 223
Streak-headed Mannikin 365
Streak-headed Munia 365
Streaked Great Rosefinch 594
Streaked Rosefinch 594
Streaked Weaver *107*, 175
Streaky Seedeater *474*, 535
Streaky Serin 535
Streaky-headed Canary 531
Streaky-headed Seedeater *482*, 531
strenuus, Vireo leucophrys 429
Stresemann's Rosefinch 587
striata, Dendroica 691, 759
striata, Lonchura 265, 367
Striated Finch 367
Striated Mannikin 367
Striated Munia 367
Striated Weaver 175
striaticeps, Basileuterus luteoviridis 788
striatipectus, Serinus reichardi 530
stricklandi, Loxia curvirostra 601
strictus, Euplectes afer 143
stridens, Plocepasser mahali 135
striolatus, Serinus 474, 535
Stripe-breasted Seedeater 530
Stripe-breasted Serin 530
Stripe-breasted Sparrow-Weaver 135
Stripe-breasted Weaver 135
Stripe-crowned Warbler 793
stuartirwini, Coccopygia quartinia 307
Stuhlmann's Weaver 191
stuhlmanni, Ploceus baglafecht 191
stygia, Lonchura 376
suahelicus, Euplectes ardens 144
suahelicus, Ploceus ocularis 182
suavis, Drepanis coccinea 658
subaureus, Ploceus 103, *116*, *121*, 161
subcastanea 373
subclarescens, Neochmia ruficauda 354
subflava, Amandava 299
subflavescens, Cyclarhis gujanensis 415
subhimachala, Propyrrhula 599
subita, Dendroica 754
subobscurus, Basileuterus belli 794
subpersonatus, Ploceus 128, 189
subsimillis, Myioborus miniatus 781
subsquamicollis, Lonchura striata 367
subulata, Carduelis carduelis 561
subundulata, Lonchura punctulata 366
Sudan Masked Weaver 172
Sudan Quelea 139
sulphuratus, Serinus 494, 529
sumatrensis, Lonchura striata 367
sumbae, Lonchura punctulata 366
sumbae, Lonchura quinticolor 375
Sunda Munia 373
Sunda Parrotfinch 347
Sunda Serin 537
Sunda Zebra Finch 357
Sundevall's Waxbill 316
sundevalli, Euplectes orix 145
superciliosa, Parula 699, 742
superciliosus, Pachyphantes 80, 157
superciliosus, Plocepasser 75, 135
superciliosus, Ploceus 135
sushkini, Leucosticte arctoa 572
Sutton's Warbler 743, 753
Swainson's Warbler *672*, 765
Swainson's Weaver 182
swainsoni, Vireo gilvus 429
swainsonii, Limnothlypis 672, 765
Swamp Masked Weaver 171
Swee
  Angola *237*, 307
  East African 307
  Southern 307
  Yellow-bellied 307
Swee Waxbill *262*, *278*, 307
swinhoei, Lonchura striata 367
Sydney Firetail 353
Sydney Waxbill 353
sylvanus, Ploceus bicolor 181
Symond's Siskin 538
symonsi, Pseudochloroptila 443, 538
sympatricus, Vireo gilvus 429
synoicus, Carpodacus 454, 591
syriaca, Fringilla coelebs 513
syriacus, Serinus 470, 517
Syrian Serin *470*, 517
Sysie, Yellow 528
szetchuanus, Pyrrhospiza punicea 596

T

tacarcunae, Basileuterus tristriatus 795
taeniatus, Peucedramus 661, *662*, *663*, 665
taeniopterus, Ploceus 80, 172
Taeniopygia 357
Taha Golden Bishop 143
taha, Euplectes afer 143
tahatali, Ploceus velatus 164
Tai Malimbe 193
tandae, Amblyospiza albifrons 138
tando, Serinus mozambicus 527
tanganjicae, Serinus burtoni 535
Tanganyika Masked Weaver 171
Tanimbar Parrotfinch 347
tanneri, Geothlypis rostrata 772
Tanzania Seedeater 536
Tanzanian Citril 521
Tanzanian Masked Weaver 171
Tanzanian Mountain Weaver 187
tarijae, Cyclarhis gujanensis 415
taruensis, Lagonosticta rhodopareia 342
taruensis, Serinus dorsostriatus 529
Tasmanian Waxbill 353
taurica, Carduelis cannabina 569
taverneri, Carpodacus purpureus 584
Taveta Golden Weaver 176
Taveta Weaver 176
Tawny-breasted Parrotfinch 346
Tawny-crowned Greenlet 438
Tawny-headed Mountain-finch 572
taylori, Carduelis ambigua 545
Teerink's Munia 375
teerinki, Lonchura 375
Telespiza 650
temporalis, Neochmia 254, 353
temporalis, Ploceus 161
tenebridorsa, Estrilda astrild 318
Tennessee Warbler *692*, *696*, 739
tenuirostris, Ploceus ocularis 182
tephra, Euthlypis lachrymosa 786
tephrocotis, Leucosticte 470, 573
tephronotus, Ploceus bicolor 181
Tepui Greenlet 436
Tepui Redstart 781
Tepui Whitestart 781
Teretistris 777
tessellata, Spermestes cucullata 361
Tetraenura 223, 224
teydea, Fringilla 505, 514
Teydean Chaffinch 514
Teydefinch 514
thibetana, Carduelis 546
Thick-billed Mannikin 377
Thick-billed Munia 377
Thick-billed Seedeater 535
Thick-billed Serin 535
Thick-billed Siskin 553
Thick-billed Vireo 418
Thick-billed Weaver *112*, *123*, 138
Thomasophantes 177
thomensis, Estrilda 288, 315
thomensis, Serinus rufobrunneus 536
thompsonae, Serinus canicollis 519
thoracicus, Hylophilus 383, 435
Three-banded Rosefinch *455*, 592
Three-banded Warbler 790
Three-coloured Nun 369
Three-coloured Parrotfinch 347
Three-striped Warbler 795
thura, Carpodacus 489, 592
Thura's Rosefinch 593
tianschanica, Loxia curvirostra 601
tibatiensis, Anomalospiza imberbis 219
Tibet Rosefinch 597
Tibetan Greenfinch 545
Tibetan Rosefinch 597
Tibetan Serin 546
Tibetan Siskin 546
Tibetan Twite 566
tigrina, Dendroica 747
Timor Dusky Sparrow 365
Timor Finch 365
Timor Munia 365
Timor Parrotfinch 347
Timor Sparrow *289*, 365
Timor Zebra Finch 357
tintillon, Fringilla coelebs 513
tobagensis, Vireo olivaceus 430
Togo Paradise Widow 223
Togo Paradise-whydah 223
togoensis, Lagonosticta larvata 336
togoensis, Spermophaga haematina 323
togoensis, Vidua 223
tokumii, Carduelis sinica 543
tolmiei, Oporornis 703, 769
tongensis, Ploceus subaureus 161
topela, Lonchura punctulata 366
torquatus, Myioborus 697, 785
tortugae, Vireo crassirostris 418
totta, Pseudochloroptila 537
Townsend's Warbler 752
townsendi, Dendroica 752
transcaspia, Fringilla coelebs 513
transcaspica, Fringilla coelebs 513
transvaalensis, Euplectes capensis 149
transvaalensis, Serinus scotops 522
travancoreensis, Ploceus philippinus 169
traversii, Euplectes axillaris 150
Tres Marias Chat 799
trichas, Geothlypis 689, *714*, 771
Trichroa 348
trichroa, Erythrura 244, *281*, 348
tricolor, Erythrura 263, *286*, 347
tricolor, Ploceus 184
tricolor, Setophaga ruticilla 761
Tricolour Parrotfinch 347
Tricoloured Mannikin 369
Tricoloured Munia 369
Tricoloured Nun 369
Tricoloured Parrotfinch *263*, *286*, 347
trifasciatus, Basileuterus 790
trifasciatus, Carpodacus 455, 592
tristis, Carduelis 468, *487*, *493*, *495*, 559
tristissima, Lonchura 365
Tristram's Serin 517
tristriatus, Basileuterus 795
tristriatus, Serinus 532
troglodytes, Estrilda 317
Tropical Parula *713*, 743
tropicalis, Icteria virens 798
tropicus, Euplectes ardens 144
trothae, Ploceus rubiginosus 158
Trumpeter Finch *469*, 578
tschadensis, Estrilda melpoda 316
tschusii, Carduelis carduelis 561
Tsinghai Rosefinch 597
tucumana, Carduelis magellanica 553
Tundra Redpoll 565
turgidus, Euplectes orix 145
turkestanica, Carduelis chloris 542
turquinensis, Teretistris fornsi 777
tuta, Ploceus pelzelni 183
Twinspot
  Brown 334
  Dusky *243*, 333
  Dybowski's 333
  Dybowski's Dusky 333
  Green *238*, 311
  Green-backed 311
  Monteiro's 334
  Peters's *282*, 333
  Pink-throated *285*, 333
  Red-throated 333
  Rosy 333
  Schlegel's 311
  Verreaux's 333
Twinspot Indigobird 231
Twite *471*, 566
Twite, Tibetan 566
Two-banded Warbler 787
Two-barred Crossbill *485*, 604
typhicola, Geothlypis trichas 771
tyrrhenica, Fringilla coelebs 513

U

uamensis, Serinus gularis 531
uchidai, Pyrrhula nipalensis 607
uelensis, Paludipasser locustella 300
Uelle Paradise Whydah 222
Uelle Paradise Widow 222
Uganda Weaver 162
ugandae, Lagonosticta rubricata 341
ugandae, Ortygospiza atricollis 300
ugogensis, Uraeginthus bengalus 327
Uhehe Rosy-flanked Waxbill 315
Ula-Ai-Hawane 647
uliginosus, Seiurus noveboracensis 766
ultima, Carduelis carduelis 561
ultima, Telespiza 621, 650
ultramarina, Vidua chalybeata 227
uluensis, Ploceus vitellinus 171
umbraticus, Oporornis formosus 767
umbrina, Leucosticte tephrocotis 573
umbrinodorsalis, Lagonosticta 243, 342
umbrosus, Serinus scotops 522
unicolor, Amblyospiza albifrons 138
unitti, Vireo huttoni 427
upembae, Ploceus katangae 172
Uraeginthus 326, 328
Uragus 580
Urocynchramus 580
uropygialis, Carduelis 555
uropygialis, Lonchura castaneothorax 374
uropygialis, Nigrita fusconotus 306
urubambensis, Carduelis magellanica 553
Urungu Seedcracker 322
Usambara Bluebill 323
Usambara Weaver 187
Ussuri Rosefinch 609
ussuriensis, Carduelis sinica 543
ussuriensis, Uragus sibiricus 580

V

vagans, Lonchura molucca 367
Van Someren's Canary 522
vana, Lonchura 373
vanderbilti, Serinus estherae 537
vanmarli, Carduelis chloris 542
vansoni, Serinus mozambicus 527
varia, Mniotilta 671, 761
Variable Indigobird 230
vasta, Microligea palustris 777
vasvarii, Loxia curvirostra 600
velata, Geothlypis aequinoctialis 773
velatus, Ploceus 120, *123*, 164
Venezuelan Shrike-vireo 416
venustus, Granatellus 681, 799
Vera Paz Vireo 425
Veracruz Vireo 417
veraguensis, Basileuterus fulvicauda 796
Vermivora 739, 765
vermivorum, Helmitheros 695, 765
vernayi, Lonchura kelaarti 367
Verreaux's Twinspot 333
verreauxii, Carpodacus rodopeplus 592
versicolor, Ergaticus 731, 780
verticalis, Myioborus miniatus 781
verticalis, Vireolanius pulchellus 416
vespertina, Hesperiphona 476, 615
vicarius, Ploceus olivaceiceps 188
vicinior, Vireo 382, 423
Victoria Masked Weaver 162, 163
victoriae, Pyrrhula nipalensis 607
victoriae, Vireo gilvus 429
Vidua 219
Viduidae 198, 219
Vieillot's Black Weaver *108*, 181
Vieillot's Weaver 181

vietnamensis, Lonchura maja 373
Vietnamese Greenfinch *506*, 544
Village Indigobird *212*, 227
Village Weaver *88*, *117*, *122*, 165
Village Widowfinch 227
vinacea, Lagonosticta larvata 336
Vinaceous Firefinch 336
Vinaceous Rosefinch *481*, 587
Vinaceous Waxbill 336
vinaceus, Carpodacus 481, 587
vincenti, Pyrenestes minor 322
viniceps, Quelea erythrops 141
Violet-eared Waxbill 328
virata, Lagonosticta 341
virens, Chlorodrepanis 623, *639*, 656
virens, Dendroica 751
virens, Icteria 701, 798
virenticeps, Cyclarhis gujanensis 415
Vireo 417
Vireo
  Baird's 419
  Belize 432
  Bell's *409*, 422
  Black-capped *404*, *411*, 422
  Black-whiskered 432
  Blue Mountain *410*, 424
  Blue-headed *384*, *400*, *403*, 425
  Brown-capped 429
  Carmiol's 426
  Cassin's *385*, *391*, *399*, 425
  Chivi 430
  Choco *413*, 426
  Cozumel *408*, 419
  Cuban *397*, 421
  Dwarf 423
  Eastern Warbling 429
  Flat-billed 422
  Golden *393*, 428
  Green-winged 417
  Grey *382*, 423
  Gundlach's 421
  Hutton's 427
  Jamaican 421
  Jamaican White-eyed 421
  Large-billed 418
  Latimer's 421
  Least Bell's 422
  Mangrove 418
  Maya 418
  Mayan 418
  Mexican Brown-capped 429
  Nelson's 423
  Noronha *392*, *396*, *410*, 431
  Old Providence 418
  Osburn's 424
  Pale 418
  Philadelphia *381*, 430
  Plumbeous *398*, 424
  Puerto Rican 421
  Red-eyed *390*, *395*, *401*, *402*, *406*, *407*, 430
  Rufous-crowned 435
  San Andres *412*, 419
  Slaty *382*, 417
  Solitary 424, 425
  St Andrew 419
  Thick-billed 418
  Vera Paz 425
  Veracruz 417
  Warbling *387*, 429
  Western Warbling 429
  White-eyed *386*, 417
  Yellow-green 431
  Yellow-throated *391*, *399*, 424
  Yellow-winged *408*, 426
  Yucatan 432
Vireo pallens 418
Vireolanius 416
VIREONIDAE 378, 415
Vireos 378, 415
Virginia's Warbler *686*, 741
virginiae, Mandingoa nitidula 311
virginiae, Vermivora 686, 741
viridescens, Basileuterus culicivorus 793
viridiceps, Hylophilus semicinereus 435
viridiceps, Vireolanius pulchellus 416
viridifacies, Erythrura 346
viridiflavus, Hylophilus flavipes 437
viridior, Hylophilus ochraceiceps 438
viridis, Cyclarhis gujanensis 415
Viridonia sagittirostris 647
vitellina, Dendroica 729, 758
Vitelline Masked Weaver 171
Vitelline Warbler *729*, 758
vitellinus, Ploceus 171
vividior, Loxia curvirostra 601
vividior, Vireo olivaceus 430
volgensis, Carduelis carduelis 561
voousi, Carduelis chloris 542
vulcani, Vireo huttoni 427

W

wahgiensis, Lonchura spectabilis 376
wallacii, Lonchura quinticolor 375
wallowa, Leucosticte tephrocotis 573
walteri, Leucosticte brandti 571
waltoni, Carpodacus pulcherrimus 586
Warbler
  Adelaide's 754
  American Fan-tailed 786
  American Red-faced 779
  American River 797
  Arrow-headed 760
  Ashy-throated 789
  Audubon's 748
  Barbuda 754
  Bay-breasted *669*, 758
  Bay-crowned 789
  Bell's 794
  Black-and-white *671*, 761
  Black-capped 778
  Black-cheeked 794
  Black-crested 788
  Black-eared 780
  Black-fronted 748
  Black-throated Blue *724*, 747
  Black-throated Green 751
  Black-throated Grey 751
  Blackburnian 753
  Blackpoll *691*, 759
  Blue-winged *722*, 739
  Brewster's 739
  Buff-rumped *690*, *708*, 796
  Cabanis's 793
  Canada *690*, 779
  Cape May 747
  Cerulean *732*, 759
  Chapman's 800
  Chestnut-capped 793
  Chestnut-sided *705*, *709*, 746
  Chocó 787
  Cincinnati 739, 767
  Citrine 788
  Colima 741
  Connecticut *672*, 768
  Crescent-chested *699*, 742
  Cuzco 787
  Delattre's 793
  Elfin Woods 760
  Fan-tailed 786
  Flame-throated *718*, 742
  Flavescent *681*, 795
  Fraser's 787
  Golden 745
  Golden Swamp 764
  Golden-bellied 787
  Golden-browed 794
  Golden-cheeked *736*, 751
  Golden-crowned *717*, 793
  Golden-winged *729*, 739
  Goldman's 748
  Grace's 754
  Green-tailed *674*, 777
  Green-tailed Ground 777
  Grey-and-gold 787
  Grey-breasted 777
  Grey-breasted Ground 777
  Grey-headed *735*, 788
  Grey-throated 789, 799
  Ground 777
  Hartlaub's 742
  Hooded *676*, 778
  Kentucky *688*, 767
  Kirtland's *730*, 757
  Lawrence's 739
  Lucy's *709*, 742
  MacGillivray's *703*, 769
  Magnolia *698*, 746
  Mangrove 745
  Mangrove Yellow 745
  Meadow 774
  Mourning *715*, 768
  Myrtle 748
  Nashville *667*, 740
  Neotropic River 797
  Neotropical Fan-tailed *678*, 786
  Neotropical River 797
  Northern Yellow 745
  Olive *661*, *662*, *663*, 665
  Olive-backed 743
  Olive-capped *726*, 755
  Orange-crowned *702*, 740
  Oriente *728*, 777
  Pale-legged 788
  Palm *682*, *691*, 758
  Parula 743
  Pileated 778
  Pine 755
  Pink-headed *731*, 780
  Pirre 794
  Plumbeous 760
  Prairie *687*, 757
  Prothonotary *706*, *719*, 764
  Puerto Rico 760
  Red *676*, 780
  Red-breasted 799
  Red-faced *720*, 779
  Riverbank 797
  Riverside 797
  Roraiman 787
  Rose-breasted 800
  Rufous-capped *693*, 793
  Russet-crowned *679*, 789
  Salvin's 793
  San José 789
  Santa Marta *732*, 795
  Semper's 777
  Spot-breasted 742
  St Lucia *668*, 755
  Stripe-crowned 793
  Sutton's 743, 753
  Swainson's *672*, 765
  Tennessee *692*, *696*, 739
  Three-banded 790
  Three-striped 795
  Townsend's 752
  Two-banded 787
  Virginia's *686*, 741
  Vitelline *729*, 758
  Whistling 761
  White-bellied 793
  White-browed *711*, 796
  White-lored 789
  White-rimmed 796
  White-striped 796
  White-winged *725*, 800
  White-winged Ground 800
  Wilson's *683*, 778
  Worm-eating *695*, 765
  Yellow *670*, *684*, *694*, *712*, *717*, *721*, 745
  Yellow-green 788
  Yellow-headed *675*, 777
  Yellow-rumped *683*, *714*, 748
  Yellow-throated 753
Warbling Silverbill 360
Warbling Vireo *387*, 429
warreni, Hesperiphona vespertina 615
Warsangli Linnet 570
waterstradti, Pyrrhula nipalensis 607
Waterthrush, Louisiana *700*, *723*, 767
Waterthrush, Northern *692*, *700*, 766
Waxbill 234, 299
  Abyssinian 315
  Abyssinian Fawn-breasted 315
  Abyssinian Red-rumped 313
  Anambra *294*, 317
  Angola 307
  Arabian *269*, 316
  Aurora 332
  Australian 353
  Barred 317
  Benguella 315
  Black-bellied 337
  Black-cheeked 313
  Black-crowned 321
  Black-faced *268*, 313, 317
  Black-faced Swee 307
  Black-headed 321
  Black-lored 317
  Black-rumped 317
  Black-tailed 315
  Black-tailed Grey 315
  Black-tailed Lavender 315
  Blackcap 321
  Blackcapped 321
  Blue *259*, 326
  Blue-billed 323
  Blue-breasted 326
  Blue-capped 327
  Bocage's Swee 307
  Brown 317
  Buff-bellied 315
  Charmosyna 313
  Cinderella *288*, 315
  Common *260*, *283*, 317
  Crimson-cheeked Blue 327
  Crimson-rumped *240*, 316
  Dufresnaye's 307
  East African Swee 307
  Fawn-breasted *261*, 315
  Gold-breasted 299
  Golden-breasted 299
  Grauer's 321
  Green 307
  Grey 315, 317
  Grey-breasted 321
  Grey-headed 307
  Kandt's *240*, 321
  Kenya Mountain 321
  Kiabo 317
  Lavender *239*, 315
  Little Olive 311
  Little Ruddy 337
  Marsh 315
  Melba 331
  Neumann's 315
  Orange 299
  Orange-breasted 299
  Orange-cheeked *255*, 316
  Pink-bellied Black-cheeked 313
  Pink-bellied Black-faced 313
  Pink-cheeked 317
  Red-browed 353
  Red-cheeked Blue 327
  Red-eared 317
  Red-flanked Lavender 315
  Red-rumped 313, 316
  Red-tailed Lavender 315
  Rosy-cheeked 316
  Rosy-flanked 315
  Rosy-rumped 316
  Rosy-winged 316
  Ruddy 341
  Sao Tome 315
  Southern Blue 326
  St Helena 317
  Strawberry 299
  Sundevall's 316
  Swee *262*, *278*, 307
  Sydney 353
  Tasmanian 353
  Uhehe Rosy-flanked 315
  Vinaceous 336
  Violet-eared 328
  White-breasted 321
  White-cheeked 311
  Yellow-bellied 307
  Zebra 299
waynei, Dendroica virens 752
Weaver 74, 132
  African Golden *103*, *116*, *121*, 161
  African Masked 164
  African Yellow 161
  Angola 161
  Asian Golden *127*, 158
  Asiatic Golden 158
  Baglafecht *88*, 191
  Bannerman's *128*, 191
  Bar-winged *85*, 193
  Bartam's 189
  Bates's 191
  Baya *114*, 169
  Bengal 169
  Bertram's 189
  Bertrand's 189
  Black 181
  Black-backed 181
  Black-billed *82*, 187
  Black-breasted *83*, 169
  Black-chinned 188
  Black-faced 164
  Black-headed 163, 165
  Black-necked 182
  Black-throated 169
  Blue-billed 323
  Bob-tailed 157
  Bocage's 161
  Bottle 182
  Brown-capped *81*, 189
  Brown-throated 162, 176
  Brown-throated Golden 176
  Cape *93*, 162
  Chestnut *82*, 158
  Cinnamon 172
  Clarke's *131*, 173

Common 169
Common Slender-billed 183
Common Social 138
Compact *80*, 157
Cuckoo 219
Cut-throat 301
Dark-backed *115*, 181
Eastern Baya 169
Eastern Forest 181
Eastern Golden 161, 163
Emin's 191
Entebbe 162, 163
Finn's 158
Flowerpecker 305
Forest 181
Fox's 178
Gambian Black-headed 163
Giant *124*, 166
Golden 158, 161
Golden Palm 175
Golden-backed 163, 188
Golden-naped 185
Grant's Forest 323
Grenadier 145
Grey-backed 181
Grosbeak 138, 538
Heuglin's 162
Heuglin's Masked 162
Himalayan 158
Holub's Golden *101*, *105*, 184
Hooded 361
Indian 169
Jackson's Golden-backed 163
Juba *124*, 172
Jubaland 172
Katanga Masked 172
Kilombero *129*, 176
Lake Lufira 171
Lake Victoria 162, 163
Large Golden 184
Larger Golden 184
Layard's 165
Layard's Black-headed 165
Lesser Masked *113*, 161
Little *94*, 170, 183
Little Olive 311
Loango *128*, 189
Loango Slender-billed 189
Lufira Masked 171
Manyar 175
Maxwell's Black 187
Monteiro's Golden 184
Mottled 165
Nelicourvi *84*, 177
Nicoll's 187
Northern Brown-throated *95*, 162
Northern Masked *80*, 172
Northern Red-headed 197
Olive-headed *126*, 188
Olive-headed Golden 188
Orange *81*, 175
Palm 175
Parasitic 219
Preuss's 188
Preuss's Golden-backed 188
Principe 178
Principe Golden 178
Red-breasted Forest 323
Red-headed *104*, 197
Red-headed Blue-billed 323
Red-headed Forest 323
Red-winged 197
Reichenow's 191
Rufous-tailed *76*, 136
Rüppell's *91*, *106*, 170
Ruwet's Masked 171
Sakalava *92*, 177
Salvadori's 172
Sao Tome *84*, 177
Sao Tome Grosbeak 538
Scaly 136
Scaly-feathered 136
Scaly-fronted 136, 137
Slender-billed *89*, 183
Sociable *96*, *111*, *119*, 138
Social 138
Southern Brown-throated 176
Southern Masked *120*, *123*, 164
Speckle-fronted *76*, *107*, 137
Spectacled *109*, 182
Speke's *118*, 178
Spot-headed 181
Spotted-backed 165
Strange 183
Streaked *107*, 175
Striated 175
Stripe-breasted 135
Stuhlmann's 191
Sudan Masked 172
Swainson's 182
Swamp Masked 171
Tanganyika Masked 171
Tanzanian Masked 171
Tanzanian Mountain 187
Taveta 176
Taveta Golden 176
Thick-billed *112*, *123*, 138
Uganda 162
Usambara 187
Victoria Masked 162, 163
Vieillot's Black *108*, 181
Village *88*, *117*, *122*, 165
Vitelline Masked 171
Western Golden-backed 188
Weyns's 184
White-cheeked Olive 311
White-eyed 187
White-naped Black 187
Yellow 158, 161
Yellow-backed 163, 172
Yellow-capped 189
Yellow-collared 163
Yellow-legged 187
Yellow-mantled 184
Weaver Bird, Black-throated 169
Weaver Finch 361
Weaver-finch, Flowerpecker 305
Weaver-finch, Olive 311
Weaver-finch, Red-fronted Flowerpecker 305
West African Seedeater 531
West African Serin 531
Western Alpine Mannikin 374
Western Alpine Munia 374
Western Bluebill *254*, 323
Western Citril 521
Western Golden-backed Weaver 188
Western Greenfinch 542
Western Negrofinch 306
Western Seedcracker 322
Western Warbling Vireo 429
wetmorei, Vireo pallens 418
Weyns's Weaver 184
weynsi, Ploceus 184
Whistling Warbler 761
White-backed Munia 367
White-bellied Canary 529
White-bellied Crimson Finch 353
White-bellied Mannikin 368
White-bellied Munia 368
White-bellied Warbler 793
White-billed Buffalo-weaver *75*, 132
White-breasted Blackfinch 305
White-breasted Finch 351
White-breasted Mannikin 351, 368
White-breasted Munia 351, 368
White-breasted Negrofinch *265*, 305
White-breasted Nigrita 305
White-breasted Waxbill 321
White-browed Rosefinch *489*, 592
White-browed Sparrow-weaver *95*, *110*, 135
White-browed Warbler *711*, 796
White-capped Munia *255*, 370
White-cheeked Bullfinch *504*, 607
White-cheeked Olive Weaver 311
White-cheeked Oliveback 311
White-cheeked Waxbill 311
White-chinned Quailfinch 300
White-collared Oliveback 311
White-cowled Munia 377
White-crowned Mannikin 375
White-crowned Munia 375
White-eared Grassfinch 358
White-eyed Vireo *386*, 417
White-eyed Weaver 187
White-eyed Widow 187
White-faced Buffalo-weaver 133
White-faced Redstart 785
White-faced Whitestart 785
White-fronted Grosbeak 138
White-fronted Redstart 786
White-fronted Whitestart 786
White-fronted Widowbird 150
White-headed Buffalo-weaver *99*, 133
White-headed Mannikin 373, 377
White-headed Munia *264*, 373, 377
White-headed Nun 373
White-lored Warbler 789
White-naped Black Weaver 187
White-naped Black Widow 187
White-rimmed Warbler 796
White-rumped Canary 522
White-rumped Mannikin 367
White-rumped Munia *265*, 360, 367
White-rumped Seedeater 522
White-rumped Serin 522
White-rumped Silverbill 360
White-rumped Siskin 522
White-shouldered Whydah 150
White-shouldered Widowbird 150
White-spotted Mannikin 365
White-striped Warbler 796
White-throated Canary *496*, 530
White-throated Munia 360
White-throated Seedeater 524, 530
White-throated Serin 524
White-throated Silverbill 360
White-winged Crossbill 604
White-winged Grosbeak *486*, 615
White-winged Ground Warbler 800
White-winged Mountain-finch 572
White-winged Rosy-finch 572
White-winged Seedeater 536
White-winged Warbler *725*, 800
White-winged Whydah 150
White-winged Widowbird 150
Whitestart
Brown-capped 781
Chestnut-crowned 785
Collared *697*, 785
Golden-fronted 786
Guaiquinima 785
Painted *704*, 780
Paria 782
Rufous-crowned 785
Saffron-breasted 785
Santa Marta 786
Slate-throated *685*, 781
Spectacled *677*, 785
Tepui 781
White-faced 785
White-fronted 786
Yellow-crowned *727*, 786
Yellow-faced *734*, 782
Whydah 198, 219
Acacia Paradise 221
African Paradise 221
Black 144
Broad-tailed Paradise 222
Chapin's Paradise 221
East African 221
Eastern Paradise 221
Fan-tailed 150
Fischer's 223
Jackson's 151
Long-tailed 152
Long-tailed Black 150
Long-tailed Paradise 222
Marsh 151
Montane Marsh 151
Mountain Marsh 151
Nigeria Paradise 222
Northern Paradise 222
Paradise 221
Pin-tailed *208*, *210*, *216*, *217*, 219
Queen 224
Red-collared 144
Red-shouldered 150
Shaft-tailed *207*, *209*, *214*, 224
Steel-blue *201*, 219
Straw-tailed *204*, *215*, 223
Uelle Paradise 222
White-shouldered 150
White-winged 150
Yellow-mantled 149
Yellow-shouldered 149
whytii, Serinus striolatus 535
Widow, Broad-tailed Paradise 221
Widow, Long-tailed Paradise 221
Widow, Montane Marsh 151
Widow, Nigeria Paradise 222
Widow, Pin-tailed 219
Widow, Red-shouldered 150
Widow, Shaft-tailed 224
Widow, Steel-blue 220
Widow, Straw-tailed 223
Widow, Togo Paradise 223
Widow, Uelle Paradise 222
Widow, White-eyed 187
Widow, White-naped Black 187
Widow, Yellow-backed 149
Widow, Yellow-rumped 149
Widowbird, Black 144
Widowbird, Buff-shouldered 151
Widowbird, Cinnamon-shouldered 150
Widowbird, Eastern Red-collared 144
Widowbird, Ethiopian 149
Widowbird, Fan-tailed 150
Widowbird, Hartlaub's Marsh 151
Widowbird, Highland Marsh 151
Widowbird, Jackson's *125*, 151
Widowbird, Jackson's Dancing 151
Widowbird, Long-tailed *100*, 152
Widowbird, Marsh 151
Widowbird, Montane Marsh 151
Widowbird, Mountain Marsh 151
Widowbird, Red-collared *91*, 144
Widowbird, Red-naped 144
Widowbird, Red-shouldered 150
Widowbird, White-fronted 150
Widowbird, White-shouldered 150
Widowbird, White-winged 150
Widowbird, Yellow-backed 149
Widowbird, Yellow-mantled *79*, 149
Widowfinch, African Firefinch 230
Widowfinch, Brown-backed Firefinch 230
Widowfinch, Green 231
Widowfinch, Purple 231
Widowfinch, Steel-blue 227
Widowfinch, Village 227
Widowfinch, Wilson's 228
wilderi, Pyrrhula erythaca 608
williamsoni, Ploceus manyar 175
Wilson's Indigobird 228
Wilson's Warbler *683*, 778
Wilson's Widowfinch 228
wilsoni, Chlorodrepanis virens 656
wilsoni, Hemignathus 624, *627*, *636*, 657
wilsoni, Serinus sulphuratus 529
wilsoni, Vidua 228
Wilsonia 778, 779
witti, Carduelis psaltria 559
wolfgangi, Fringilla coelebs 513
wolstenholmei, Loxops 647
wolstenholmei, Loxops coccinea 647
woltersi, Amblyospiza albifrons 138
woltersi, Spermestes bicolor 362
woltersi, Vidua regia 224
woodfordi, Erythrura trichroa 348
Woodhouse's Antpecker *236*, 305
woodhousei, Parmoptila 236, 305
Worm-eating Warbler *695*, 765
Wrenthrush *680*, 798

X

xanthogastra, Carduelis 555
xantholaemus, Serinus 508, 525
xanthomelas, Euplectes capensis 149
xanthophrys, Pseudonestor 624, *638*, 657
xanthops, Ploceus 101, *105*, 184
xanthopterus, Ploceus 176
xanthopygius, Serinus 524
xanthotera, Dendroica petechia 745
Xenoligea 777, 800
xericus, Philetairus socius 138
xuthus, Hylophilus flavipes 437

Y

yaegeri, Dendroica graciae 754
yarrellii, Carduelis 508, 549
Yellow Bishop 149
Yellow Canary *442*, 528
Yellow Fody 156
Yellow Swamp Finch 219
Yellow Sysie 528
Yellow Warbler *670*, *684*, *694*, *712*, *717*, *721*, 745
Yellow Weaver 158, 161
Yellow-backed Peppershrike 415
Yellow-backed Pytilia 331
Yellow-backed Weaver 163, 172
Yellow-backed Widow 149
Yellow-backed Widowbird 149
Yellow-bellied Greenlet 437
Yellow-bellied Redstart 781
Yellow-bellied Siskin 555
Yellow-bellied Swee 307
Yellow-bellied Waxbill 307
Yellow-billed Grosbeak *479*, 613
Yellow-billed Hawfinch 613
Yellow-breasted Chat *701*, 798
Yellow-breasted Greenfinch *445*, 544

Yellow-breasted Pytilia 331
Yellow-browed Seedeater 535
Yellow-browed Shrike-vireo 416
Yellow-capped Weaver 189
Yellow-collared Weaver 163
Yellow-crowned Bishop *99*, 143
Yellow-crowned Canary 518
Yellow-crowned Redstart 786
Yellow-crowned Whitestart *727*, 786
Yellow-crowned Yellowthroat 772
Yellow-eyed Canary 527
Yellow-faced Redstart 782
Yellow-faced Siskin *508*, 549
Yellow-faced Whitestart *734*, 782
Yellow-fronted Canary *480*, 527
Yellow-fronted Malimbe 187
Yellow-green Greenlet 437
Yellow-green Vireo 431
Yellow-green Warbler 788
Yellow-headed Warbler *675*, 777
Yellow-legged Malimbe 187
Yellow-legged Weaver 187
Yellow-mantled Weaver 184
Yellow-mantled Whydah 149
Yellow-mantled Widowbird *79*, 149
Yellow-rumped Bishop 149
Yellow-rumped Finch 374
Yellow-rumped Mannikin *249*, 374
Yellow-rumped Munia 374
Yellow-rumped Seedeater 524
Yellow-rumped Serin 524
Yellow-rumped Siskin 555
Yellow-rumped Warbler *683*, *714*, 748
Yellow-rumped Widow 149
Yellow-shouldered Whydah 149
Yellow-tailed Finch 374
Yellow-tailed Mannikin 374
Yellow-tailed Munia 374
Yellow-throated Seedeater *509*, 524
Yellow-throated Serin 524
Yellow-throated Vireo *391*, *399*, 424
Yellow-throated Warbler 753
Yellow-winged Pytilia 332
Yellow-winged Vireo *408*, 426
Yellowthroat
  Altamira 772
  Andros 772
  Bahama 772
  Belding's *737*, 771
  Black-lored 773
  Black-polled *733*, 773
  Brush 773
  Chapala 771
  Chiriqui 773
  Common *689*, *714*, 771
  Grey-crowned 774
  Hooded 773
  Maryland 771
  Masked 773
  Olive-crowned *673*, 772
  Orizaba 773
  Peninsular 771
  Southern 773
  Yellow-crowned 772
Yemen Linnet *489*, 570
Yemen Serin *442*, 535
yemenensis, Carduelis 489, 570
Yucatan Vireo 432
yucatanensis, Cyclarhis gujanensis 415
yukonicola, Geothlypis trichas 771
Yunnan Black-headed Greenfinch 545
Yunnan Greenfinch 545
yunnanensis, Lonchura punctulata 366

Z

Zaire Indigobird 227
Zaire Locustfinch 300
zambesiensis, Euplectes capensis 149
Zambezi Indigobird 231
Zanzibar Bishop 146
Zanzibar Red Bishop 146
zanzibaricus, Euplectes axillaris 150
Zebra Waxbill 299
zedlitzi, Bucanetes githagineus 578
Zeledonia 798
Zeledonia 798
Zonaeginthus 352, 353
zuliensis, Basileuterus cinereicollis 789



SUMMARY OF VOLUME 15

PLOCEIDAE (Weavers)
VIDUIDAE (Whydahs and Indigobirds)
ESTRILDIDAE (Waxbills)
VIREONIDAE (Vireos)
FRINGILLIDAE (Finches)
DREPANIDIDAE (Hawaiian Honeycreepers)
PEUCEDRAMIDAE (Olive Warbler)
PARULIDAE (New World Warblers)

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